1. Beverages

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comments from authors
Helen Benson	UNESDA Soft Drinks Europe	No general comments, only specific comments (please see below)	Responses on specific sections from UNESDA: INTRODUCTION We would like the chapter to note that as sweeteners are much sweeter than sucrose, they are used in minute, not smaller, amounts and in the EU can only be used in soft drinks containing no added sugars or following a significant reduction in sugars (>30% energy). DIET INTAKE - Data on soft drink intake is not relevant when looking at evidence on effects of sugar-sweetened beverages (SSBs) and low- and no-calorie sweetened beverages (LNCSBs) independently, and when our sales data suggests that in some Nordic countries LNCSBs represent >50% soft drink sales 1. Data for these sub-categories of soft drinks should either be presented for all age groups or highlighted as a gap in the data. - To estimate added sugars intake from SSBs, EFSA used data which had been uploaded to the EFSA food consumption database. However, more recent surveys have been undertaken in Denmark (all age groups), Finland (adults) and Sweden (adolescents). Since the soft drinks sector has undertaken significant reformulation of soft drinks to contain no or lower levels of sugars 1, these local sources will better reflect the most recent data. SSBs, AND SECTION IN FOOD-BASED DIETARY GUIDELINES (FBDG) - The authors could note that the evidence	1)we have changed to much smaller amounts; 2) we have no data on LNCSB seperately from dietary surverys, and have added that as data gap; 3) we have clarified that EFSA have used data on not always most recent; 4) we highlight the fact that evidence from RCTs and observational studies are consistent; 5) we mention the risk of bias by confounding; 6) we have clarified that excess weight gain are considered the main mechanism; 7) we have clarified that mechnism through lower satiety with liquid calories needs to be further studied; 8) we mentioned mechanism with LNCSB compared to SSB; 9)we added the conclusion from the SR using substitution modelling

			reported by EFSA on SSBs arising from RCTs was generally of much lower certainty compared to evidence from prospective cohort studies.2 Evidence from cohort studies likely includes a greater risk of bias mainly in the form of residual and unmeasured confounding, including via total energy intake, and collinearity with less healthy dietary and lifestyle patterns.3 EFSA considers excess energy intake leading to positive energy balance and body weight gain to be the main mechanism by which intake of dietary sugars may contribute to the intake of chronic metabolic diseases in free-living conditions. It is therefore suggested that any guidelines to limit SSB intake should particularly refer to high intake increasing risk of excess energy intake and weight gain. SECTION ON MECHANISMS - The statement on differential effects of calories from liquid vs. solid sources is a suggestion based on a limited and narrative review of evidence.4 The EFSA panel also noted potential differences but considered that the evidence was equivocal.2 Although results of acute studies generally suggest that liquid preloads are more often associated with lower satiety and/or incomplete energy compensation compared to other preloads, longer duration trials lasting 4 – 8 weeks have not shown clear differences in effects on body weight between sugars as liquid vs solid.5 - As noted elsewhere in the chapter, the authors should include the mechanism for reductions in body weight seen in RCTs where LNCSBs have been used to replace SSBs which is likely mediated via lower sugars and energy intake.	

			SECTIONS ON LOW AND NO-CALORIE SWEETENED BEVERAGES AND FBDG - A recent review which used analytical approaches to mitigate effects of reverse causation in prospective cohort studies by modelling change in intake or substitution of LNCSBs for SSBs showed that LNCSBs are associated with weight loss and decreased incidence of diabetes, CVD and all-cause mortality.6 This evidence has already been used to inform recent clinical guidelines on obesity.7 1. Sales and Consumption – UNESDA 2. EFSA Panel on Nutrition 2022 https://doi.org/10.2903/j.efsa.2022.7074 3. Sievenpiper and De Souza https://doi.org/10.3945/ajcn.113.067215 4. Pan & Hu 2011 https://doi.org/10.1097/mco.0b013e328346df36 5. DiMeglio et al., 2000 https://doi.org/10.1038/sj.ijo.0801229 ; Houchins et al., 2012 https://doi.org/10.1038/oby.2011.192 ; Apolzan et al., https://doi.org/10.1371/journal.pone.0251700 ; Te Morenga et al. 2021 https://doi.org/10.3389/fnut.2021.636275 6. Lee t al., https://doi.org/10.2337/dc21-2130 7. https://obesitycanada.ca/guidelines/nutrition/	
Marleena Tanhuanpää	Finnish Food and Drink Industries' Federation	Taking into account the missing references (Purohit et al. 2022; Tsilas et al. 2017) it cannot be concluded that SSBs are a cause of several diseases. A missing causality should be highlighted in the chapter. It would be important to include a discussion of the limitations of studies	Page 1: Compering table 2, the statement of high consumption of SSB in Nordic Countries seems to be speculative. Are there any comparisons to other countries? If not, this sentence should be relativized. Page 4: It would be important to include a discussion of the limitations of studies focusing on SSBs to the chapter, especially applicability of	EFSA conclude that the results on SSB can be generealized; no need to comapre the intake of these beverages to other countries, but we have reformulated to frequently consumed; the strenghts of observational studies were added

		focusing on SSBs to the chapter, especially applicability of predominantly US based studies High Fructose Corn Syrup (HFCS) to Nordic populations, definitions of SSBs and of missing descriptions of sugar content and portion size. EFSA highlighted applicability of US studies of their findings to European population as a limitation (EFSA Panel on Nutrition, Novel Foods and Food Allergens. 2022). If pointing out as a recommendation that one should not drink too much boiled coffee - if possible, be specific to how many cups. And to balance the picture, be clear about whether filtered coffee is recommended to be included in a balanced diet. Overall, a moderate consumption of coffee, equivalent to 3-5 cups per day, has been associated with a range of desirable physiological effects in scientific literature and can fit within a healthy, balanced diet and active lifestyle. Also, if pointing to the weakness of observational studies (that backs up the health effects of coffee), remember to point out the strengths that it can measure hard endpoints (like deaths and diseases), in contrast to randomized controlled studies that only measures risk factors for disease (cholesterol levels). Also, when talking about observational studies being	predominantly US based studies High Fructose Corn Syrup (HFCS) to Nordic populations, definitions of SSBs and of missing descriptions of sugar content and portion size. EFSA highlighted applicability of US studies of their findings to European population as a limitation (EFSA Panel on Nutrition, Novel Foods and Food Allergens. 2022).	

		weakened by confounding factors, such as traditional healthy foods correlating with exercise and healthy living; coffee consumption can correlate with basically anything, also negative parameters such as pastry consumption and smoking etc. Purohit, Bharathi M, Anika Dawar, Kalpana Bansal, Nilima, Sumit Malhotra, Vijay P Mathur, and Ritu Duggal. 2022. "Sugar-Sweetened Beverage Consumption and Socioeconomic Status: A Systematic Review and Meta-Analysis." Nutrition and Health, November, 02601060221139588. Tsilas, Christine S., Russell J. de Souza, Sonia Blanco Mejia, Arash Mirrahimi, Adrian I. Cozma, Viranda H. Jayalath, Vanessa Ha, et al. 2017. "Relation of Total Sugars, Fructose and Sucrose with Incident Type 2 Diabetes: A Systematic Review and Meta-Analysis of Prospective Cohort Studies." CMAJ : Canadian Medical Association Journal 189 (20): E711–20.6.		
Anne-Mette Nielsen	Nordic Sugar	Regarding the role of sugar-sweetened beverages (SSBs) in the development of overweight and obesity as well as several metabolic diseases, the authors refer mainly to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars (EFSA Panel on	Part 1 of 2 Page 1: Abstract a. For background information, the statement that SSB consumption is high in Nordic and Baltic Countries seems speculative (compare table 2). Are there any comparisons to other countries? If not, this sentence should be	1) We have added text on confounding for SSB. We think it is already clear that the effect of SSB is mainly due to energy surplus; 2) the intake data are the data we got from NNR and EFSA; 3) we change to frequently consumed; 4) we have no

		Nutrition, Novel Foods and Food Allergens, 2022). The authors concluded that SSB intakes are associated with weight gain and adverse health effects. However, the authors did not point out several limitations. For data from observational studies, it should be highlighted that high consumers of SSBs are more likely to have less healthy lifestyles, dietary patterns and consume more calories in general and other confounding factors. Furthermore, only a minority of the studies included by EFSA showed positive and significant associations. For intervention studies, it is important to know, if studies were controlled for energy intake or where ad libitum studies, because current data indicates that energy balance is a key determinant for the effects for SSBs. Several remarks should be included to improve the chapters quality: a. In general, high SSB intakes are associated with a clustering of other diet and lifestyle factors which are often considered as 'unhealthy'. Therefore, the association of SSB intakes with several diseases, like type 2 diabetes, hypertension or cardiovascular diseases is confounded by several other factors, including, reduced physical activity, smoking or a lower socioeconomic status (Purohit	relativized. b. For conclusion, the sentence on SSBs should be rephrased. SSBs may affect health due to a positive energy balance, whereas isocaloric trails show no harm (for example, see (Choo et al. 2018)). This effect applies to all energy-containing beverages. Since most of observational studies on SSBs and metabolic diseases are biased by several confounders, the word 'consistently' should be deleted. Page 4: Methods a. Translating results from US studies/guidelines seems not to be appropriate due to several reasons, especially for SSBs. First, US studies on SSB intakes are mainly based on HFCS (high fructose corn syrup). Second, the US population have higher baseline obesity (Abarca-Gómez et al. 2017). Third, for this reason, EFSA highlighted applicability of US studies of their findings to European population as a limitation (EFSA Panel on Nutrition, Novel Foods and Food Allergens. 2022). Page 8: Sugar-sweetened beverages a. In general, limitations of SSB intake with several metabolic diseases should be highlighted. Moreover, relationships of SSB intakes with metabolic diseases come from observational studies, which are biased by several confounders: High SSB consumers are more likely to have an 'unhealthy' diet and lifestyle, have a higher energy intake, be less physically active, smoke more (Tsilas et al. 2017) and have a lower socioeconomic status (Purohit et al. 2022). Therefore, it cannot be derived that SSBs are the single cause of obesity and other metabolic diseases.	reason to change the grade of certainty from the EFSA report

		et al. 2022; Tsilas et al. 2017). Therefore, it cannot be concluded that SSBs are a cause of these diseases. Moreover, a missing causality should be highlighted. This is especially the case if data comes from prospective cohort studies (and other observational studies). b. The authors may include a section to discuss the limitations of studies focusing on SSBs, including confounding factors of observational studies, the role of energy intake, applicability of predominantly US based studies High Fructose Corn Syrup (HFCS) to Nordic populations, definitions of SSBs and of missing descriptions of sugar content and portion size. c. Regarding table 2, more recent dietary surveys are available for Denmark (2011-2013) and Finland (2017) showing lower intake of SSBs. If possible, time trends of SSBs in Nordic countries in the last years/decades should be included since sales of beverages with no or low sugar has increased. It should not be concluded that the intake of SSBs is high without comparisons. This should also be corrected in the beginning of the abstract. Moreover, it is questionable if adults mean intake level of SSBs (added sugars 1-2 E%) contribute to non-communicable	b. For obesity, it should be clarified, if RCTs were ad libitum or isocaloric studies, investigating the effect SSB intake on weight gain, because current data indicates that energy balance is a key determinant for the effects for SSBs. Therefore, it should be included, if results were due to increased energy intake (ad libitum) or SSB intake as such (isocaloric). Furthermore, it should be pointed out that only two of six RCTS showed a statistical effect of SSBs on body weight. For prospective cohort studies, confounding as mentioned above should be highlighted. c. For type 2 diabetes, confounding as mentioned above should be highlighted for prospective cohort studies. Furthermore, since dietary sugars as such (Tsilas et al. 2017; Neuenschwander et al. 2019) are not associated with type 2 diabetes, the role of body weight gain in development of type 2 diabetes should be pointed out (Shulman 2014; Lean et al. 2018; Veit et al. 2022). d. For NAFLD, data from EFSA is mainly based on Studies with HFCS form the US, which is a main limitation and hampers transferability towards the European population. Furthermore, only ad libitum but not isocaloric RCTs in the EFSA assessment showed effects on liver fat, which indicates rather an effect of positive energy balance than SSBs as such on the development of NAFLD. This should be highlighted, since body weight gain but not dietary sugars are established risk factors for NAFLD (Chiu et al. 2014; Musso et al. 2010).	

		disease in the Nordic adult population.		
Anne-Mette Nielsen	Nordic Sugar	part 2 of 2: Specific comments continued	part 2 of 2 Page 8: sugar-sweetened beverages e. For dyslipidemia, as mentioned previously, the limitations with ad libitum RCTs (control of energy intake) and prospective cohort studies (confounding lifestyle factors) should be highlighted. Furthermore, as written in the paragraph, the majority of prospective cohort studies did not find any association of SSB intakes with dyslipidemia, since the results were non-significant. f. For hypertension, since only four of seven prospective cohort studies showed a positive association of SSB intakes and RCTs showed mixed results, it cannot be concluded that SSB intakes are causal and positively linked with hypertension. g. For cardiovascular diseases, was data from prospective cohort studies significant? Please add a referring sentence. If not, it should be pointed out that the results from observational studies seem to be conflicted and with that a positive association of SSB intakes with the development of CVDs cannot be derived from current data. Page 11: Mechanisms a. A sentence should be added, which points out that current scientific evidence only indicates that calories from all liquid sources may (this is not finally confirmed as long-term studies are needed) have a lower effect on satiety compared to solid foods. Therefore, the link of SSBs with body weight gain is due to a positive energy balance rather than due to SSBs and sugars as	1) We have added a sentence on bias by confounding; 2) Although not statistically significant, they all were in same direction; 3) we have no reason to change the grade of certainty from EFSA regaring SSB and CVD; 4) we think it is clear that the main mechanism is through excess energy intake; 5) sentence on bias in observational studies are added

			such. Page 12: Food-based dietary guidelines a. For data of SSB intakes with metabolic diseases, limitations due to several confounding factors (e.g., lifestyle and socioeconomic status) should be mentioned in this section. Furthermore, the limitation of observational studies to keep energy intake constant should be added. b. The conclusion to reduce consumption of added sugars from beverages is not justified by the current data assessment. The limitations of observational studies explained in the coffee section are also relevant to this section. The large limitation about not keeping energy constant in this analysis should have more weight in the conclusion. Intake of any energy-containing food groups - if consumed in excess could result in a positive energy balance and hereby result in weight gain and increased risk of metabolic disease. Full reference list is available on request from the authors.	
Swedish Food Agency	Swedish Food Agency	This is a good overview of different beverages in relation to health outcomes. A strength is tha mendelien randomization studies have been included in studies of coffee and different outcomes. In the abstract conclusion the following sentence is suddenly appearing: ""Pregnant women should	No specific comments.	This has been rephrased

		not exceed the daily recommended dose of caffein intake", where does this come from? It is not explained in the results part of the abstract. Furthermore, the sentence could be misunderstood. There is no recommendation for daily intake of caffein as such, it is an upper limit that pregnant women should not exceed. Please rephrase to make this clearer. For example to: "Pregnant women should not exceed the upper limit of daily caffein intake of 200 mg, set by EFSA as safe for the fetus."		
Rikke Bekker Henriksen	DI Fødevarer	Danish Food and Drink Federation would like to add a few comments to the NNR 2022 chapter on Beverages. The abstract, section "Background" page 1 says: "The consumption of coffee, tea, sugar-sweetened beverages (SSB) and low- and no-caloric sweetened beverages (LNCSB) are generally high in the Nordic and Baltic countries. These beverages have also been related to potential health effects". There is no reference for this statement? Table 1 and 2 in the report only show data from Nordic and Baltic countries. Reference(s) should be added to the list of references – or the statement should be removed/reformulated. The authors refer to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars (1),	No specific comments	1) We have modified it to frequently consumed. 2) sentence regarding increase in LNCSB have been added; 3) the limitation in observational studies (incl confounding) have been discussed

		from which they use data for table 2. Intake data for the consumption of SSB's and LNCBS's in the EFSA report are not the most updated data. Recent sales data from UNESDA (2) show that the intake of LNCBS's in the Nordic counties has increased significantly, and this fact is not reflected in the EFSA opinion and thus in this chapter. Regarding the role of SSBs in the development of overweight and obesity as well as several metabolic diseases, the authors also refer to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars. The authors conclude that SSB intakes are associated with weight gain and adverse health effects. However, the authors do not point out several limitations. For data from observational studies (eg. Tsilas et al. 2017 (3) and Purohit et al. 2022 (4)), it should be highlighted that high consumers of SSBs are more likely to have less healthy lifestyles, dietary patterns and consume more calories in general and as well as other factors. Thus, it cannot be derived that SSBs are the single cause of obesity and other metabolic diseases. Furthermore, only a minority of the studies included by EFSA showed positive and significant associations. List of references: 1. "Tolerable Upper Intake Level for		

		Dietary Sugars." EFSA Journal. European Food Safety Authority 20 (2). 2. Sales and Consumption – UNESDA 3. Tsilas, Christine S., Russell J. de Souza, Sonia Blanco Mejia, Arash Mirrahimi, Adrian I. Cozma, Viranda H. Jayalath, Vanessa Ha, et al. 2017. "Relation of Total Sugars, Fructose and Sucrose with Incident Type 2 Diabetes: A Systematic Review and Meta-Analysis of Prospective Cohort Studies." CMAJ : Canadian Medical Association Journal 189 (20): E711–20.6. 4. Purohit, Bharathi M, Anika Dawar, Kalpana Bansal, Nilima, Sumit Malhotra, Vijay P Mathur, and Ritu Duggal. 2022. "Sugar-Sweetened Beverage Consumption and Socioeconomic Status: A Systematic Review and Meta-Analysis." Nutrition and Health, November, 02601060221139588.		
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	Please find FoodDrinkNorway`s general comments for consideration.  One of the main references is the EFSA`s scientific opinion on tolerable upper intake level for dietary sugars. It is important to keep in mind that EFSA`s evaluation has limitations that should be carefully assessed. As an example, EFSA did not separate between sugars in solid foods and in sugars in beverages. The report is therefore not appropriate for use in	p. 4 - Diet intake in Nordic and Baltic countries: The chapter lacks reference to updated data on the Norwegian beverages market. The organization "Norwegian Beer and Soft Drink Producers" gather and publish the official sales statistics for all Norwegian soft drink producers, data that is used both by Statistics Norway and researchers. Their data show a strong and continuous shift from SSB towards LNCSB, as LNCSBs share of the Norwegian soft drink market has increased from 43 % in 2015 to 66 % in 2022.	1) EFSA can be used to evaluate health effectys of SSB; 2) the limitation in observational studies have been discussed; 3) We have added a sentence regaring increase in LNCSB

		the evaluation of health outcomes for SSBs only. Second, EFSA`s analysis is only valid for added and free sugars in the 10-30 % range. There is no validated evidence for the risk of metabolic diseases for intakes below 10 % added and free sugars because of high scientific uncertainties. When assessing the intake of SSBs and negative health outcomes it is also important to take confounding factors into account. As an example, high consumers of SSBs are more likely to have less healthy lifestyles and dietary patterns in general, which in turn could lead to excess energy intake and weight gain.	LNCSBs yearly market share in Norway: 2015: 43 % 2016: 45 % 2017: 48 % 2018: 52 % 2019: 56 % 2020: 60 % 2021: 64 % 2022: 66 % According to the same statistics, the total consumption of soft drinks in 2015 was 466827000 liters, and in 2022 566480000 liters.	
Elisabet Rytter	Swedish Food Federation	x	Introduction -page 3 The following information should be added about sweeteners: - is much sweeter than sucrose and used in minute, not "smaller amounts" - can only be used in soft drinks containing no added sugars or following a significant reduction in sugars (>30% energy) (EU legislation). Diet intake in Nordic and Baltic countries -page 4 and table 1-2 In some Nordic countries LNCSB represent more than 50% of soft drink sales. Data for these sub-categories of soft drinks should be presented or highlighted as a gap in the data. Mechanisms – page 11 It should be added that evidence only indicates	1) we clarify that sweeteners are much sweeter; 2) we did not add anything regarding EU legistlation, but have refered to EFSA; 3) we add the gap in intake of LNCSB seperately; 4) we already mentioned the calories from liquids; 5) recommendations for coffee are provided by the NNR committee and was not the aim of this chapter; 6) we already mentioned the mechanism through excess energy

			that calories from liquids may have a lower effect on satiety vs solid foods. EFSA noted that the evidence for this isn´t univocal. It should be added that the mechanism for reductions in body weight seen in RCTs where LNCSBs have been used to replace SSBs likely is mediated via lower sugars and energy intake. Food Based dietary guidelines Coffee- page 11 The chapter describe the health effects of coffee in general, but it is unclear whether it is recommended. If it is according to science, recommendations for coffee as part of a healthy diet should be added including indications of maximum level of boiled coffee. Here is an example of such recommendation from Institute of Scientific Information on Coffee, ISIC: https://www.coffeeandhealth.org/about-isic: "Overall, a moderate consumption of coffee, equivalent to 3-5 cups per day, has been associated with a range of desirable physiological effects in scientific literature and can fit within a healthy, balanced diet and active lifestyle." SBB – page 12 EFSA considers excess energy intake leading to positive energy balance and body weight gain to be the main mechanism by which intake of dietary sugars may contribute to the intake of chronic metabolic diseases in free-living conditions. It is therefore suggested that any guidelines to limit SSB intake should particularly refer to high intake increasing risk of excess energy intake and weight gain.	

Berit Elkjær	Fredensborg Sumdhedscenter	Tak for et spændende kapitel. Forstår det er vanskeligt at konkludere ud fra primært epidemiologiske data, hvilket fremføres megt fint i kapitlet.	Det kunne være interessant, hvis man kunne forholde sig til kaffe og søvn. Derved kunne man måske give anbefaling om tidspunkter for indtagelse ift halveringstider af koffein. Kaffes indhold af tanniner og deres påvirkning af optagelse af jern/mineraler fra måltidet kunne også indikere en anbefaling om tidspunkt for kaffeindtag i forhold til måltidet. Af overvejelser kunne også være kaffes indhold af akrylamid. Har det betydning? Kunne det være relevant i denne sammenhæng også at forholde sig til kakao? I fitnessbranchen indtages store mængder af proteindrikke og energidrikke af især unge mænd. Hvilken betydning har det? Hvis man samlet skal forholde sig til klima i NNR, er indtaget af drikke ikke uvæsentlige for klimabelastningen. Det kunne være interessant at integrere klima i de relevante kapitler. I dette kapitel kunne man måske fokusere på at vælge kvalitet og reducere kvantiteten af disse drikke. Man kunne også forholde sig til Fairtrade m.m. i sammenhæng med kaffe etc.	The focus of the chapter was on the relationship between coffee consumption and the non-communicable diseases with the highest burden in a society. Therefore, sleep impairment was not one of the outcomes that was assessed. That being said, it would be somewhat difficult to give a clear recommendation regarding the timing of the coffee intake in regard to sleep, as the half-life of caffeine can range from 1.5 hours to 9 hours with the average of 5 hours (this was added in the chapter). Also, the effect of caffeine seems to be different in those that drink coffee regularly compared to those that drink it occasionally, with the latter being more affected by caffeine in regard to their sleep.

2. Cereals (grains)

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comment from authors
Mikael Fogelholm	University of Helsinki	No general comments.	In the abstract, there is the sentence "There is less evidence for refined grains, but available evidence does not seem to indicate similar beneficial associations as for whole grains". I do not totally disagree, but I am a little uncertain if this is put too nicely. In the review, only one reference towards the associations between refined grain and health was presented, and the outcome was body weight (with a non-significant result). Is it really so, that nothing else could be found? More on the refined: p. 8, sentence: "However, they are normally smaller contributors to the grains group." Is this referring to cakes etc.? But also many types of bread are based on refined grains and the fiber content of these is consequently quite low (<4 g/100 g). Aren't these included in refined grains? And is the contribution of these in the dietary grains "low"? I have the feeling that (at least in Finland), a too high proportion of all breads on market do not have a high fiber content and moreover, are based on mostly low-fiber, refined grains.	1. Based on this and other comments we have expanded the description on refined grains The abstract says "It is suggested that replacing refined grains with whole grains would improve several important health outcomes. However, we think the concerns are covered by these sentences from the Food based dietary guidelines "Meta-analyses including both whole grains and refined grains, generally indicate more beneficial associations for whole grains/whole grain products than for refined grains/refined grain products for most health outcomes including cardiovascular disease and mortality, diabetes type 2 and overweight/obesity (34, 36, 37, 38, 39, 40, 41). Thus, even with some limitations and less certainty on findings related to refined grains, it is reasonable to recommend a high intake of whole grains partly at the expense of refined grains, but also at the expense of other food groups where the intake is higher than recommended." 2. We have clarified the text. See also above comment.
Morten Gram Sell	the Danish Whole Grain Partnership		Quote from abstract: Cereals can be consumed with its entire grain kernel and are then referred to as whole grains, or can be consumed after removal of the bran and germ and are	Thank you for the clarification, we have modified the text and abstract

			then referred to as refined grains. Correction: If the bran OR germ is removed it is defined as refined grains, not it dosent have to be both the bran AND germ. Link: https://fuldkorn.dk/wp-content/uploads/2023/01/Fuldkornslogomanualen_revideret-udgave_gaeldende-06012023_English.pdf	
Lene Møller Christensen	National Food Institute, Technical University of Denmark	Thank you for a very interesting paper on cereals and cereal products and for the opportunity to comment on the background papers. I would like to draw your attention to a memo on updating the recommendation for whole-grain intake in Denmark: Christensen & Biltoft-Jensen (2022). Scientific background for updating the recommendation for whole-grain intake. DTU National Food Institute. ISBN: 978-87-93565-92-0. Available at: https://orbit.dtu.dk/files/278648582/Final_Memo_whole_grain_May.pdf. The memo contains a review of cohort studies from Northern Europe and identifies the amount of whole grain that is associated with a reduction of disease risk and all-cause mortality. The memo (incl. the references used) might provide perspective on the amount of whole grain to recommended in the Nordic context. Throughout the paper: It could help the reader if you are consistent about whether you are talking about whole grains as a concept, whole grain as an ingredient (refers to the grain itself) or a whole-grain product (refers to foods having a minimum content of whole	Introduction page 3: Be consistent in how you refer to cereals and cereal products. In the first section, they are referred to as cereals, while in the third section they are referred to as grains. Section one: I believe that when defining whole-grain products, you would typically mention the minimum content of whole grain as an ingredient and when defining whole grains, you would typically mention the components endosperm, bran and germ being present in the same proportion. Section two: Regarding the front-of-pack nutrition claim for foods with a minimum of 25% whole-grain ingredient based on dry weight, it might be relevant to mention the minimum content required in the Nordic Keyhole Label or the Danish whole-grain logo. Are you aware that the proposed definition has been published in this paper: Van der Kamp et al. Consensus, Global Definitions of Whole grain as a Food Ingredient and of Whole-Grain foods Presented on Behalf of the Whole Grain initiative. Nutrients 2022, 14, 138. Diet intake in Nordic and Baltic countries page 4: How do you define a high intake of cereals and whole grains? Amounts in grams describing the intake could be useful.	1. Thank you for this update. We have included some of these papers, including the memo. 2. We have tried to be clearer and consistent in our use of the terms now and have carefully revised the manuscript with this comment in mind. 3. We used grains and cereals interchangeably. We were asked to write about cereals, but grains are often (probably more often) used in the literature, and we have mostly used the terminology used by the authors we quote. 4. We agree, and that is what we have done, but we have modified some of the text and included the new article reference. 5. We have incorporated some text regarding the Keyhole criteria. 6. Thank you for the reference. It has been incorporated. 7. We have given some examples, but try to avoid too many numbers. 8. We have now tried to be clearer regarding serving sizes measured as both dry-weight and fresh/ready-to-eat-weight, and whole grain products. 9. Yes, we have now also added the conversion.

		grain). The same applies to cereals and cereal products.	Table 1b note 1: How do you define a serving size being 30 g whole-grain (product?)? Is serving size in dry weight the same as the content of whole grain as an ingredient? Integration page 9: Is it possible to convert "3-7 servings of whole grains" to whole grain as an ingredient and whole-grain products measured in grams? On which level of energy intake does this amount apply? If it is not possible to convert the servings to grams and energy level, this should be mentioned.	
Anita Gynther	Yksityishenkilö	Jos suositukset kerran ottavat kantaa myös ilmaston kannalta suositeltaviin valintoihin, niin tuleekohan mitään kantaa riisin käytöstä Suomessa? Eikö se ole melko paha viljelytapansa aiheuttamien metaanipäästöjen kannalta, ja onko puhdistettu riisi edes kovin arvokasta ravitsemuksen kannalta?	Kts edellä	The authors were instructed not to write about the environmental/sustainability issues, that was done by others. This has however been incorporated in the final recommendations, where rice is highlighted as it leads to higher greenhouse gas emissons, and more fresh-water use
Swedish Food Agency	Swedish Food Agency	No general comments.	Comment 1: It would be valuable for the reader if it could be added somewhere under the heading "Health outcomes relevant for Nordic and Baltic countries" within which whole grain intake ranges the association analyses for morbidity and mortality were performed when discussing the results from Reynolds et al. Comment 2: The models in the Swedish report referred to on page 7 (reference 30) was done on total cereal intake in the population and not whole grain intake. The model was also on whole grain products and not whole grain as well as	1. Incorporated. 2. Corrected.

			MI incidence. It should therefore be described as follows: "It was modelled on the proportion of whole grain products of total cereal intake, and found that even if all of the intake of cereal products were whole grain products, the benefits in terms of reducing incidence of first myocardial infarctions outweighted possible negative effects caused by cadmium and mycotoxins. Mean total cereal intake was 166/218 g per day for women/men and whole grain intake in population was 34/40 g per day for women/men."	
Nina Elzer	CEEREAL asbl	We noticed that this chapter provides little information on cereals as a food group and their benefits beyond carbohydrates and places particular emphasis on whole grains. Also, it does not inform how cereals compare between each other. We feel that if the chapter is to address cereals, it should be broadened and expanded to review cereals with more specificity, including specific benefits of individual cereals, e.g., blood cholesterol lowering potential of oat beta-glucans, reduced intestinal transit time associated with wheat bran fibre. The various mechanisms outlined in the chapter indeed support the need for this broader scope. On structure, we observe that topics addressed in this chapter largely focus on whole grain, lightly touching on other relevant and important elements, e.g., dietary fibre and carbohydrates. Given that both dietary fibre and carbohydrates	P. 3, Intro, para 1: propose deleting "we refer to cereals as whole grains or refined grains to reflect the processing". Grains need to be processed to some degree in order to become edible as food products (e.g., bread, pasta, etc.). Therefore, a reflection on processing is rather confusing than conducive to the argument. P. 3, Intro, para 2: Ref 5 (to the Whole Grain Initiative) is dysfunctional; replace with: https://doi.org/10.3390/nu14010138. P. 5, Health outcomes, para 2, mention: - 'Higher intakes of whole grains were associated with a 13–33% reduction in the risk for all critical health outcomes' - not only '20% reduction in CHD incidence' but also '34% reduction in CHD mortality' - also 'reduction in stroke incidence/mortality' - a '33% reduction in risk of T2D' (according to Reynolds et al., 2019) - include benefits reported for fibre (Reynolds et al. (2019)), e.g., 'Higher intakes of total	1. Thanks for many useful comments. Relating to cereals vs. fibres and carbohydrates, the instructions to the authors were quite concise both in terms of content and quantity. We agree that a more comprehensive discussion of all (some) cereals and other nutrients or bioactive plant compounds would have been interesting, however, it was outside the scope of this chapter. We have focussed on the topics for which there was more evidence regarding mortality, obesity, and the large non-communicable diseases. As dietary fibres and carbohydrates are indeed separate chapters, they have only been mentioned briefly here, but are important components in cereals/grains, and cannot be completely omitted. 2. This comment was not quite clear to the authors. Very little information exists on health effects of germ. There is some more on

		are addressed in separate chapters, we wonder if the NNR would not benefit from this chapter focusing specifically on whole grain, which we suggest should also include recommendations to daily intakes. Despite the use of the term "refined grains" in scientific literature, we would like to caution about the use of the term "refined grains" as a classification of cereals within the NNR, as it has significant potential to be misleading. Often the term alludes to grains "after removal of the bran and germ" (see abstract). Applying this definition, alongside the classification whole grains, could result in the bran and germ elements of the grain being misplaced. Considering the nutritional attributes of such components, e.g., the bran's contribution to fibre intake, it is important that consumers and other stakeholders are accurately informed, educated and empowered to make healthy choices. FOR SPACE REASONS ADDED HERE (SPECIFIC COMMENTS continued) P. 6, Mechanisms: add references: - Barrett et al., 2019: https://doi.org/10.1017/S00071145190003 1X and Fardet 2019: https://doi.org/10.1017/S0954422410000041. The intake of whole grain, cereal fibre and bran (total and added) appeared to be similarly associated with lower risk of various CVD-related risk factors and	dietary fibre are associated with a 15–31% reduction in the risk of specified critical outcomes'; 24% reduction in CHD incidence; 16% reduction in type 2 diabetes incidence, etc. P. 5 ff, Health outcomes - add: - 2019 Global Burden of Disease on dietary risk factors (whole grain as leading dietary risk factor): https://doi.org/10.1016/s0140-6736(19)30041-8 - Tieri et al. 2020: https://doi.org/10.1080/09637486.2020.1715354 : "… inverse association between whole grain consumption and risk of type-2 diabetes and colorectal cancer; possible evidence of decreased risk of colon cancer and cardiovascular mortality with increased whole grain intake" - Shing Kwok et al. 2019: https://doi.org/10.1177/2047487319843667: "Carbohydrates were associated with a reduced risk of all-cause mortality (whole grain bread: relative risk (RR) 0.85, 95% confidence interval (CI) 0.82–0.89; breakfast cereal: RR 0.88,95% CI 0.83–0.92; oats/oatmeal: RR 0.88, 95% CI 0.83–0.92)" - Gaesser 2022: https://doi.org/10.1016/j.tcm.2022.08.002: "Refined grains do not contribute to the higher CVD risk associated with unhealthy Western dietary pattern" - Miller Jones et al. 2020: https://doi.org/10.1093/advances/nmz114: "…counter negative deductions about GBFs and RGFs, especially staple ones, and to support dietary guidance recommending a balance of GBF - achieved through the right mix, type, and quantity of WGFs and RGFs."	bran, but the qualified reviews that was chosen for us did not cover bran. Focussing on whole grains/whole foods rather than single components means that we can take all components and their synergies and interactions into account. Although there is less literature on refined grains than whole grains, it is the most established term that we are aware of, and it is not clear to us how this should be misleading. 3. We have modified the text somewhat. 4. Thank you, done . 5. We have selected some numbers to illustrate the results, but repeating all numbers from the table would make it almost redundant, and reduce readability. Fibres are covered in another chapter. 6. Thank you for these additional references. We were asked to use the qualified reviews selected by the NNR project. We have included some of these aspects when found to be particularly relevant. 7. Thank you for these additional references. Several of these have now been added. 8. Thanks, now incorporated. 9. Thank you for these references, we have not done systematic searches for specific foods, and are thus reluctant to focus much on this. But we have included some of this in the integration section.. 10. Sustainability is covered in other chapters, and we were instructed to remove the text that we had written

		outcomes within this review, suggesting that the fibre component of whole grains, located primarily within the bran fraction, may play an important role in the cardio-protective associations observed with whole grain intake. Notably, however, when the accepted definition and precise categorisation of whole grain and bran intake were used, associations found were stronger and less prone to attenuation after adjustment for cereal fibre, potentially indicating a role of whole grain nutrients beyond fibre - Guo et al. 2022: https://doi.org/10.1080/10408398.2021.1928596 "Due to their richness in a variety of unique bioactive components, whole grain cereals play an important role in human health" - Jefferson & Adolphus 2019: https://doi.org/10.3389/fnut.2019.00033: Supports a role of intact cereal fibers in promoting gut microbiota diversity and abundance. Strongest evidence lies in the role of wheat bran and wholegrain wheat fiber promoting gut microbiota diversity…" - P. 7, complete sentence: "The evidence for an association between intake of dietary fibres and reduced body weight seems to be slightly stronger than for intake of whole grains as a food group" by also mentioning that there was a higher number of studies (27 vs. 11). P. 8 : add references to studies showing lower mortality or disease risk associated with consumption of breakfast cereals:	- Sanders et al. 2021: https://doi.org/10.1093/advances/nmaa178: "Consumption of WG foods, compared with RG foods, significantly impacts subjective appetite, and might partly explain the inverse associations between WG food intake and risk of overweight, obesity, and weight gain over time" - the chapter very much covers cardiometabolic health, and cancer to a lesser extent, but omits other aspects, e.g., digestive health and psychological wellbeing. Therefore, add: -- Lawton et al. 2013: https://doi.org/10.3390/nu5041436: "… improvements in study outcomes increased with increasing cereal/fibre consumption. However, consuming an additional minimum 5.4 g of fibre (3.5 g wheat bran) per day was shown to deliver measurable and significant benefits for digestive health, comfort and wellbeing." -- de Vries et al. 2015: https://doi.org/10.3748/wjg.v21.i29.8952: "Wheat fiber, and primarily wheat bran fiber was found to improve measures of bowel function, including total stool weight, dry stool weight, and stool frequency, as well as intestinal transit time among those with an initial transit time greater than 48 h." P. 7, para 2, Biomarkers for disease: The sentence "a high intake of whole grains is also linked with lower glycated hemoglobin, but the evidence for this is slightly lower due to the heterogeneity of results between the randomized trials" should also mention the fact that there is a low number of trials.	

		- Aune et al. 2016 (http://dx.doi.org/10.1136/bmj.i2716) Both total and whole grain breakfast cereal consumption were inversely associated with all-cause mortality. Study failed to observe an association, in this regard, for oats or oatmeal in the high vs low analysis. - Systematic review and meta-analysis from Taneri et al., 2022 (https://doi.org/10.1093/aje/kwac039). Higher consumption of breakfast cereals was associated with a 15% lower mortality risk.	Sustainability: add: Wei and Frankel Davis 2021: https://doi.org/10.1088/1748-9326/ac32fc. "...increasing the share of whole grains can increase nutrient supply (+7% protein, +37% iron, +42% zinc)..."	
Ann-Kristin Sundin	LRF	Dear NNR Committee, Thank you for this opportunity to comment on the Cereals draft. Here are the comments from LRF. The focus is mostly on whole grains and almost nothing on refined grains. Highly refined grains need to be addressed from a health perspective, as more and more cereal products are actually highly refined. Some even contain added sugars, e.g. breakfast cereal products, and are also low in beneficial nutrients. Further, most of the inherent cereal-characteristic nutrients and bioactive components described in this chapter are no longer to be found in highly refined cereal products. Moreover, during the refinement process, simple sugars are created, most likely contributing to a negative impact on e.g. postprandial blood glucose response. We therefor suggest the authors recognize these differences between		Based on this and other comments, we have expanded the description of refined grains/cereals and particularly refined cereal products

		grains and highly refined cereals from a health perspective, pointing out that the highly refined cereals lack the cereal-characteristic nutrients and bioactive components, thus do not contribute to the health benefits stemming from them. Further, there is a need to emphazise that highly refined cereals are a source of added or created simple sugars.		
Tanja Kalchenko	Physicians' and nutritionists' organisation Food for the health	I suggest to add a paragraf: The new products made of whole grains - dairy and meat alternatives - potential for the public health In the future, the whole grain's importance for public/community nutrition and health should not be limited to traditional products only. New products, such as oat milk, oat yogurt and other alternatives to animal products made from oats and maybe other grains (oat milk in Sweden and oat meat in Finland), and their potential, should be considered. Today some of these products are ultra-processed, and thus less healthy. It doesn't have to be this way - oat milk, oat yoghurt and oat cheese, oat meat can contain the whole grain. Some research is being done on this, namely on how to make products that are both healthy, modern and attractive (https://nofima.com/projects/496882/). Protein content in oats is quite high - about 11 percents, and content of	None	The aim of this chapter was to review literature evaluating products that has been on the market long enough to see associations between their use and health outcomes.

		essential amino acid lysin is higher than in other cereals. As of today, most of the oats that are grown (in Norway) are used to make livestock feed. Sweden and Finland are among the world's ten largest exporters of oats. When the population in the Nordic region consumes an unhealthy amount of saturated fat (which mainly comes from dairy and red meat), both dairy and red meat can be replaced by oat milk, oat cheese and oat meat. These should be made with whole grains and not ultra-processed. Policy makers should focus and invest in research (RCT) and development of such new whole cereals products - healthy alternatives to dairy and meat.		

3. Vegetables, fruits and berries

Name	Organization/Affiliation	General comments	Detailed comments	Comments from authors
Andrea Grossmann	Svensk Egenvård	Svensk Egenvård (Swedish self-care) is a trade organization that consists of suppliers of food supplements, herbal medicinal products, natural remedies, weight loss products and sports nutrition on the Swedish market. See our suggestions in capital letters below "detailed comments". Below we have listed the references that should be added to the reference list (these studies are mentioned in our suggestions): Pojer E, Mattivi F, Johnson D, Stockley CS. The Case for Anthocyanin Consumption to Promote Human Health: A Review. Compr Rev Food Sci Food Saf. 2013 Sep;12(5):483-508. doi: 10.1111/1541-4337.12024. PMID: 33412667. Fallah AA, Sarmast E, Fatehi P, Jafari T. Impact of dietary anthocyanins on systemic and vascular inflammation: Systematic review and meta-analysis on randomised clinical trials. Food Chem Toxicol. 2020 Jan;135:110922. Shah K, Shah P. Effect of Anthocyanin Supplementations on Lipid Profile and Inflammatory Markers: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Cholesterol. 2018 Apr 22;2018:8450793. Yang L, Ling W, Du Z, Chen Y, Li D, Deng S, Liu Z, Yang L. Effects of Anthocyanins on Cardiometabolic Health: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Adv Nutr. 2017 Sep 15;8(5):684-693.	We suggest the following addition in paragraph 4 in the introduction (See capital letters below): Berries, such as blueberries, strawberries, blackberries and cranberries, stand out with a particularly high content of phytochemicals such as flavonoids INCLUDING ANTHOCYANINS, ellagitannins and phenolic acids (9). We suggest the following addition in paragraph 3 below the headline "Health outcomes relevant for Nordic and Baltic countries" (See capital letters below): ... cruciferous vegetables, allium, pome fruit (apples/pears), and citrus fruit may play a role in the observed risk reductions (16, 17). NO ASSOCIATIONS WERE SEEN FOR THE DIVERSE GROUP OF BERRIES IN GENERAL, BUT EVIDENCE IS INCREASING FOR A BENEFICIAL CONTRIBUTION FROM DARK BERRIES RICH IN ANTHOCYANINS (POJER E, MATTIVI F, JOHNSON D, STOCKLEY CS. THE CASE FOR ANTHOCYANIN CONSUMPTION TO PROMOTE HUMAN HEALTH: A REVIEW. COMPR REV FOOD SAF. 2013 SEP;12(5):483-508). However, more evidence is needed... and paragraph 4 below the same headline (See capital letters below): ... however, not for boiled potatoes or cruciferous vegetable intake overall. HOWEVER, THE NUMBER OF STUDIES ON SUBGROUPS OF FRUITS AND VEGETABLES IS SMALL, WITH THE EXCEPTION OF STUDIES WITH SOME DARK BERRIES (GUO	This aim of this chapter is to describe the overall evidence for the role of vegetables, fruits, and berries for health-related outcomes.The literature search was not designed to address health aspects of specific components in these foods, such as anthocyanins. Phytochemicals and their subgroups are addressed in the chapter chapter "Phytochemicals and antioxidants".

			X, YANG B, TAN J, JIANG J, LI D. ASSOCIATIONS OF DIETARY INTAKES OF ANTHOCYANINS AND BERRY FRUITS WITH RISK OF TYPE 2 DIABETES MELLITUS: A SYSTEMATIC REVIEW AND META-ANALYSIS OF PROSPECTIVE COHORT STUDIES. EUR J CLIN NUTR. 2016 DEC;70(12):1360-1367. DOI: 10.1038/EJCN.2016.142. EPUB 2016 AUG 17. PMID: 27530472). SOME FINDINGS MAY HAVE BEEN DUE TO SELECTIVE REPORTING OR CHANCE. Using the WCRF criteria... and paragraph 9 below the same headline (See capital letters below): ... These trials involve different study populations and the effects were more noticeable in people with obesity or cardiovascular risk factors (49). THE INTAKE OF BERRIES OR BERRY-BASED FLAVONOID-CONTAINING PRODUCTS MAY ALSO HAVE BENEFICIAL EFFECTS ON INFLAMMATION (FALLAH AA, SARMAST E, FATEHI P, JAFARI T. IMPACT OF DIETARY ANTHOCYANINS ON SYSTEMATIC AND VASCULAR INFLAMMATION: SYSTEMATIC REVIEW AND META-ANALYSIS ON RANDOMISED CLINICAL TRIALS. FOOD CHEM TOXICOL. 2020 JAN;135:110922, SHAH K, SHAH P. EFFECT OF ANTHOCYANIN SUPPLEMENTATIONS ON LIPID PROFILE AND INFLAMMATORY MARKERS: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS. CHOLESTEROL. 2018 APR 22:2018:8450793), CARDIOVASCULAR HEALTH (YANG L, LING W, DU Z, CHEN Y, LI D, DENG S, LIU Z, YANG L. EFFECTS ON ANTHOCYANINS ON CARDIOMETABOLIC HEALTH: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS. ADV NUTR. 2017 SEP 15;8(5):684-693) AND	

			COGNITIVE FUNCTION (52). We suggest the following addition in paragraph 1 below the headline "Mechanisms" (See capital letters below): … Apart from the established nutrients, plant foods contain thousands of other bioactive compounds, or phytochemicals, including phenolics (such as flavonoids AND FLAVONOID SUBGROUPS AS ANTHOCYANINS),… We suggest the following addition in paragraph 3 below the headline "Food-based dietary guidelines" (See capital letters below): …Trials, on the other hand, are commonly focused on specific fruits and vegetables, especially berries, and often in concentrated forms, such as juice, purée, or powder, rather than vegetables, fruits, and berries as a food group. They may also involve subjects with existing risk factors. STILL, BENEFICIAL EFFECTS ON INFLAMMATORY MARKERS AND CARDIOVASCULAR RISK FACTORS, ESPECIALLY FROM BERRIES, SEEN IN TRIALS (FALLAH AA, SARMAST E, FATEHI, JAFARI I. IMPACT OF DIETARY ANTHOCYANINS ON SYSTEMATIC AND VASCULAR INFLAMMATION: SYSTEMATIC REVIEW AND META-ANALYSIS ON RANDOMISED CLINICAL TRIALS. FOOD CHEM TOXICOL.2020 JAN;135:110922) SUPPORT THE ASSUMPTION THAT VEGETABLES, FRUITS, AND BERRIES CONTAIN SUBSTANCES THAT ALSO COULD MEDIATE PROTECTIVE EFFECTS ON CHRONIC DISEASES SEEN IN OBSERVATIONAL STUDIES. The…	
Johanna Kaipiainen (M.Sc, RD),	Finnish Vegan Association		Page 3. Legumes should not be included in the vegetable group, but in the protein foods	The chapter suggests that legumes should be considered

Charlotta Hyttinen (M.Sc), Evy Peltola (M.Sc, RD)			group. This in important, as we wish people to substitute meat with plant-based proteins.	as a separate food group. Legumes is discussed in a separate chapter.
Puk Holm	Danish Agriculture & Food Council	General comments Thank you for the opportunity to comment the chapter on Vegetables, fruits and berries. We have now been through a vast number of public consultations on NNR chapters. This is a general comment to the chapters on different food groups and meal patterns, initiated by the overall positive approach to plant-based food groups and negative to animal based. First, we need to stipulate that we agree that most population groups need to eat a more balanced diet, including more fruit, vegetables, berries, seeds, legumes and wholegrain. This is what we at the Danish Agriculture & Food Council communicate. All foods consist of both helpful nutrients, macro- and micronutrients and impose us with unhealthful substances such as natural toxins, contaminations and components from preparation and processing – there is no exception. This relationship is the main reason why the best nutritional guidance to give a population is "to eat a varied and balanced diet" in order to get sufficient nutrient coverage and maintain an acceptable level of health degrading substances. These relationships should be reflected in all the chapters describing the different food groups in the NNR. We urge that every chapter considers both the pro´s and con´s of all the different food groups. Meals are a matter of combination of food stuffs. The synergistic effects are not solely happening within food groups but also in between. It should therefore be addressed that for instance intake of meat with greens improve the uptake of iron from greens as too the contribution of vitamin C from vegetables/fruits enhances the uptake of iron. It is		Factors that affects iron absorption are discussed in the chapter on iron. A discussion on phytic acid may be more relevant in the chapters on cereals, and maybe also nuts and legumes, since these are the main sources of both iron (and minerals such as zinc) and phytic acids.

		basic information that the presence of phytic acid in plant-based foods inhibits the uptake of different nutrients, etc. These are important effects that underpins the importance of balanced and varied diets.		
Torill Nysted	Animalia	This chapter shows clearly the complexity of our food and food groups. Vegetables, fruits and berries are heterogenic food groups with plenty of different nutritional compounds. The authors offer quite much space to explain this, thus showing that there are so many factors that need to be taken into consideration. Such a comprehensive description should be done for all the different food groups, e.g. meat, where there has been given no description of different meats. The authors of the chapter of meat should look to the present chapter. Plant foods, such as vegetables, fruits and berries, may contain anti-nutrients which might have a negative impact on e.g. absorbtion and bioavailability of nutrients from other food sources. These facts are lacking, and should be discussed. We question why paragraph as "Data gaps for future research" and "Limitations" is not included in the chapter. Neither do they discuss the potential effects of preparation methods, processing etc. The chapter also shows that «the more, the better» is not necessarily the case. Therefore, all food groups should be taken into consideration when setting the dietary guidelines. Variety of all kinds of foods is still the best advice for the general population and for the public health. The authors state a recommendation of the importance of these food groups in a healthy diet, but according to the Disclaimer of the chapter, «the NNR committee is reponsible for setting the recommendations». The authors' conclusions and recommendations should therefore be left out at this stage. Conflict of interest for the authors is lacking.		See the comment above regarding inhibiting factors, such as phytic acid. The chapter includes paragraphs on data gaps for future research as well as limitations, although these subheadings were not used: the 6th and 7th paragraph in the section "Food based dietary guidelines", respectively. Limitations are also discussed in the 2nd and 3rd paragraph in the same section. The aim of this chapter is to describe the overall evidence for the role of vegetables, fruits, and berries for health-related outcomes, and the search strategy focused on meta-analysis and systematic reviews. There was almost no data on possible effects of different preparation methods. This is also commented upon in the section regarding data gaps for future research. The chapter does not set the recommendations but summarises the current evidence and highlights that it supports the recommendation from 2012

L.M. Granskog	concerned citizen	More emphasis should be on the production of nutrient dense fruits and vegetables and finding out the nutrient density of wild versus cultivated fruits and vegetables. Increasing fruits and vegetables in the diet may result in greater ghg emissions and other environmental consequences https://doi.org/10.1007/s10669-015-9577-y This might be reduced if people produced or harvest their own fruits and vegetables. Read the following article and note the references there in. Montgomery DR, Biklé A, Archuleta R, Brown P, Jordan J. 2022. Soil health and nutrient density: preliminary comparison of regenerative and conventional farming. PeerJ 10:e12848 https://doi.org/10.7717/peerj.12848 This book is also recommended: What Your Food Ate: How to Heal Our Land and Reclaim Our Health by David R. Montgomery & Anne Biklé https://www.dig2grow.com/books	On page 9 it is implied that a healthy diet is one that is low in red and processed meat. Red meat is mentioned in the same category of unhealthy foods such as sugar sweetened beverages and refined grains. This is unacceptable. There has already been a rise in NCD's (non-communicable diseases) while the consumption of red meat has declined. https://doi.org/10.3389/fnut.2021.748847 https://doi.org/10.1016/j.nut.2015.02.007 Red meat is an important source of nutrients critical for survival, including all of the essential amino acids, and iron which many women of reproductive age are deficient in. As more people start wearing CGM or testing their blood sugar after meals, it will become amply apparent to the individual what is and is not good dietary advice.	The aim of this chapter is to describe the overall evidence for the role of vegetables, fruits, and berries for health-related outcomes. The search strategy focused on meta-analyses and systematic reviews. No data was found regarding possible differences for wild versus cultivated fruits and vegetables. According to the qSR on dietary patterns (ref 70), red meat is a componant that is consistantly associated with negative health outomes.

4. Pulses

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comments from authors
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc)	Finnish Vegan Association	In some Nordic countries legumes are included in vegetable group in food guides, for example in Finnish food pyramid. Instead of that, legumes should be included in the protein foods group, so people understand that also legumes are protein foods. It is very common myth that only animal-based foods contain protein. This in important, as we wish people to substitute meat with plant-based proteins. Legumes should also be mentioned as first, and preferable, when protein foods are listed in recommendations.	No specific comments.	We have now added some text about protein aspects in the introduction.
L.M. Granskog	concerned citizen	The Paris agreement recognizes the fundamental priority of safeguarding food security (http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf). What foods can meet nutrient requirements and be locally produced must be taken into account. Most legumes do not grow well this far north and the production of them here will be limited. Animal sources of protein can be produced everywhere in the country of Norway, even in climates so cold as to be above the tree line. We are frequently hearing people should eat more legumes and less meat. Do the math. A significant proportion of the population is becoming overweight. We cannot grow soybeans in Norway. Legumes other than soybeans have significantly lower DIASS than animal	Reference number 32 in the chapter refers to a model. With regard to life expectancy, a cross-sectional data analysis of 175 contemporary populations found that worldwide, meat intake is positively correlated with life expectancies (https://doi.org/10.2147/IJGM.S333004). Observational studies rife with confounding are low certainty evidence. This is mentioned in the conclusions of one of the reference articles cited in this chapter on legumes, reference # 9, see the quote and reference below. One of the authors of this cited article, Hana Kahleová, lists an affiliation with the "Physicians Committee for Responsible Medicine". They clearly promote "plant based foods" with the intent to reduce animal suffering (https://www.pcrm.org/about-us). This affiliation indicates a bias against animal source foods. It may be mentioned that entire ecosystems above and below ground have been sacrificed to grow the monoculture crops of "plant based" foods. There has been no shortage of animals killed in this process. The following is a quote from reference 9 in the chapter, about the confidence in the evidence for the conclusion	Thanks for pointing out the importance of protein quality, this has now been mentioned in the revised chapter

		sources of protein. A hundred grams of roast biff has 125 kcal (https://www.matvaretabellen.no/roastbiff-skiver-03.354), and provides ca. 25 grams of top quality protein with all of the EAS (essential amino acids). Roast beef has DIASS of 1.1. A hundred grams of dried peas (uncooked) has 334 kcal and provides about 22 grams of poorer quality protein, deficient in some essential amino acids, with a DIASS of ca. 0.6 (https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score). Animals including people will keep eating until they get enough protein (https://doi.org/10.1038/508S66a). This an important point which deserves discussion in this chapter. You have to eat more plant protein and more kcal to get the digestible protein equivalent of animal source foods, and the daily requirements for protein are based on high quality easily digestible protein with all of the essential amino acids. Plant sources of protein come with significantly more calories, excess carbohydrates, and may be more poorly digested especially by some population groups such as the elderly. Meat has no carbohydrates. This matters also for people trying to keep their blood sugar within the normal range. Red meat is also one of the best sources of easily absorbable iron. This is especially an important issue for women of childbearing age. Again, do the math, the daily requirement of iron for women of childbearing age is 18mg. To get that	of the article. To imply that health benefits will occur if individuals eat more legumes is not justified by the quality of the evidence. Neither is the totality of the evidence considered. India has many vegetarians, and also a lot of childhood stunting. Quote from ref. 9 in the chapter on legumes: .... "Our confidence in the evidence for this conclusion is generally weak or very weak. Sources of uncertainty include the risk of residual confounding in observational studies that prevent causal inferences from being drawn, serious inconsistency between studies, indirect measurement of dietary pulses, and imprecision in estimates of pooled risk." .... the above quote is from this article: Viguiliouk E, Glenn AJ, Nishi SK, Chiavaroli L, Seider M, Khan T, Bonaccio M, Iacoviello L, Mejia SB, Jenkins DJA et al: Associations between Dietary Pulses Alone or with Other Legumes and Cardiometabolic Disease Outcomes: An Umbrella Review and Updated Systematic Review and Meta-analysis of Prospective Cohort Studies. Adv Nutr 2019, 10(Suppl_4):S308-s319. https://doi.org/10.1093/advances/nmz113 Please read the following report, this report should be discussed and in your reference list. Martin H. Inderhaug. (2020) Skal norsk husdyrproduksjon erstattes av importerte varer? Rapport 9–2020 AgriAnalyse. https://www.agrianalyse.no/getfile.php/136007-1610444152/Dokumenter/Dokumenter 2020/Rapport 9_2020 (web).pdf	

		amount of iron from beef alone you would need to eat 600 grams with 750 kcal of roast beef. Iron from meat is more easily absorbed than that from plants (https://ods.od.nih.gov/factsheets/iron-healthprofessional/ https://www.matvaretabellen.no/storfe-stek-roastbiff-rosa-stekt-03.281). To absorb that amount of iron from peas you would need to eat around twice as many calories as that of roast beef. That is also lot of peas, one of the few legumes that can be grown here. Nobody I know wants to go around doing these calculations every day. Iron deficiency is common among young women. India, which has many vegetarians also has many children suffering from stunting. It is misleading to constantly associate red and processed meats with refined grains and SSB (sugar sweetened beverages) as unhealthy foods. Meat contains important essential nutrients.		
Swedish Food Agency	Swedish Food Agency	There is no information on lectins in pulses and legumes and the health risk associated with consuming them raw. It is important to soak them in water overnight and cook them properly afterwards to avoid symptoms such as nausea, vomiting, bowel pain and diarrhoea if. Relevant information is available in NNR 2012 (page 126) and those sentences could be added to the information on allergies on page 6 in NRR 2022.	On p. 126 in NNR 2012 there are a few sentences about lectins under heading "Nutritional considerations" and subheading "Protein". Those sentences can be added to these sentences on allergies on page 6 in NRR 2022. "Allergies and related adverse reactions to legumes are not among the most common [31]. Reactions to soy are not uncommon, but these reactions are rarely severe. With proper labelling and storage of food, such allergies and related reactions could be limited [31]. From NRR 2012: "Also, lectins found in many varieties of pulses could cause unfavourable health effects such as nausea, vomiting, bowel pain and diarrhoea if beans and peas are improperly cooked, or are consumed	Thanks for this important information, this has been added to the chapter as suggested.

			uncooked. Dried beans and peas should be soaked in water overnight, and boiled until soft (94)." Replace the reference (no 94 in NNR12) with the most recent reference from the Swedish Food Agency: Livsmedelsverket 2017. Lektiner i baljväxter – kunskapsöversikt. Livsmedelsverkets rapportserie nr 14 del 1. https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2017/kunskapsoversikt-lektiner-i-baljvaxter-livsmedelsverkets-rapportserie-nr-14-del-2-2017.pdf	
L.M. Granskog	concerned citizen	Typo errors were made in my previous comment on this chapter, which those who understand this topic will immediately catch, DIASS should be DIAAS, it stands for Digestible Indispensable Amino Acid Score, (https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score). Anybody wanting to understand this topic of protein better might want to watch this video, I learned a lot from it: When is "Protein" NOT Protein? https://www.globalfoodjustice.org/nutrition/when-is-protein-not-protein	see above	
Tanja Kalchenko	Physicians' and nutrition association Food for health	Thank you for the good systematization and clear presentation. I suggest some small details, about lysine, potential for cultivation of more legumes in the North and Balticum, and phytates effects being reduced in long term.	On page 2, after this sentence: "Legumes form an important part of the food culture in many countries, but in many settings the intake is in relatively low [5]" I suggest that you write following: "Legumes are particularly rich in the amino acid lysine ((of which there is less in cereal products)), and are thus a good replacement/substitute for animal foods in vegan an other diets which are mostly plant based. Together with grains, legumes ensure the intake of all the essential amino acids (so that the protein quality in	Thank you, we have added information about protein quality and the value of combining legumes with cereals. We have also added methods to reduce anti-nutritional factors such as phytates.

			the diet is good.)" Source: Vegetarian and vegan diet - expert opinion from the Norways Nutrition Council. Chapter 7. Is it necessary to combine different food groups to meet the protein needs of a vegan diet? https://www.helsedirektoratet.no/rapporter/vegetar-og-vegankost-ekspertuttalelse-fra-nasjonalt-rad-for-ernaering On page 3, after this sentence: ".... for adults in Denmark and Norway to 17-18 g in Latvia [11, 12]." I suggest that you write following: "There is great potential for increasing the cultivation of some peas and beans in Norway and the Nordic region. (Possibly also in Baltic countries?) In Norway, for example, research from NIBIO and NMBU shows that the cultivation of peas and some types of beans can be increased by up to 10 times." Sources: Unni Abrahamsen, Anne Kjersti Uhlen, Wendy M. Waalen & Hans Stabbetorp. Muligheter for økt proteinproduksjon på kornarealene. NIBIO Korn og frøvekster, NMBU. https://nibio.brage.unit.no/nibio-xmlui/bitstream/handle/11250/2605814/019_Muligheter%2Bfor%2Bokt%2Bproteinproduksjon.pdf Norwegian University of Life Sciences (NMBU) https://www.nmbu.no/aktuelt/node/46361 Food Pro Future-project https://foodprofuture.no/ Linn Borgen Nilsen. NIBIO, Beans https://www.nibio.no/tema/mat/plantegenetiske-ressurser/nytteplanter-i-	

			norge/hagebruksplanter/gronnsakssorter/bonner (Norwegian University of Life Sciences (NMBU). Researchers believe we should grow more peas and field beans in Norway https://forskning.no/landbruk-mat-og-helse-nmbu-norges-miljo-og-biovitenskapelige-universitet/forsker-mener-vi-bor-dyrke-mer-erter-og-akerbonner-i-norge/1858641 Norwegian University of Life Sciences (NMBU). Will make it easier for Norwegians to choose short-travel plant protein. https://forskning.no/mat-og-helse-nmbu-norges-miljo-og-biovitenskapelige-universitet-partner/vil-gjore-det-enklere-for-nordmenn-a-velge-kortreist-planteprotein/1325613) Abrahamsen, U., Åssveen, M., Uhlen, A.K. & Olberg, E. 2015. Dyrkings- og avlingspotensialet av rybs, raps og erter i Norge. Husdyrforsøksmøtet 2005. Bugge, A.B. & Alfnes, F. 2018. Kjøttfrie spisevaner – hva tenker forbrukerne? Rapport 14-2018 Oslo, Forbruksforskningsinstituttet SIFO (ISBN 82-7063-480-3), 83s.) On page 5, after this sentence: " Some compounds such as phytates might also contribute to a reduction in the bioavailability of some nutrients in the gastrointestinal tract" I suggest that you write following: "But studies show that this effect however decreases significantly over time (in a few weeks - months). Therefore, this is unlikely to be significantly important in the long term." "In addition, foods rich in vitamin C and fruit acids reduce the effect of phytates. Soaking, sproating and some industrial processing of legumes do the same".	

			Source: Armah SM, Boy E, Chen D, Candal P, Reddy MB. Regular Consumption of a HighPhytate Diet Reduces the Inhibitory Effect of Phytate on Nonheme-Iron Absorption in Women with Suboptimal Iron Stores. J Nutr. 2015;145(8):1735-9 Siegenberg D, Baynes RD, Bothwell TH, Macfarlane BJ, Lamparelli RD, Car NG, et al. Ascorbic acid prevents the dose-dependent inhibitory effects of polyphenols and phytates on nonheme-iron absorption. Am J Clin Nutr. 1991;53(2):537-41.	
Ann-Kristin Sundin	LRF	Dear NNR Committee, Thank you for this opportunity to comment on the Pulses and legumes draft. Here are the comments from LRF. Page 2, Introduction: It is claimed that "several legumes are rich in folate, potassium, magnesium, iron, zinc, and thiamine…" However true as such, there is no reference to the low bioavailability of important minerals such as iron and zinc. There is a critical need for the authors to recognize this important difference between sources of nutrients, or the reader will risk believing that legumes may replace meat gram for gram, which is not the case. The same reasoning is true for protein/amino acids. Page 2, Introduction: The authors claim that "legumes are increasingly used as meat substitutes, being a nutritious food with high protein content and a low environmental		Page 2, Introduction: Reduced bioavailability and protein quality have been added to the chapter The statement about the environmental footprint of legumes is not controversial and has not been modified Page 4, Health outcomes The studies included that have assessed the health effect of soy have mainly used soy products. For instance, Kazemi et al write: "In previous metaanalyses of the association of soy intake and breast cancer, most of the included studies assessed the soy isoflavones. We did not include these studies, since the aim of our study was to investigate the association of food groups, rather than the food component, with breast

		footprint". We refer to the statement above on bioactivity, as well as kindly remind the authors that environmental sustainability is not to be included at this stage. Page 4: Health outcomes… Soy is mentioned to have very positive health outcomes, when – in fact – it is not soy itself but soy isoflavones that are more strongly associated with these health outcomes. Since we are not eating isolated soy isoflavones, and they will not be recommended in the FBDGs as they are extracts and not actual foods for consumption, the chapter may benefit for being clearer on this point. When soy is mentioned, explain what soy is referring to – is it soy beans and tofu? If so, this needs to be clarified, in order not to confuse the reader into thinking that one might just as well consume soy drinks. Page 5, Mechanisms: It is claimed that legumes contain mono- and polyunsaturated fatty acids. The content, however, of mono- and polyunsaturated fatty acids are so small that legumes are hardly a viable source of these fatty acids. For instance, kidney beans contain 0,1 g of MUFA and 0,4 g of PUFA per 100 grams of wet weight. For red lentils, the content is 0,1 and 0,2, respectively. Page 5, Mechanisms: Reference 30 is claimed to rank food		cancer." This was the case also in the study by Wang et al (on colorectal cancer). It might be that the positive effects of soy is due to soy isoflavones, as has been commented on under Mechanisms. Page 5, Mechanisms A reference to an article on fatty acid content and profile of legumes has been added.

		groups according to their association with biomarkers of cardiovascular disease and diabetes type 2. However, reference 30 (Schwingshackl et al, 2017) state that "optimal consumption of risk-decreasing foods (2 servings/day of whole grains; 2–3 servings/day of vegetables; 2–3 servings/day of fruits; 3 servings/day of dairy) results in a 42% reduction compared to non-consumption of these foods. The highest reduction in risk for T2D in terms of servings could be observed for whole grains; 50 g/day was associated with a 25% reduction in risk compared to non-consumption of this food group". (Summary across food groups). We believe that this relationship deserves acknowledgement. Schwingshackl L et al. Food groups and risk of type 2 diabetes mellitus: a systematic review and meta-analysis of prospective studies. Eur J Epidemiol. 2017; 32(5): 363–375.		
Armando Perez-Cueto	Umeå Universitet	Although the environmental footprint of legumes is not part of this review, it would be beneficial for the authors to mention that legumes production would sequestrate CO_2 and bring it to the land. Authors could also mention that sensory characteristics of pulses can be used to promote their consumption.	In the integration, authors may want to add the environmental aspects, as well as the social sustainability such as job creation in rural areas, livelihoods for farmers producing pulses & legumes. Pulses will play an important role in a just transition to more sustainable healthy diets.	Integration will not be included as part of the chapter, as it is the NNR committee that will make the integration between health aspects and sustainability aspects.

5. Nuts

Name	Organization/Affiliation	General comments	Detailed comments	Comment from authors
L.M. Granskog	concerned citizen	Humans are not herbivores, a basic fact that apparently needs repeating. Nuts are not a replacement for red meat. Almonds have a DIAAS score of ca. 0.40, roasted peanuts a DIAAS score of ca. 0.43. Beef has a DIAAS score of ca. 1.1. https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score One hundred grams of almonds have ca. 21 grams of protein lower in some EAA (essential amino acids), and this comes with 601 kcal. https://www.matvaretabellen.no/mandler-06.107 One hundred grams of roast beef has 25 grams of top quality protein (with all the EAA) for 125 kcal. https://www.matvaretabellen.no/roastbiff-skiver-03.354 Roast beef also has heme iron, and iron is a common nutrient deficiency even in western countries. Protein from plant sources may also not be as easily absorbed as that from ASF (animal source foods) by some segments of the population, such as the elderly, who also have greater needs for protein. The elderly may need much higher than 0.8 grams /kg body weight to avoid sarcopenia. https://doi.org/10.3390/nu8060359 If plant source foods are to provide this protein the amounts required to be consumed will be higher, this can easily lead to excessive caloric consumption. This problem of excessive weight is now	There is no high quality evidence that nuts prevent CVD or that meat causes it. Correlation is not causation and there are many confounding factors, most especially amongst meat eaters https://doi.org/10.1371/journal.pone.0183787. High quality recent reviews of the literature have found the evidence linking meat to CVD to be of low quality. https://www.acpjournals.org/doi/10.7326/M19-0655 https://www.acpjournals.org/doi/10.7326/M19-1583 https://www.nature.com/articles/s41591-022-01968-z When this discussion comes up you can expect that people will be bringing up the findings of these studies https://doi.org/10.7326/M19-1621 https://doi.org/10.7326/M19-0622 https://doi.org/10.7326/M19-1583 https://doi.org/10.7326/M19-0699 https://doi.org/10.7326/M19-0655 https://doi.org/10.7326/M19-1326 https://doi.org/10.1038/s41591-022-01968-z and demanding more scientific rigor in the dietary guidelines process.	Thanks for your comments. As you write, intake of various food groups might be correlated with other factors, including alcohol consumption, tobacco smoking etcetera. That said, even though most observational studies on intake of nuts and its health outcomes are adjusted for other risk factors such as smoking, alcohol and activity, some residual confounding might still be involved. We have added a comment on that. As mentioned, for nuts there are also a number of studies with experimental design on biomarkers for chronic diseases that. This evidence from trials mirrors the findings of the associations from observational studies. This strengthens the evidence. Nevertheless, we try to be transparent on the degree of evidence, and what is linked to different study designs. Relating to the comment on replacement of meat with nuts, we see that it was a bit unclear which of the references that was used for the sentence on studies on replacement of meat with nuts. The reference was a de novo systematic review for NNR2022 committee that, and we have now specified this more clearly.

		epidemic https://www.who.int/health-topics/obesity/#tab=tab_1		Relating to "protein quality", the importance of having all essential amino acids single food groups has not been well justified. Considering that the total diet provides all essential amino acid, it is not necessary that all the separate food items each cover all essential amino acids. Similarly, no food items cover all essential vitamins and beneficial phytochemicals. But as you indicate, eating a diet only consisting of nuts will probably not be beneficial (and the evidence we provide suggests an intake of around a handful per day to balance different aspects). Protein requirements for different groups are also covered in a separate chapter. However, it is difficult to see good arguments for why including nuts in the diet should be negative in respect to intake of proteins. To which degree red meat should have a role in healthy diets are covered in a separate chapter in the NNR6 and going extensively into this discussion in this chapter would be outside our scope.

6. Fish

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comment from authors
Mikael Fogelholm	University of Helsinki	In general, I would have liked to see more clearly if the studies include a substitution (e.g. SFA vs. PUFA), or whether the study was on "independent" association of SFA vs. health.	Concluding remarks, p. 6: Can this be concluded from the interventions (showing weight loss)? At least the conclusion is based on slightly different information. p. 35-36, recommendations: Any conclusions/recommendations for the ratio between SFA and MUFA+PUFA? Moreover: any conclusion of total fat for health? Last time (NNR2012) we concluded that any level between 25 and 40 E% was OK, while it is more important to pay attention to fat quality.	We have made revision regarding the direction of the effect (got the same comment from referee), and also we have added a sentence in the advice for setting FBDG that the health effects of fish consumption outweigh the risks caused by contaminantes. Moreover, we advise that each country should make their own FBDGs for fish intake, where it is taken into account the avilability and areas of contamination.
Mikael Fogelholm	University of Helsinki	I was really missing a sub-chapter on the environmental pollutants/toxins. These are now mentioned in the introduction, but it is very brief. Since the nutritional benefits should be weighed against the health risks (or the other way round), a narrative summary of what is known about the pollutants in fish and human health is warranted, in my mind. I minor general point is that there are some chapter beginning with a sentence pointing out that there is an association between fish consumption and a specific disease. Since this association is in fact negative (higher fish consumption vs. lower risk), I think this direction should be pointed out in the sentence.		Please see above
Kay Ove Hafsås	FISKEBÅT	Fiskebåt is an interest- and employer organization for the Norwegian ocean-going fishing fleet and represents the majority of ocean-going fishing vessels. The most important vessel groups among our approximately 200 member vessels are seine	First and foremost, the global climate footprint for seafood cannot be used as a starting point to assess Norwegian consumption of seafood. Norwegian seafood production operates under completely different standards than the case is for global seafood production, and consequently	We do not include sustainablity in our chapter, this will be included by others

		vessels, seine and cod trawlers, net and line vessels, shrimp trawlers, large coastal vessels, and pelagic trawlers. In Norway, there are approximately 10,000 people who derive their main income from fishing. Of these, approximately 4,900 works in the ocean-going fishing fleet. The ocean-going fishing fleet accounts for well over 70 percent of the first-hand value of catches that Norwegian fishing vessels bring ashore. In this consultation response, we will concentrate on answering in relation to capture fisheries and claim that Norwegian fisheries mainly operate in accordance with a sustainable management of wild fish in Norwegian fishing areas. Norway has control over some of the world's most resource-rich sea areas. The North Sea, the Norwegian Sea and the Barents Sea are all highly productive areas that provide the basis for large fish stocks in Norwegian waters. Norway today has a comprehensive regime to ensure sustainable management of the resources in the sea. The goal is to manage the resources so that they best meet today's needs while also considering that future generations will also be able enjoy them. This has resulted in effective ecosystem management that enables Norway to export a significant amount of seafood that can be eaten with a clear conscience. Fishing is regulated through quota schemes and licenses, where the quotas for the individual species are based on advice from the Institute of Marine Research and the International Council for the Exploration of the Sea (ICES).	has a significantly lower climate footprint than the global average. In regards of capture fisheries In Norway we have according to Fiskeridirektoratet five central principles for sustainable Norwegian fisheries management; - Research and reliable statistics on fishing stocks - Marine protected areas - Selective tools - Discards ban - Good control with fishing activity and turnover of fish. Globally, on the other hand, unfortunately, overfishing is more the rule than the exception, and in addition, the discarding of fish represents a large unknown factor. Finally, so-called IUU fishing (illegal, unreported, and unregulated fishing) is a major problem worldwide. Norway participates in regional fisheries commissions that work for the distribution of fishery resources, management in international waters, and against what is called IUU fishing (illegal, unreported, and unregulated fishing). The entire objective of Norwegian fisheries management is to maintain the natural dynamics of fish stocks and ecosystems so that fishing is sustainable. Advice on the management of fish stocks from international and Norwegian marine scientists is the most important basic information for this work, and for quota determination. The most common Norwegian fish stocks are currently in good condition. Norwegian knowledge and technology help to	

		Most fish stocks migrate between Norwegian and foreign waters. Therefore, the Norwegian authorities cooperate with neighboring countries and use international negotiations as the basis for the national decision-making process. The transition from free fishing to quota regulation based on sustainability has contributed to the fact that most Norwegian fish stocks are in good condition today. Although some species are still threatened, the North-East Arctic cod and Norwegian herring stocks are today as large as they were at their peak around the middle of the last century. Norway comes out best in WWF's ranking of the world's fishing nations according to how well they comply with the UN's rules for responsible fishing. Increased food production is necessary to take care of an ever-growing world population. Wild fish has a very low climate footprint compared to alternative protein sources and is therefore part of the solution for a more climate-friendly and sustainable food production in the future. The low climate footprint of Norwegian captured fisheries, and the fact that fish is regarded as healthy, should be a sufficient incentive for the fishing fleet to fish the amount of fish that is considered safe within a biologically sustainable fisheries management regime in the future as well.	make us world-leading when it comes to the sustainable practice of fisheries and aquaculture. This is ensured through the Norwegian model: a close collaboration between research, authorities and the seafood industry that works continuously and intensively to constantly improve. We have strict laws and regulations when it comes to the management and control of our fish resources, feed production, animal welfare, medicinal use, and environmental impact. This contributes to make the Norwegian fishing fleet the most modern fishing fleet in the world. Norwegian fisheries management also takes sustainability aspects of human rights, working environment, equality and social working conditions into account, in contrast to many global players. The global average climate footprint for seafood production is therefore not representative of the climate footprint of Norwegian seafood production, and hence a dietary advice for the Nordic countries based on the global average makes no sense. In fact, a larger Norwegian share of seafood production globally will reduce the global climate footprint for the total seafood sector. The report also points to several weaknesses in relation to the data material for the Nordic region, also in the global numerical material, and Fiskebåt thus questions whether there is any basis for concluding at all. The fact is, however, that a growing world population needs food, and global climate challenges require that increased food production must be produced in a more sustainable way. Seafood has a lower climate footprint than most alternative protein sources	

			and seafood consumption should therefore increase its share of food consumption in the future. If you compare seafood globally, Norwegian seafood is considered one of the most sustainable things you can eat, especially Norwegian captured fish. Fiskebåt therefore considers Norwegian captured fish to be an important part of the solution to future climate challenges and the need for more sustainable food production. A larger market share for Norwegian seafood in global food consumption is a step in the direction of more sustainable food production. Fiskebåt believes that this dietary advice is founded on a completely wrong basis, and would strongly advise against such an approach for a Nordic dietary advice.	
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc)	Finnish Vegan Association	As mentioned in page 3, health effects of fish are partly due to the substitutional effect when fish and seafood are eaten instead of other animal-based proteins, like red meat. This is seen in two large cohort studies, EPIC-Oxford and Adventist Health Study, in which different dietary patterns are compered. Findings from these cohort studies indicates, that pesco-vegetarian diet is healthier than omnivore or low-meat diets. But when compared in vegan or lacto-ovo-vegetarian diets, these non-fish diets have lower hazard rations than pesco-	Page 5. The limited evidence of beneficial effects of omega-3 supplementation during pregnancy is mentioned here. It is important to note that the situation may be different in vegan and vegetarian mothers who do not eat fish. Studies show conclusive, that vegan have lower blood DHA status than people who eat fish (references 1-4) and DHA content of breast milk of vegan mothers is in the same level with others only when mothers have used DHA supplement (5). So, The Finnish Vegan Association recommends a supplement of 200 mg/day of	We base our chapter on qualified systematic reviews and the outcome of interests for this chapter were intermediate CVD risk factors including lipids, blood pressure, and the inflammatory marker C-reactive protein, obesity, metabolic syndrome, and some cancers common in the Nordic countries.

		vegetarian diets in some morbidity, for example in all cancers and type 2 diabetes. Reference: Segovia-Siapco G, Sabaté J. Health and sustainability outcomes of vegetarian dietary patterns: a revisit of the EPIC-Oxford and the Adventist Health Study-2 cohorts. Eur Jour Clin Nutr 2019;72:60-70. Available: https://doi.org/10.1038/s41430-018-0310-z	DHA for pregnant and lactating vegans. DHA supplementation for vegan mothers is also suggested in NNR chapter "Infant feeding". It would be preferable if all chapters were in line with other chapters regarding DHA supplementation, as well as with a recommendation set by the Finnish Vegan Association. So far, the Finnish Vegan Association haven't had a DHA recommendation for vegan children. References: 1. Elorinne A-L, Alfthan G, Erlund I, Kivimäki H, Paju A, Salminen I et al. Food and nutrient intake and nutritional status of Finnish vegans and non-vegetarians. PLoS One 2016;11(2):e0148235.doi:10.1371/journal.pone.0148235 Available: https://pubmed.ncbi.nlm.nih.gov/26840251/ 2. Sarter B, Kelsey KS, Schwartz TA, Harris WS. Blood docosahexaenoic acid and eicosapentaenoic acid in vegans: associations with age and gender and effects of an algal-derived omega-3 fatty acid supplement. Clinical Nutrition 2015;34:212-218. Available: https://pubmed.ncbi.nlm.nih.gov/24679552/ 3. Rosell MS, Lloyd-Wrigth Z, Appleby PN, Sanders TAB, Allen NE, Key TJ. Long-chain n-3 polyunsaturated fatty acids in plasma in British meat-eating, vegetarian, and vegan men. Am J Clin Nutr 2005;82:327-34. Available: https://pubmed.ncbi.nlm.nih.gov/16087975/ 4. Sanders T. DHA status of vegetarians. Prostaglandis, Leukot Essent Fatty Acids 2009;81:137-41. Available: https://pubmed.ncbi.nlm.nih.gov/19500961/ 5. Perrin MT, Pawlak R, Dean LL, Christis A, Friend L. A cross-sectional study of fatty acids	

			and brain-derived neurotrophic factor (BDNF) in human milk from lactating women following vegan, vegetarian, and omnivore diets. Eur J Clin Nutr 2019;58(6):2401-2410. Available: https://pubmed.ncbi.nlm.nih.gov/30051170/	
Anna-Lena Klapp	ProVeg International	Please provide a precise definition of seafood.This is currently lacking in the chapter. Please include algae as potential seafood and that algae might be a sustainable future food source of protein and long-chain omega-3s.	On p.2 the authors rightly acknowledge that '[f]ish and seafood can contain environmental toxins'. The chapter should go more into detail on this potential health hazard related to high fish consumption. We strongly suggest that the authors review the relevant scientific literature and evaluate the persistent risks for consumers before making recommendations for healthy fish consumption levels. In the background paper on food consumption and environmental sustainability that is part of the NRR revision, the authors acknowledge that the Baltic sea is 'highly polluted' (p.59) and adopt a 'precautionary approach' to recommendations of increased fish consumption. Industrial activity near the coastlines and military waste from the second World War have been linked to high levels of persistent organic pollutants (POPs), such as dioxins, polychlorinated dibenzofurans (PCDD/Fs), polychlorinated biphenyl (PCBs), as well as toxic heavy metals including methylmercury, arsenic, lead and cadmium in the Baltic sea. [1] Some claim that the Baltic sea is one of the most polluted in terms of POPs.[2] Despite a significant decrease in toxicant levels due to effective environmental measures in the last decades, pollution still remains. Examining three basins along the Polish Baltic coast, Preisner, Smol & Szoldrowska (2021) find that concentrations of Cadmium, Mercury, and lead	We have included the VKM report which is a benefit-risk assessment of fish intake, taking contamintans into account. We have addded a sentence in the section advice for setting FBDG

			still exceeded safety levels in 2017 and 2018. [3] Jarosz-Krzeminska, Mikolajzcyk & Adamiec (2020) find that levels of Pb in Baltic cod exceed EU maximum levels of concentration per kg body weight by five times, and maximum levels for Cd by 2 times. [4] To what extent the remaining pollution in the Baltic sea still poses a health risk to consumers of seafood from these waters is uncertain. A quick review of a dozen recent studies shows mixed findings. However, several authors still find alarming results. Karjalainen et al. (2013) find that 1 - 15% of Finnish children exceeded USEPA reference value intakes of methylmercury from fish. [5] Mikolajczyk, Warenik-Bany & Pajurek (2021) find that intake of PCDD/Fs and PCBs from Baltic fish for adults and children exceeds WHO tolerable weekly intake levels for nearly all examined species. [6] What is more, the Swedish National Food Administration still recommends pregnant women to limit their consumption of Baltic herring and other fish, including perch, pike, and burbot, because of mercury and PCB pollution in the Baltic sea. [7] Given these findings and the remaining uncertainty about potential health and food safety risks from Baltic fish consumption for consumers, we strongly recommend that the researchers conduct a thorough review of the existing literature on the matter and treat any recommendations for higher fish intake with precaution. References:	

			[1] DOI:10.13140/RG.2.2.11144.85769/1 ; https://doi.org/10.1002/jsfa.10911 ; https://doi.org/10.1016/j.chemosphere.2022.135614 [2] https://doi.org/10.1016/j.marpolbul.2021.112763 [3] doi: 10.5004/dwt.2021.27325 [4] https://doi.org/10.1002/jsfa.10911 [5] https://doi.org/10.1016/j.fct.2012.02.074 [6] https://doi.org/10.1016/j.marpolbul.2021.112763. [7]https://www.livsmedelsverket.se/globalassets/publikationsdatabas/andra-sprak/rad-om-mat-till-dig-som-ar-gravid/advice-about-food-for-you-who-are-pregnant.pdf.	
Tanja Kalchenko	Physicians' and nutrition association Food for health	When Norwegian Scientific Committee for Food and Environment, VKM, made their report/assesment of risk and benefits of fish consumption, they used data material from the other report. The last is named "Risk assessment of dioxins, furans and dioxin-like PCBs in food in Norway. Scientific Opinion of the Panel on Contaminants of the Norwegian Scientific Committee for Food and Environment." The VKM says following, as summary of the report "Risk assessment of dioxins, furans and dioxin-like PCBs in food in Norway", quoted: "Dioxins and dioxin-like PCBs are difficult to break down, fat-soluble and highly toxic organic pollutants that accumulate in the food chain. They end up in animal feed and food because they are found in the environment. Dioxins and dioxin-like PCBs in food do not cause acute health effects. It is primarily the amount in the body after accumulation over	I suggest that you write following in the Introduction, page 2: "Fatty fish, together with milk and dairy, and meat, is the main source of environmental pollutants, or toxins - dioxins and dioxin-like PCBs - in the Norwegian diet. These are fat-soluble and highly toxic organic pollutants that accumulate in the food chain, and end up in animal feed and then in foods (fish, dairy and meat) of animal origin, because they are in the environment. The Norwegian population is exposed to more dioxins and dioxin-like PCBs from food than the EFSA's upper tolerance limit (which has been recently changed/increased). Fish and other seafood in Norway account for over 40% of exposure in Norway, while around 25% comes from dairy products, according to Figure 1 in the article on environmental toxins and health at Norwegian Institute of Public Health.	We agree and include these other food groups in the introduction

		many years that can cause health damage." "The food groups that contribute the most are fatty fish, milk and dairy products, and meat." "On average, the Norwegian population is exposed to more dioxins and dioxin-like PCBs from food than the tolerance limit." Source: Norwegian Scientific Committee for Food and Environment (VKM 2022). Dioksiner i maten til den norske befolkningen - Dioxins in the food of the Norwegian population https://vkm.no/risikovurderinger/allevurderinger/dioksinerimatentildennorskebefolkningen.4.413ea92416707dc4375a0a18.html VKM. Risk assessment of dioxins, furans and dioxin-like PCBs in food in Norway. Scientific Opinion of the Panel on Contaminants of the Norwegian Scientific Committee for Food and Environment. Helle Katrine Knutsen, Heidi Amlund, Jonny Beyer, Barbara Bukhvalova, Dagrun Engeset, Inger Therese Laugsand Lillegaard, Espen Mariussen, Gro Haarklou Mathisen, Anne Lise Brantsæter, Sara Bremer, Ingunn Anita Samdal, Cathrine Thomsen, Gunnar Sundstøl Eriksen (2022). VKM Report 2022:16, ISBN: 978-82-8259-391-5, ISSN: 2535-4019. Norwegian Scientific Committee for Food and Environment (VKM), Oslo, Norway EFSA. Risk for animal and human health related to the presence of dioxins and dioxin-like PCBs in feed and food https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2018.5333 Scientific Opinion on the risk for animal and	Dioxins and dioxin-like PCBs in food do not cause acute health effects. But accumulation in the body (adipose tissue) over many years can cause disease. These environmental toxins, which exists in fish, dairy and meat, are being stored in the fat tissue of women, and are transferred from mother to fetus. Then they are excreted in breast milk, together with fat from storages in woman's body. Children are exposed to larger amounts of environmental toxins, before birth (as fetus) and then with breast milk, like other toxic substances in the mothers blood, such as medicines, nicotine, alcohol and more. Replacement of fish oil with algae oil Fish and fish oil is important source of the long-chained omega-3 fatty acids EPA and DHA. It is actually EPA and DHA that accounts for many of the positive health effects of fatty fish. But fish is not the only source of EPA and DHA. Algae oil contains exactly the same substances as fish and fish oil do - EPA and DHA. Supplements made of algae oil, The long-chain omega-3 fatty acids EPA and DHA Supplements made of algae oil are becoming more common and available. Unlike fatty fish or fish oil, algae oils do not contain any environmental toxins. That's because they are grown in closed systems/tanks, like pools on land. Therefore, the authorities should make an assessment of how the replacement of fish oil	

		human health related to the presence of dioxins and dioxin-like PCBs in feed and food. EFSA Journal 2018;16(11):5333, 331 pp. https://doi.org/10.2903/j.efsa.2018.5333 EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2018. Environmental toxins and health - FHI, Norwegian Institute of Public Health https://www.fhi.no/ml/miljo/miljogifter/fakta/dioksiner-og-dl-pcb-faktaark/ In their report about risk benefit analyses of fish consumption, VKM has not considered/looked at the possibilities of achieving the same positive health effects of the long-chain omega-3 fatty acids EPA and DHA, by replacing fish oil supplements (or fish), with the same EPA and DHA from algal oils. The long-chain omega-3 fatty acids EPA and DHA supplements made of algae oil is becoming more common and available. Algae oil contains exactly the same substances as fish oil do - EPA and DHA. The long-chain omega-3 fatty acids EPA and DHA accounts for many of the positive health effects of fatty fish. Unlike fatty fish or fish oil, these do not contain any environmental toxins. That's because they are grown in closed systems/tanks, like pools on land. Not much research has been done on this, but the authorities should consider this. Considering environmental toxins in fish and fish oils, as well as in dairy and meat, it is important to compare following: How the health effects of EPA and DHA from	(long-chained omega-3 acids EPA and DHA accounts for many of the positive health effects of fatty fish and fish oil). This is not made in VKM's risk benefit analyses of fish consumption Per today there is no any arguments against that thew EPA and DHA from fish oil is better than EPA and DHA from algae. Not much research has been done on this replacement, but the authorities should consider this. Considering the negative health effects of environmental toxins in fish and fish oils, as well as in dairy and meat, it is important to do such research and assessment." Source: Norwegian Scientific Committee for Food and Environment (VKM 2022). Dioksiner i maten til den norske befolkningen - https://vkm.no/risikovurderinger/allevurderinger/dioksinerimatentildennorskebefolkningen.4.413ea92416707dc4375a0a18.html VKM. Risk assessment of dioxins, furans and dioxin-like PCBs in food in Norway. Scientific Opinion of the Panel on Contaminants of the Norwegian Scientific Committee for Food and Environment. Norwegian Scientific Committee for Food and Environment (VKM), Oslo, Norway EFSA. Risk for animal and human health related to the presence of dioxins and dioxin-like PCBs in feed and food https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2018.5333 Scientific Opinion on the risk for animal and human health related to the presence of dioxins	

		fish oil would be affected if one replace these with algae oils, that containes accurately the same long chained fatty acids EPA and DHA.	and dioxin-like PCBs in feed and food. EFSA Journal 2018;16(11):5333, 331 pp. https://doi.org/10.2903/j.efsa.2018.5333 EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2018. Environmental toxins and health - FHI, Norwegian Institute of Public Health https://www.fhi.no/ml/miljo/miljogifter/fakta/dioksiner-og-dl-pcb-faktaark/	
Swedish Food Agency	Swedish Food Agency	Most health outcomes start with "there is no strong evidence for…." althought in most of those cases there is only weak/ no evidence. Couldn´t that be misleading? Wouldn't it be more correct to say that there is only weak evidence/ lack of evidence instead? Based on what is written in the summary it would probably be more correct for at least the following health outcomes: obesity and body weight, type 2 diabetes, cancers, neurodevelopment in children, asthma and allergy, birth outcomes. Otherwise, it would be great if the summaries of the different health outcomes could be clarified in such a way that it is clearer for the reader for the beneficial associations between fish intake and the different health outcomes.		We agree and have made the changes

7. Meat and meat products

Name	Organization	General comments	Detailed comments	Comment from authors
Gunnar Rundgren	Agriculture consultant	The term "red meat" is badly defined and lacks scientific rigour. There are many reasons to assume that the health effects of the various "red meats" that exist vary and even vary according to how an animal is raised. To my knowledge there are NO studies that has tested how the consumption of different "red meats" affects health. Most research is conducted in countries with a large share of industrial livestock rearing. To lump feed lot beef or industrial pork in the same category as horse, reindeer or grassfed beef is not meaningful.		This has been mentioned as a limitation in the Data gaps. Some clarifications regarding meat types has been added.
Mikael Fogelholm	University of Helsinki, Finland	The chapter is informative and the authors have done a careful job. However, the presentation is not very reader-friendly.- There should be a better distinction between red meat and processed meat already in the text. Moreover, a simplified summary table of the main findings are needed. A small comment, btw, is that consumption of poultry has increased sharply in Finland and at present the consumption is higher than for beef or pork. Together, beef and pork still re consumed more than poultry.		A summary table of the strength of evidence evaluations has been added - the meat type has been clarified where necessary - A mention of the increased consumption of poultry has been added.
Soile Käkönen	HKScan Finland Oy	There are list of potentially harmful ingredients and nutrients in processed meat and red meat and compounds that may be formed when meat is processed, e.g. heme iron, N-nitroso compounds (NOCs), heterocyclic amines (HCA), polycyclic aromatic hydrocarbons (PAH), N-glycolylneuraminic acid (Neu5Gc) etc. I would like to have some mentioning what the food		We don't have detailed information available from all food manufacturers about these procedures to be able to say what the industry is doing.

		industry is regularly doing to prevent these harmful compounds to exist. For example, we always use oxidants (ascorbid acid) together with nitrites, which reduces the formation of NOCs, PAHs are not present at least in Finnish processed meat products, thanks to low temperatures in processing and using liquid smoke in smoking. Of course, people may process meat in variety of ways at home, but industry takes seriously the risk factors and works determined to decrease at least some of them.		
Lars T. Fadnes	University of Bergen	Notes about AMSTAR-rating	The chapter provides a comprehensive overview of meat intake and health outcomes relevant for the Nordic countries, and is generally well written and presented. Some of the AMSTAR scoring of quality of the systematic reviews were a bit surprising. For example, Schwingshackl et al. 2017 on all-cause mortality is AMSTAR-scored as "critically low". Taking this study as example, Schwingshackl et al. provide detailed PICO tables (see supplementary documents), provide a PROSPERO published protocol, searched 3 databases (search terms listed in supplementary), screening and extractions were done in duplicate, exclusions were explained, risk of bias was assessed including risk of confounding, selection and publication bias, funding of the studies and the meta-analysis (by public funding), calculated heterogeneity, presented Egger test and funnel plots, conducted sub-group analyses, explained heterogeneity, and had no conflict of interest. It is also worthy to note that Schwingshackl has worked in the Cochrane center for several years, and it would be surprising if he was not relatively up-to-date	The main reasons for low AMSTAR-ratings are given in Limitations. The main criteria are also listed in the methods section and on the web page of the NNR 2023 (https://www.helsedirektoratet.no/english/nordic-nutrition-recommendations-2022). In the case of Schwingshackl, the reasons were 1) although risk of bias assessment was done, it did not meet the requirements listed in the AMSTAR2 form, 2) the authors did not justify a deviation from the protocol in why other variables than what was reported in the protocol, were investigated as causes of heterogeneity.

			in terms of quality requirements. The same is true for Schwingshackl et al. 2017 on hypertension, Schwingshackl et al. 2017 on type 2 diabetes, and it maybe more of the studies. Nevertheless, except the AMSTAR-rating, the overall presentation of the findings seem to be well balanced. It giving substantial AMSTAR penalties to studies, it might be reasonable to provide a note about which aspects are taken into consideration.	
Lene Meinert	Danish Technological Institute, DMRI	I relation to the section "Data gaps for future research" and specifically the posed question "What is the health impact of the different cooking methods of meat", the Danish Technological Institute has together with the Danish Technological Institute (DMRI) conducted studies investigating the development of PAH and HCA in barbecued meat. Furthermore, the content of iron has been investigated in pork and chicken. Please see the references in detailed comments.	Margit D Aaslyng, Lene Duedahl-Olesen, Kirsten Jensen, Lene Meinert. (2013). Content of heterocyclic amines and polycyclic aromatic hydrocarbons in pork, beef and chicken barbecued at home by Danish consumers. Meat Science, 93(1):85-91 Lene Duedahl-Olesen, Margit Dall Aaslyng, Lene Meinert, Tue Christensen, A.H. Jensen, Mona-Lise Binderup (2015). Polycyclic aromatic hydrocarbons (PAH) in Danish barbecued meat. Food Control, 57: 169-176 Lene Meinert, Kirsten Jensen (2018). Iron and heme iron concentrations in three different pork cuts compared with chicken filet. Journal of Food and Clinical Nutrition Vol 1 No 2 April, p. 16-17 Margit D. Aaslyng, Birgitte Winther Lund, Kirsten Jensen (2016). Inhibition of Heterocyclic Aromatic Amines in Pork Chops Using Complex Marinades with Natural Antioxidants. Food and Nutrition Sciences, Vol.7 No.14.	The references are relevant and we have added the first two.
Ann-Kristin Sundin	LRF	Dear NNR Committee, Thank you for the opportunity to submit	The authors mention that meat is a good source of e.g. tiamine and riboflavin (though using the older names, B1 and B2,	The review concentrates on the associations between meat and disease outcomes and the literature

		feedback on the NNR drafts and background papers. Here are the comments from LRF, Sweden, on the draft on meat and meat products. In summary, there are, with a few exceptions, only references to negative health implications of meat and meat products in this draft, ignoring most of the important positive ones. As the food based dietary guidelines are formulated, this tendency composes a risk to public health among vulnerable groups such as children, young women, and elderly and frail. Therefor, we are of the opinion that the chapter om meat and meat products need to take a more balanced approach and take into account the positive health aspects of meat.	respectively). However, they do not mention vitamin B12. We find question that, since meat and other animal foods are the only sources of vitamin B12. Further, the authors do not mention that the bioavailability if iron in meat is far greater than the iron in plantbased foods. This is an important state to make, and we find it critical that such a statement is been made clear in this chapter. Furthermore, the authors mention a few nutrients that meat is a good source of, but, in the same sentence, emphazise that meat contains unfavorable nutrients such as saturated fatty acids. Unfortunately, there is no acknowledgement to the statistical difference between absolute and relative risk of consumption of meat, revealing that the true health risk increase in absolute terms is rather modest. Nor is there any reference to food matrix, or the observation that consumption of a mixed diet is associated with a lower risk of developing iron deficiency than consumption of a vegetarian or near-vegetarian one, underlining the fact that meat also hold several favorable health implications to the consumer in a diet that is balanced, varied, and nutritious in a whole. The above mentioned formulation rather gives at hand that the authors tend to hold a negative attitude towards meat and meat products, which could prove problematic as the chapter	search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has been explained. - While the difference between absolute and relative risk is important, it has not been reported in most of the reviewed studies. - This chapter does not consider dietary patterns, for which there is a separate chapter. - The logic of including and not including studies in the table has been explained in the methods section. The lack of associations have also been described in the results. - The recommendations are based on adverse or beneficial health impacts when there are such. If there is an adverse impact on one or more chronic disease, it is not compensated by lack of impact on other chronic diseases. - The mechanistic implications are there to explain possible mechanisms of adverse health outcomes to which there was evidence. - Confounding is common knowledge in nutritional sciences and has been

			moves on to be used as background material for developing food based dietary guidelines. Moreover, studies that show no association between meat and cancer site has not been included in the table. Does this mean that these studies have not been taken into consideration, and that the conclusions have been drawn from positive association studies only? If so, we question the methodology, and would urge the authors to either explain the choice of methodology or include studies that also show no association to site. We also take the opportunity to emphazise the importance to acknowledge that epidemiological studies show correlation and not causation. The increased health risk that is associated with meat and meat product consumption, therefore, may – at least in part – be because of confounding factors such as an unhealthy lifestyle in general with a low intake of fruits and vegetables, dietary fibers, too low a physical activity, smoking, and other factors known to increase e.g. risk of cancer. There is also a reference to negative health impacts due to saturated fatty acids and heme iron. Again, there is no reference to the high bioavailabilty of iron and the positive health implication of this. Nor is there	considered when evaluating the evidence.

			anything written on the importance to stratify fatty acids in the studies referring to health implications of saturated fatty acids in order to underline that individual fatty acids have unique health implications. Considering all saturated fatty acids as the same is simply not correct.	
Ulrika Åkesson	Food Frame Sweden AB	Kapitlet har stort fokus på kött och köttprodukter kopplat till diagnoser. Förmodligen för att det är här som forskningen haft sitt fokus, forskning som till del bygger på långt högre köttkonsumtion än vad vi faktiskt har i de nordiska länderna idag. Det är viktigt att studier som lyfts fram är relevanta för gällande nordisk mat- och måltidskultur. Det finns idag få vetenskapliga studier som visar på kött och köttprodukters näringstäthet och dess biotillgänglighet när det kommer till grundläggande näringsämnen. Detta borde synliggöras som en brist i det vetenskapliga underlaget. Det finns svensk studie publicerad som jämför till exempel rött kött med växtbaserat protein kopplat till förmåga att ta upp järn. En mycket aktuell fråga för svenska förhållande då flera svenska kvinnor har järnbrist, och då framför allt unga kvinnor. Det finns många detaljer kring olika diagnoser och sjukdomar kopplat till rött kött utan hänsyn till skillnader mellan köttslag. Det skiljs mellan processad och icke processat rött kött, utan vägledning om hur kött och köttprodukter som råvara kan hanteras och tillagas på ett sätt som främjar hälsa. Kapitlet är således obalanserat i vad som väljs ut att		Due to language, considered by the NNR Committee

		formuleras i detalj och vad som generaliseras. De nordiska näringsrekommendationerna fördes fram vid COP27 då man önskade framhålla att hållbara kostvanor är en del av arbetet denna gång. Norden är ett föregångsland när det gäller hållbar köttproduktion med höga djurvälfärdsvärden, god tillgång på frodiga gräsmarker som bidrar till flera ekosystemtjänster. Detta borde framhållas som en del i framtidens hållbara livsmedelssystem. Djurhållningens bidrag till en fungerande cirkulär bioekonomi nämns inte alls i underlaget trots att det pågår världsledande forskning i Norden inom området, i både Sverige och Danmark. Här kan nämnas: Sustainamal – centrumbildning för ökad kunskap om de livsmedelsproducerande djurens roll för konkurrenskraftiga, hållbara och resilienta lantbruk och livsmedelssystem i Sverige. https://www.slu.se/site/sustainimal/ CBIO – center for cirkulær bioøkonomi https://cbio.au.dk/om-cbio Pathways – Projektet kommer att bidra till EU:s ”Farm-to-Fork-strategi”, genom att utforma övergångar som tillgodoser kraven på tillhandahållande av säkra, näringsrika och prisvärda djurbaserade livsmedel, samtidigt som vi minskar miljöpåverkan och främjar hållbarheten för den europeiska boskapssektorn. https://pathways-project.com/about-pathways/ Har man ambitionen att integrera hållbarhetsperspektivet behöver detta också finnas med i de kapitel som behandlar olika		

		produktområden och produktgrupper. Kött och köttprodukter är en stor och avgörande del för det nordiska lantbruket som tar utgångspunkt i de odlings- och markförutsättningar som finns samt årstiders begränsningar av odlingsperiodens längd. Ett resilient och robust livsmedelssystem i Norden omfattar både växtodling och djurhållning, även i framtiden. Vilket i sin tur ger utrymme för en blandad kost.		
Heli Åby	Atria Finland Ltd	In meat chapter the positive aspects of meat and it's nutrients are neglected. Meat is an excellent source of high-quality protein. It contains all the amino acids that our bodies need. Proteins are the body's protective nutrients. They are necessary for growing muscle and repairing damage to the body, and they help to stave off hunger. Meat also provides group B vitamins and it is a good source of iron. It is a good idea to eat a diverse range of meat: chicken, pork and beef in lean pieces. Cold cuts and other meat products could be eaten in moderation as part of a varied diet. We stand for the UECBV analysis on meat chapter in Nordic Nutrition Recommendations , given 4th of November 2022 in Brussels, Ref: SL-25888	UECBV analysis on meat chapter in Nordic Nutrition Recommendations , given 4th of November 2022 in Brussels, Ref: SL-25888 In summary: No strong connection was found in any of the diseases and high unprocessed red meat intake. High unprocessed red meat intake very often coincides with other dietary and nondietary factors that influence overall health. Results found may be due to the confounders and not meat intake. Cooking methods account for more risks than unprocessed red meat itself. Red meat intake shows positive impacts, in particularly for the decrease of micronutrients deficiency and sarcopenia. · The limitations and gaps in research are substantial. Reduction of the dietary guidelines for unprocessed red meat intake is not advised. · High quality evidence is severely lacking.	The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - The recommendations are based on adverse or beneficial health impacts when there are such. If there is an adverse impact on one or more chronic diseases, it is not compensated by lack of impact on other chronic diseases. - Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - The evaluation of the evidence follows a standard protocol described

				in Arnesen et al. 2020. The limitations and data gaps have been described.
Hans Agné	Svenska Köttföretagen AB	• Det är angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på kan minska risken för diagnoser såsom cancer (se under Specifika synunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och vitamin B12, i många fall är associerade med mycket allvarliga fysiska och mentala tillstånd. • En generell önskan i sammanhanget är att författarna till samtliga NNR-kapitel ska hjälpa läsarna att dra relevanta slutsatser av den information som lyfts fram i respektive kapitel. Det är positivt att författarna uppmärksammar brister i materialet såsom att olika studier har studerat olika saker (rött kött, processat kött eller både rött och processat kött) och frånvaron av rättvisande och jämförbara data från samtliga länder. Men det krävs även att författarna lägger sig vinn om att redovisa också sådan fakta som inte nödvändigtvis stödjer den egna tesen. Varför väljer författarna att inte inkludera de studier som inte visar på ett samband mellan kött och cancer i tabellen? Har författarna inte	• Det finns fler rapporter och slutsatser att beakta. I den Lancet-publicerade artikeln The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019) framhålls en kosthållning med lågt innehåll av kalcium, mjölk och fibrer, liksom låg fysisk aktivitet och övervikt, som betydande riskfaktorer kopplade till kolorektalcancer, liksom alkohol och rökning. En kosthållning med ett högt intag av rött kött respektive ett högt intag av processat kött utgjorde studiens lägsta riskfaktorer globalt. Att det finns skillnader mellan mäns och kvinnors kosthållning respektive mellan olika länder bör beaktas. Se t ex även: - C.J. L Murray m fl The Burden of Proof: Assessing the evidence of risk (2022); - S. Mocellin m fl, Vitamin B6 and Cancer Risk: A Field Synopsis and Meta-Analysis (2017); - N. Smith m fl, Modeling the Contribution of Meat to Global Nutrient Availability (2022); - N. Smith m fl, Animal and plant-sourced nutrition: complementary not competitive (2021); - NEP Deutz m fl, Protein intake and exercise	Due to language, considered by the NNR Committee

		alls tagit hänsyn till dessa i sitt arbete? Det vore en tveksam metod, och den bör hur som förklaras. • Författarna nämner att kött är en bra källa till tiamin (vitamin B1) och riboflavin (vitamin B2). De NNR-kapitel som har presenterats över dessa näringsämnen beskriver vidare tydligt köttets betydelse för intaget av tiamin och riboflavin och samma skrivningar skulle kunna finnas med också i kapitlet om kött och köttprodukter. Även kapitlet om vitamin B6 är tydligt med köttets betydelse – medan kapitlet om kött och köttprodukter inte nämner att kött är en viktig källa till vitamin B6. • Det huvudsakliga fokuset för NNR är näring. Kapitlet om köttprodukter bör därför i betydligt större utsträckning lyfta frågan om köttets näringsinnehåll och bidrag i en varierad och hälsosam kost, samt framhäva förekomsten av food matrix. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till växtbaserade livsmedel. Det är både olyckligt och missvisande att varje positivt bidrag hos köttet som beskrivs följs av en brist. Det gäller bl a skrivningarna om mättade fettsyror (saturated fatty acids), där heller ingen åtskillnad mellan olika typer sker. • Kött är ett av de mest näringstäta	for optimal muscle function with aging: recommendations from the ESPEN Expert Group (2014); • Fördelarna med kött i fråga om hemjärn och biotillgänglighet bör lyftas fram. Se t ex C. Mayer Labba, Nutritional limitations of a Green Protein Shift with Focus on Iron (2022) samt Lower Non-Heme Iron Absorption in Healthy Females from Single Meals with Texturized Fava Bean Protein Compared to Beef and Cod Protein Meals: Two Single-Blinded Randomized Trials (2022). • I sammanhanget bör även näringsmässiga begränsningar hos substitut till kött omnämnas. Se härom bl a C. Mayer Labba, Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market (2022) samt S. Bryngelsson m fl, Nutritional assessment of plant-based meat analogues on the Swedish market (2022). • Även köttets bidrag i fråga om miljö och klimat bör uppmärksammas. Se t ex K. von Greyerz m fl, A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production (2022).	

		livsmedlen och dess betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder) bör understrykas. • I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. • Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas		
Fredrik Sundblad	Meat unit LRF	• Det är angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på kan minska risken för diagnoser såsom cancer (se under Specifika synunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och	• Det finns fler rapporter och slutsatser att beakta. I den Lancet-publicerade artikeln The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019) framhålls en kosthållning med lågt innehåll av kalcium, mjölk och fibrer, liksom låg fysisk aktivitet och övervikt, som betydande riskfaktorer kopplade till kolorektalcancer, liksom alkohol och rökning. En kosthållning med ett högt intag av rött kött respektive ett högt intag av processat kött utgjorde studiens lägsta riskfaktorer globalt. Att det finns	Due to language, considered by the NNR Committee.

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		Kapitlet om köttprodukter bör därför i betydligt större utsträckning lyfta frågan om köttets näringsinnehåll och bidrag i en varierad och hälsosam kost, samt framhäva förekomsten av food matrix. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till växtbaserade livsmedel. Det är både olyckligt och missvisande att varje positivt bidrag hos köttet som beskrivs följs av en brist. Det gäller bl a skrivningarna om mättade fettsyror (saturated fatty acids), där heller ingen åtskillnad mellan olika typer sker. • Kött är ett av de mest näringstäta livsmedlen och dess betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder) bör understrykas. • I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. • Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i	and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market (2022) samt S. Bryngelsson m fl, Nutritional assessment of plant-based meat analogues on the Swedish market (2022). • Även köttets bidrag i fråga om miljö och klimat bör uppmärksammas. Se t ex K. von Greyerz m fl, A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production (2022).	

		branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas.		
Fredrik Sundblad	Quarna Resilince AB	• Det är angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på kan minska risken för diagnoser såsom cancer (se under Specifika synunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och vitamin B12, i många fall är associerade med mycket allvarliga fysiska och mentala tillstånd. • En generell önskan i sammanhanget är att författarna till samtliga NNR-kapitel ska hjälpa läsarna att dra relevanta slutsatser av den information som lyfts fram i respektive kapitel. Det är positivt att författarna uppmärksammar brister i materialet såsom att olika studier har studerat olika saker (rött kött, processat kött eller både rött och processat kött) och frånvaron av rättvisande och jämförbara data från samtliga länder. Men det krävs även att författarna lägger sig vinn om att redovisa också sådan fakta som inte nödvändigtvis stödjer den egna tesen. Varför väljer författarna att inte inkludera de	• Det finns fler rapporter och slutsatser att beakta. I den Lancet-publicerade artikeln The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019) framhålls en kosthållning med lågt innehåll av kalcium, mjölk och fibrer, liksom låg fysisk aktivitet och övervikt, som betydande riskfaktorer kopplade till kolorektalcancer, liksom alkohol och rökning. En kosthållning med ett högt intag av rött kött respektive ett högt intag av processat kött utgjorde studiens lägsta riskfaktorer globalt. Att det finns skillnader mellan mäns och kvinnors kosthållning respektive mellan olika länder bör beaktas. Se t ex även: - C.J. L Murray m fl The Burden of Proof: Assessing the evidence of risk (2022); - S. Mocellin m fl, Vitamin B6 and Cancer Risk: A Field Synopsis and Meta-Analysis (2017); - N. Smith m fl, Modeling the Contribution of Meat to Global Nutrient Availability (2022); - N. Smith m fl, Animal and plant-sourced nutrition: complementary not competitive (2021);	Due to language, considered by the NNR Committee

		studier som inte visar på ett samband mellan kött och cancer i tabellen? Har författarna inte alls tagit hänsyn till dessa i sitt arbete? Det vore en tveksam metod, och den bör hur som förklaras. • Författarna nämner att kött är en bra källa till tiamin (vitamin B1) och riboflavin (vitamin B2). De NNR-kapitel som har presenterats över dessa näringsämnen beskriver vidare tydligt köttets betydelse för intaget av tiamin och riboflavin och samma skrivningar skulle kunna finnas med också i kapitlet om kött och köttprodukter. Även kapitlet om vitamin B6 är tydligt med köttets betydelse – medan kapitlet om kött och köttprodukter inte nämner att kött är en viktig källa till vitamin B6. • Det huvudsakliga fokuset för NNR är näring. Kapitlet om köttprodukter bör därför i betydligt större utsträckning lyfta frågan om köttets näringsinnehåll och bidrag i en varierad och hälsosam kost, samt framhäva förekomsten av food matrix. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till växtbaserade livsmedel. Det är både olyckligt och missvisande att varje positivt bidrag hos köttet som beskrivs följs av en brist. Det gäller bl a skrivningarna om mättade fettsyror (saturated fatty acids), där heller ingen åtskillnad mellan olika typer sker.	- NEP Deutz m fl, Protein intake and exercise for optimal muscle function with aging: recommendations from the ESPEN Expert Group (2014); • Fördelarna med kött i fråga om hemjärn och biotillgänglighet bör lyftas fram. Se t ex C. Mayer Labba, Nutritional limitations of a Green Protein Shift with Focus on Iron (2022) samt Lower Non-Heme Iron Absorption in Healthy Females from Single Meals with Texturized Fava Bean Protein Compared to Beef and Cod Protein Meals: Two Single-Blinded Randomized Trials (2022). • I sammanhanget bör även näringsmässiga begränsningar hos substitut till kött omnämnas. Se härom bl a C. Mayer Labba, Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market (2022) samt S. Bryngelsson m fl, Nutritional assessment of plant-based meat analogues on the Swedish market (2022). • Även köttets bidrag i fråga om miljö och klimat bör uppmärksammas. Se t ex K. von Greyerz m fl, A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production (2022).	

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L. M. Granskog	concerned citizen	Statements and selected references indicate biased positions by one author and one reviewer of this chapter. https://doi.org/10.1371/journal.pstr.0000015 https://doi.org/10.1017/jns.2022.6 The first line of the abstract of a paper written by Jelena Meinilä with others is the following "Achieving a sustainable and healthy diet requires increased replacement of red meat with more sustainable foods." https://doi.org/10.1371/journal.pstr.0000015 I strongly disagree. Ruminant agriculture is arguably the most sustainable agriculture	If dietary guidelines are to be trusted the process has to be transparent and trustworthy. There are problems with this. https://doi.org/10.1093/pnasnexus/pgac107 https://doi.org/10.1017/S1368980022000672 GRADE is mentioned as a recommended option by the NASEM report Redesigning the Process for Establishing the Dietary Guidelines for Americans (2017) https://doi.org/10.17226/24883 A top quality GRADE review of the topic of processed and unprocessed red meat https://www.acpjournals.org/doi/10.7326/m19	This chapter is about the association between meat intake and health/chronic disease outcomes, not about environmental impacts of meat. - The choice of not using GRADE has been explained in Arnesen et al. 2020 and this chapter follows a predefined protocol described in the same article. - The sentence in the text about substitution analysis does not refer to animal feed but substituting meat

		there is. Ruminant agriculture can produce food where crops can't. Both wild and domestic ruminants are essential components of the natural ecosystems and agro-ecosystems they evolved with. Ruminants are used for maintaining grassland ecosystems, reducing fire load and achieving other environmental goals. https://blog.nature.org/science/2014/02/03/bison-good-cattle-bad-a-prairie-ecologists-perspective/ https://www.audubon.org/conservation/ranching https://nibio.brage.unit.no/nibio-xmlui/bitstream/handle/11250/2452000/SOL-Fakta-2013-15.pdf https://www.ars.usda.gov/news-events/news/research-news/2021/targeted-cattle-grazing-quickly-contains-wildfires-in-the-great-basin/ Ruminants can produce food without fossil fuel inputs, pesticides, artificial fertilizers, or the destruction of entire ecosystems above and below ground via tillage. In many places they do. As much as 75% of the ghg emissions from ruminants are coming from developing countries, and these animals vary greatly in how much methane they produce per carcass weight. https://doi.org/10.15232/aas.2019-01951 There are approximately 300 million bovids in India, a country with many vegetarians. We have carbon rich soils in the north and that carbon needs to stay there. Over 70% of the methane in the north is coming from natural ecosystems and recent research indicates that shrubification (gjengroing) causes more ghg emissions to be released from the environment. https://svs.gsfc.nasa.gov/4799 https://doi.org/10.1038/s41598-020-60938-y	-2620 has been conducted, and the recommendation is that people should be advised to continue to eat red and processed meat. https://doi.org/10.7326/M19-1621 https://doi.org/10.7326/M19-0622 https://doi.org/10.7326/M19-1583 https://doi.org/10.7326/M19-0699 https://doi.org/10.7326/M19-0655 https://doi.org/10.7326/M19-1326 The complete GRADE references should be included, with the recommendation. Below is a link to a very good video to watch to understand the GRADE studies on red and processed meat. What was done and why is explained in plain language. Correlation (not causation) between red and process meat consumption and health risk (Science Animated, August 2021) https://www.nutrirecs.com/media-coverage/correlation-not-causation-between-red-and-process-meat-consumption-and-health-risk/ Another recent study has come to similar conclusions: Health effects associated with consumption of unprocessed red meat: a Burden of Proof study https://doi.org/10.1038/s41591-022-01968-z . An article in the Conversation (Confused about your cancer risk from eating meat? Here's what the figures mean https://theconversation.com/confused-about-your-cancer-risk-from-eating-meat-heres-what-the-figures-mean-49888) discusses relative versus absolute risk, the absolute increase in risk (raised from 2.9 % to 3.4%) is very small. See also https://doi.org/10.3945/ajcn.112.047142 Rats fed bacon had fewer indicators of colon carcinogenesis	with other food in human diet. The question is, do the associations between meat and disease outcomes depend on types of food with which meat is replaced with. To answer that, substitution analysis is needed. - We are aware of the studies by NutriRECS. The results of the meta-analyses are in line with other meta-analyses. Their interpretation differs from ours because we use different strength of evidence evaluation method based on the reasoning given in Arnesen et al. 2020. We are also aware of the study by Lescinsky et al. 2022, which we have now mentioned in the text.

		https://doi.org/10.1007/s10021-020-00589-2 https://doi.org/10.1007/s10021-017-0158-4 https://doi.org/10.1029/2008GL036332 There is ca. twice as much carbon in the soils of the north as there is in the entire atmosphere. We may need far more ruminants rather than less to avoid catastrophic warming. Ruminants emit no additional fossil carbon, the carbon they emit was drawn down from the atmosphere via photosynthesis, the methane they emit is being continuously converted back to carbon dioxide and is removed within about 12 years by natural processes. When this is taken into account it is questionable whether they are contributing to global warming at all. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12504-EU-methane-strategy/F540870_en https://doi.org/10.1038/s41612-018-0026-8 https://clear.ucdavis.edu/explainers/gwp-star-better-way-measuring-methane-and-how-it-impacts-global-temperatures Ruminant agriculture has been critical for sustaining populations in the north for thousands of years, this is literally what "sustainable" means. Ruminants have been instrumental in restoring degraded lands and are critically important for carbon storage and maintenance in the soil. https://doi.org/10.1038/ncomms7995 https://doi.org/10.2489/jswc.71.2.156 https://doi.org/10.1016/j.agsy.2018.02.003 https://4p1000.org/discover/?lang=en If all the animals were removed from agriculture in the US, greenhouse gas emissions might only be reduced by ca. 2.6% and this would result in over consumption of calories and nutrient	https://doi.org/10.1080/01635589809514736 https://doi.org/10.1207/S15327914NC381_11 . The issue of heme iron is raised. The amount of roast beef needed to meet the daily requirement for iron for people over 51 would be about 300 g roast beef per day. Women of childbearing age need much more. https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/#h2 https://www.matvaretabellen.no/roast-beef-cold-cuts-sliced-03.354 With regard to saturated fat https://doi.org/10.1186/s12937-017-0254-5 https://doi.org/10.1016/j.amepre.2007.11.017 With regard to TMAO https://doi.org/10.1161/JAHA.116.003970 https://doi.org/10.1080/16512235.2017.1327309 With regard to data gaps for further research on food substitution analyses with other protein sources, if animals do not get enough protein they will keep eating until they do. Perspective: Tricks of the trade https://doi.org/10.1038/508S66a see Digestible Indispensable Amino Acid Score https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score When is protein not protein https://www.globalfoodjustice.org/nutrition/when-is-protein-not-protein FAO FOOD AND NUTRITION PAPER 92 Dietary protein quality evaluation in human nutrition https://www.fao.org/3/i3124e/i3124e.pdf Protein on labels and in matvaretabellen is apparently not protein, it is the N content of the food x 6,25 https://lovdata.no/dokument/LTI/forskrift/2014-11-28-1497 Obesity: the protein leverage hypothesis.	

		deficiencies. https://doi.org/10.1073/pnas.1707322114 The ghg emissions of the health care industry in the US is estimated to be about 479 million tonnes of carbon dioxide each year, ca. 8% of the total. https://jme.bmj.com/content/48/5/334 A sustainable diet is one that provides necessary nutrients and energy balance, while keeping blood sugar within a healthy range.	https://onlinelibrary.wiley.com/doi/10.1111/j.1467-789X.2005.00178.x See also https://doi.org/10.1038/srep26074 https://doi.org/10.3945/an.116.013821 https://doi.org/10.3390/nu8060359 . Soil health and nutrient density: preliminary comparison of regenerative and conventional farming https://doi.org/10.7717/peerj.12848 The world's diet is already plant based https://www.nationalgeographic.com/what-the-world-eats/ . Perhaps too plant based https://www.dietdoctor.com/diabetes/what-happened-how-to-fix-it https://doi.org/doi:10.1001/jama.2015.10029 https://doi.org/10.3389/fnut.2021.7...	
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc), Evy Peltola (M.Sc, RD)	Finnish Vegan Association		Page 10: "Most meta-analysis of observational cohort studies there is little information on food substitution analysis with other protein sources, although this would be very relevant for public health guidelines", the authors of this chapter wrote. There is two large cohort studies, EPIC-Oxford and Adventist Health Study, in which different dietary patterns are compered. Findings from these cohort studies indicates, that vegan, lacto-ovo-vegetarian and pesco-vegetarian diets are more beneficial for health than semi-vegetarian or low-meat diets. It can therefore be concluded that substitution of red meat with plant and fish protein instead of poultry meat should be preferred in recommendations. Reference: Segovia-Siapco G, Sabaté J. Health and sustainability outcomes of vegetarian dietary patterns: a revisit of the EPIC-Oxford and the Adventist Health Study-2 cohorts. Eur Jour Clin Nutr 2019;72:60-70. Available: https://doi.org/10.1038/s41430-018-0310-z	Although valuable references, this chapter does not consider dietary patterns, for which there is a separate chapter.

Anna Jamieson	Sveriges Nötköttsproducenter SNP	Det huvudsakliga fokuset för NNR borde vara näring, men texterna handlar i väldigt stor utsträckning istället om hur fakta-söket har bedrivits, att det varit svårt att hitta tillräckligt bra underlag och allmåänom hur statistiken beräknats. . Kapitlet om köttprodukter bör i betydligt större utsträckning belysa köttets näringsinnehåll och bidrag i en varierad och hälsosam kost. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör också understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till näring i växtbaserade livsmedel. Det är både olyckligt och missvisande att varje positivt bidrag hos köttet som beskrivs följs av en brist. Det gäller bl a skrivningarna om mättade fettsyror (saturated fatty acids), där heller ingen åtskillnad mellan olika typer av fettsyror sker. I detta sammanhang bör även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas, eftersom det är en viktig aspekt av att äta blandkost jämfört med rena vegetariska eller veganska måltider. Kött är också ett av de mest näringstäta livsmedlen som vi har och köttets betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder) bör därför uppmärksammas i rekommendationerna. Författarna nämner att kött är en bra källa till tiamin (vitamin B1) och riboflavin (vitamin B2). De NNR-kapitel som tidigare har presenterats om dessa näringsämnen	Fördelarna med kött i fråga om hemjärn och biotillgänglighet borde finnas med i texten. Se helt ny forskning från C. Mayer Labba, Nutritional limitations of a Green Protein Shift with Focus on Iron (2022) samt Lower Non-Heme Iron Absorption in Healthy Females from Single Meals with Texturized Fava Bean Protein Compared to Beef and Cod Protein Meals: Two Single-Blinded Randomized Trials (2022). Det saknas också information om de näringsmässiga begränsningar som substitut till kött har. Se helt ny forskning från bl a C. Mayer Labba, Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market (2022) samt S. Bryngelsson m fl, Nutritional assessment of plant-based meat analogues on the Swedish market (2022). Det finns fler rapporter och slutsatser att ta upp vad gäller diskussionen om rött kött och cancer. I artikeln The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019) framhålls att en kosthållning med lågt innehåll av kalcium, mjölk och fibrer, liksom låg fysisk aktivitet och övervikt, innebär betydande riskfaktorer kopplade till kolorektalcancer, liksom alkohol och rökning. En kosthållning med ett högt intag av rött kött respektive ett högt intag av processat kött utgjorde studiens lägsta riskfaktorer globalt. Att det finns skillnader mellan mäns och kvinnors kosthållning respektive mellan olika länder är också viktigt. Exempel på fler referenser:	Due to language, considered by the NNR Committee

		beskriver tydligt köttets betydelse för intaget av tiamin och riboflavin. Samma skrivningar borde finnas med också i kapitlet om kött och köttprodukter. Även kapitlet om vitamin B6 lyfter tydligt köttets betydelse – medan kapitlet om kött och köttprodukter inte nämner alls att kött är en viktig källa till vitamin B6. Vad gäller rekommendationernas fokus på hälsorisker är det angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk, och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på, kan minska risken för diagnoser såsom cancer (se vidare Specifika synpunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och vitamin B12, i många fall är associerade med mycket allvarliga fysiska och mentala tillstånd. En generell önskan i sammanhanget är att författarna till samtliga NNR-kapitel ska hjälpa läsarna att dra relevanta slutsatser av den information som lyfts fram i respektive kapitel - det ligger i definitionen av Rekommendationer. Det är positivt att författarna uppmärksammar brister i materialet såsom att olika studier har studerat olika saker (rött kött, processat kött eller både rött och processat kött) och frånvaron av rättvisande och jämförbara data	- C.J. L Murray m fl The Burden of Proof: Assessing the evidence of risk (2022); - S. Mocellin m fl, Vitamin B6 and Cancer Risk: A Field Synopsis and Meta-Analysis (2017); - N. Smith m fl, Modeling the Contribution of Meat to Global Nutrient Availability (2022); - N. Smith m fl, Animal and plant-sourced nutrition: complementary not competitive (2021); - NEP Deutz m fl, Protein intake and exercise for optimal muscle function with aging: recommendations from the ESPEN Expert Group (2014); Som underlag för vår önskan att wtt mer holistiskt synsätt på kött och dess påverkan på ekosystemtjänster med mera violl vi framhålla t ex K. von Greyerz m fl, A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production (2022).	

		från samtliga länder. Men författarna borde också redovisa sådan fakta som inte nödvändigtvis stödjer den egna tesen. Varför väljer författarna att inte nämna de studier som inte visar på ett samband mellan kött och cancer i tabellen? Har författarna inte alls tagit hänsyn till dessa i sitt arbete? Kapitlets fokus är starkt begränsat. Författarna bör ha ett mer holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyf…		
Magnus Därth	Swedish Meat Industry Association	The studies included in the chapter have heterogeneity between themselves. Note that there is a risk for confusions between relative risks and absolute risks in the analysis and conclusion done. High intake of unprocessed and processed meat very often coincides with other dietary and non-dietary factors that influence overall health. Results found may be due to the confounders and not meat intake. Many of the mechanisms are associated to processing methods (including cooking at home). The amount of salt and oil, as well as processing methods, can influence the risk of certain diseases. If the risk of developing chronic diseases depends on processing or consumption of meat per se must be taken carefully into consideration (1). It should also be noted that the chapter generally is lacking many positive aspects of red meat consumption. This is important to give a balanced picture of the role of meat intake for health-related outcomes. This is	2. Introduction Page 1; It should also be mentioned that red meat also is a good source of vitamin B6 and B12 and other important nutrients. Page 2; The sentence "Compared to red meat consumption, poultry is typically lower in Western countries" is not correct with some exceptions, according to OECD data (2). 4; Diet intake in Nordic and Baltic countries: The sentence "poultry intake being several times lower" is based on old intake data in Sweden (2010). When looking at statistics from 2019 (1)(3) the consumption of red meat has decreased. As a matter of fact, the consumption of red meat has decreased steadily from 2011 and onwards with red meat being replaced by poultry meat. 6. Mechanisms The risk assessment report about nitrate and nitrite from the Swedish Food Agency (4) should be taken into consideration. - Whether the cancer-causing nitrosamines	Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - The potential role of processing has been considered in the text. - The list of nutrients of which meat is a good source has been complemented with some nutrients. - The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - The list of nutrients of which meat is a good source has been complemented with some nutrients. - The poultry intakes are from national dietary intake data. The increase in poultry consumption in

		especially true in relation to the positive impacts that meat have on sarcopenia. Good nutrition, especially adequate protein intake, helps limit and treat age-related declines in muscle mass, strength, and functional abilities.	are also formed in the body when nitrate/nitrite is ingested from food is not clear. - The Swedish Food Agency also concludes that only 7 % of adult consumers in Sweden are above the ADI for nitrite (from all sources) and that this is implies no direct health risk. - According to calculations in the report, the contribution from charcuterie/meat products only averages about 10 percent of total nitrite exposure among adults, while exposure from primarily vegetables, after conversion from nitrate, accounts for the largest portion. References 1. Konsumtion av kött, Jordbruksverkets hemsida https://jordbruksverket.se/mat-och-drycker/hallbar-produktion-och-konsumtion-av-mat/konsumtion-av-kott 2. Agricultural output - Meat consumption - OECD Data [Internet]. The OECD. [cited 2022 Nov 4]. https://data.oecd.org/agroutput/meat-consumption.htm 3. Livsmedelskonsumtion och näringsinnehåll. Uppgifter till och med 2019 - Jordbruksverket.se 4. https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2017/2017-nr-18-del-2-nitrat-0-nitrit-i-livsmedel-och-dricksvatten-fran-egen-brunn-riskvarderingsrapport.pdf	recent years have now been mentioned. - The data provided in the comment does not prove that nitrite could not mediate a mechanism of disease. - Concerning nitrites, it would probably not be the nitrate exposure alone but compounds formed in the presence of them. N-nitroso-compounds are a possible, not a confirmed, mechanism for colorectal cancer, as discussed by IARC 2018 (available at: https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Red-Meat-And-Processed-Meat-2018).
Marit Kolby	Oslo New University College	- Studies on meat intake and health outcomes should classify meat (products) according to NOVA, to separate between extensively and	Associations between meat intake and health outcomes are consistently stronger for processed meat. However, no studies to date	The mechanism section is discussing potential mechanisms mediating the associations between meat intake

		minimally processed meat. - Studies on meat intake and health outcomes need to control for the share of ultra-processed foods in the diet. - The mechanisms section is highly speculative. - The inconsistency in studies on meat intake and health outcomes speaks against strong recommendations.	on meat intake have been using the NOVA framework to separate between ultra-processed meat products, processed meat products and minimally processed meat. Some products (e.g. burgers and meatballs) can fall into both the processed or the ultra-processed category depending on the product, but are sometimes classified as red meat, which likely impacts the results. The lack of studies using NOVA to assess meat intake across categories of processing represent a knowledge gap that should be addressed in this chapter. Related to this, studies on meat intake should control for the dietary share of ultra-processed foods (UPF) in the diet. Given the substantial and consistent evidence that a high share of UPF in the diet is associated with multiple adverse health outcomes, this should be regarded as a confounding factor. This view is supported e.g. by the "Alberta's tomorrow project", clearly demonstrating that a lack of whole plant foods like fruits, vegetables and whole grains impact the health effect of the meat intake: Maximova et al., Co-consumption of Vegetables and Fruit, Whole Grains, and Fiber Reduces the Cancer Risk of Red and Processed Meat in a Large Prospective Cohort of Adults from Alberta's Tomorrow Project. Nutrients 2020, 12, 2265. The importance of the share of UPF in the diet is also strongly supported by the study by Hall et al.: Hall et al., Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metab. 2019 Jul	and disease outcomes. When there is no supporting evidence for the mechanism, it is reflected in the strength of evidence evaluation. - We are reporting the associations on the level they have been provided in the studies referred to. It would be important to consider different types of processing but there is not enough data available for that, which has been mentioned in the Data gaps. (The concepts of UPF and NOVA classifications are not uniformly agreed on within the scientific community.) - Although the data is inconsistent for many outcomes, it is consistent for others. This has now been clarified by adding a table of strength of evidence for each meat type and outcome. - The wordings regarding evidence from RCTs have been revised.

			2;30(1):67-77.e3. The importance of assessing the diet as a whole is also supported by the review by Barabási et al.: Barabási, AL., Menichetti, G. & Loscalzo, J. The unmapped chemical complexity of our diet. Nat Food 1, 33–37 (2020). https://doi.org/10.1038/s43016-019-0005-1 Hence, the lack of adjustment for the UPF share of foods in the diet when assessing the effect of meat intake on health outcome represents a knowledge gap that should be addressed in this chapter. For several of the proposed mechanisms (e.g., inflammation, glycemia, TMAO and blood pressure), these are not supported by RCTs listed. Still, the authors emphasize the possibility that future studies could potentailly provide evidence to the contrary. This wording reveals a biased point of view. Hence, the mechanisms section in this chapter is highly speculative and should be edited accordingly. Associations between meat intake and health outcomes are not consistent across studies. Also, results from RCTs do not reflect epidemiology. All in all, the inconsistency in the evidence base, the low certainty as well as the lack of supportive biological mechanisms speak against strong recommedations for further reduction of red meat.	
Ulf Ullring	Regenerativt Norge	The overall impression of this chapter is one of heavy bias towards red meat. Meats are evolutionary foods to which the human body is anatomically and metabolically adapted. During the evolution and history of humans,	We know that a main predictor of long life, health and life quality in old age is lean muscle mass and muscle strength. Red meat play an important role in the maintenance of muscle in old age. Why isn't this discussed? Some	One of the references provided is relevant and has been taken into account (Lescinsky et al 2022). Other points are not scientifically solid.

		meats, and especially red meat, bone marrow and offal, have been correlated with excellent health to an old age. As also have been seen in most hunter-gatherer and pastoralist societies until today. Numerous studies by archeologists and anthropologists can attest to that. It is then no wonder that the "findings" of this chapter just does not fit the track record of the human history. Adding to that, the studies referred to in this chapter conspicuously lean towards suggesting a health risk with most health markers that are evaluated, even when the correlation is very weak. One cannot but wonder how the human species have managed to survive. One can then also wonder why modern diet heavy in carbs and PUFA oils haven't managed to save mankind from the diseases of civilization, as meat and animal fats so surely is the culprit. This smell of rancid pseudoscience. This chapter misses the overall picture. And it starts right off assuming there is a consensus on saturated animal fats as a health risk, as well as an established risks with red meat. I don't agree on that, and wonder where they are, those articles that argues differently. Because I know some of them, which refer to even more articles. E.g. where is Leroy et al 2022 "Animal board invited review: Animal source foods in healthy, sustainable, and ethical diets – An argument against drastic limitation of livestock in the food system", Animal. Or Lescinsky et al 2022 "Health effects associated with consumption of unprocessed red meat: a Burden of Proof study", Nature Medicine. Or You et al 2022	experts like Professor Emeritus Don Layman, University of Illinois Urbana, think we for this reason should advice older people to eat more red meat, and much more protein than is recommended today. How can you reconcile the long life expectancy and good health throughout life findings correlated with red meat and the overall negative health risk findings correlated with red meat in this chapter? Surely something is missing.	

		"Total Meat Intake is Associated with Life Expectancy: A Cross-Sectional Data Analysis of 175 Contemporary Populations", J.General Medicine. The best advice I can give to this important work, is to throw away this chapter, start all over again and do it unbiased, with full scientific integrity.		
Maria Häger	HKScan Sweden AB	Vi önkar lyfta ett antal punkter kopplat till förslaget: -En generell önskan i sammanhanget är att författarna till samtliga NNR-kapitel ska hjälpa läsarna att dra relevanta slutsatser av den information som lyfts fram i respektive kapitel. Det är positivt att författarna uppmärksammar brister i materialet såsom att olika studier har studerat olika saker (rött kött, processat kött eller både rött och processat kött) och frånvaron av rättvisande och jämförbara data från samtliga länder. Men det krävs även att författarna lägger sig vinn om att redovisa också sådan fakta som inte nödvändigtvis stödjer den egna tesen. Varför väljer författarna att inte inkludera de studier som inte visar på ett samband mellan kött och cancer i tabellen? Har författarna inte alls tagit hänsyn till dessa i sitt arbete? Det vore en tveksam metod, och den bör hur som förklaras. -Det är angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin	Det finns fler rapporter och slutsatser att beakta. I den Lancet-publicerade artikeln The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019) framhålls en kosthållning med lågt innehåll av kalcium, mjölk och fibrer, liksom låg fysisk aktivitet och övervikt, som betydande riskfaktorer kopplade till kolorektalcancer, liksom alkohol och rökning. En kosthållning med ett högt intag av rött kött respektive ett högt intag av processat kött utgjorde studiens lägsta riskfaktorer globalt. Att det finns skillnader mellan mäns och kvinnors kosthållning respektive mellan olika länder bör beaktas. Se t ex även: - C.J. L Murray m fl The Burden of Proof: Assessing the evidence of risk (2022); - S. Mocellin m fl, Vitamin B6 and Cancer Risk: A Field Synopsis and Meta-Analysis (2017); - N. Smith m fl, Modeling the Contribution of Meat to Global Nutrient Availability (2022);	Due to language, considered by the NNR Committee

		grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på kan minska risken för diagnoser såsom cancer (se under Specifika synunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och vitamin B12, i många fall är associerade med mycket allvarliga fysiska och mentala tillstånd. -Författarna nämner att kött är en bra källa till tiamin (vitamin B1) och riboflavin (vitamin B2). De NNR-kapitel som har presenterats över dessa näringsämnen beskriver vidare tydligt köttets betydelse för intaget av tiamin och riboflavin och samma skrivningar skulle kunna finnas med också i kapitlet om kött och köttprodukter. Även kapitlet om vitamin B6 är tydligt med köttets betydelse – medan kapitlet om kött och köttprodukter inte nämner att kött är en viktig källa till vitamin B6. -Det huvudsakliga fokuset för NNR är näring. Kapitlet om köttprodukter bör därför i betydligt större utsträckning lyfta frågan om köttets näringsinnehåll och bidrag i en varierad och hälsosam kost, samt framhäva förekomsten av food matrix. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till	- N. Smith m fl, Animal and plant-sourced nutrition: complementary not competitive (2021); - NEP Deutz m fl, Protein intake and exercise for optimal muscle function with aging: recommendations from the ESPEN Expert Group (2014); Fördelarna med kött i fråga om hemjärn och biotillgänglighet bör lyftas fram. Se t ex C. Mayer Labba, Nutritional limitations of a Green Protein Shift with Focus on Iron (2022) samt Lower Non-Heme Iron Absorption in Healthy Females from Single Meals with Texturized Fava Bean Protein Compared to Beef and Cod Protein Meals: Two Single-Blinded Randomized Trials (2022). I sammanhanget bör även näringsmässiga begränsningar hos substitut till kött omnämnas. Se härom bl a C. Mayer Labba, Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market (2022) samt S. Bryngelsson m fl, Nutritional assessment of plant-based meat analogues on the Swedish market (2022). Även köttets bidrag i fråga om miljö och klimat bör uppmärksammas. Se t ex K. von Greyerz m fl, A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production (2022). Sammanfattningsvis så önskar vi belysa att vi	

		växtbaserade livsmedel. Det är både olyckligt och missvisande att varje positivt bidrag hos köttet som beskrivs följs av en brist. Det gäller bl a skrivningarna om mättade fettsyror (saturated fatty acids), där heller ingen åtskillnad mellan olika typer sker. -Kött är ett av de mest näringstäta livsmedlen och dess betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder) bör understrykas. -I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. -Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas.	saknar en balans i detta kapitel vilket vi hoppas ovan inspel har klargjort på ett tydligt sätt.	
Guro Waage	Nortura SA	The authors of the chapter state that the aim is to describe the totality of evidence for the role of meat intake for health-related outcomes as a bias for setting and updating the food based dietary guidelines. In the protocol "Instruction for chapter authors", published on the NNR website, it seems clear that the instruction is not to assess the role of	Introduction: In the chapter introduction it is written that in western countries meat is a major source of energy (page 1, paragraph 3). According to Nordkost 3 (6), meat and meat products contribute with 12% of the total energy intake in the Norwegian population. Based on this, we think you should change the word major; it is an exaggeration.	The aim is consistent with the instructions to the authors. The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited.

		meat intake for all health-related outcomes, but solely in terms of risk of negative health outcomes (chronic diseases). It is also only the risk of some specific chronic diseases that is addressed in the chapter. We are surprised by this approach and believe that meat should be assessed and discussed in a balanced way, where you consider the positive factors against the negative ones. Meat contains essential nutrients, and the potential positive effect meat intake can have on human health, are not discussed at all. There are also several uncertainties that are not addressed in the chapter. There is no doubt that results of studies on meat consumption and health outcomes are inconsistent(1). Recent studies suggest that the dietary patterns might be the major factor in the association with chronic disease, rather than the consumption of meat itself(2,3). People that have a high meat consumption often have a less healthy diet, are often less physically active and have an overall less healthy lifestyle than people that consume less meat(4). Which potential influence the quality of diet has on the outcomes of disease is not discussed. Furthermore, there is no clear definition of processed meat, and no distinction between processed red or white meat. This makes the results difficult to interpret. Also, the category red meat includes a heterogeneous group of animal species. There are reasons to believe there are differences between the animal species and their effect on health-related outcomes, due to their nutrient profile(5). E.g the content of iron (heme-iron) and the amount of saturated	Methods: Under methods (page 2, paragraph 3) it is described which search string was used. The search string for web of Science was: (ALL=)((meat OR meats OR beef OR lamp OR mutton OR pork OR poultry). Based on this it looks like there have been done an individual search on the different animal species included in the group read meat, but the probable individual differences between the species are not mentioned in the chapter. It is also stated that articles not included in the chapter are described in table 2 (page 2, paragraph 4). This table are not made public, which make it impossible to assess which articles have been reviewed and which selection has been made. Health outcomes relevant for Nordic and Baltic countries: Several described associations between meat and chronic diseases are unclear, making it challenging to draw conclusion between meat and health. The uncertainties linked to the results are not well described. We also like to point out that the authors do not reproduce the research's conclusion entirely correct. E.g under Overall cardiovascular disease and coronary heart disease (page 3, paragraph 6) it is written that One meta-analysis found that lower intakes of both unprocessed red meat and processed meat were associated with modestly lower risk of CVD mortality (unprocessed red meat: 8 studies / 389,528 participants; processed meat: 9 studies / 478,128 participants), when compared to higher intakes (Zeraatkar et al. 2019a). In the refereed meta-analysis from	The excluded studies have been listed. Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - This chapter is not about dietary patterns but meat intake and its association with chronic disease. The definitions have been highlighted. - Inconsistencies cannot be inferred based on one study (as was referenced). - Despite the search was intended to capture studies considering different animal species separately, little evidence was present for differences between different animal species (one study that analysed different species separately has been described in Table 1.). - We have included the results from the meta-analyses by Zeraatkar et al. Their interpretation differ from ours because we use different strength of evidence evaluation method based on the reasoning given in Arnesen et al. 2020. - A mention about the role of different species has been added in the limitations section. - The word major has been changed to significant.

		fat (and unsaturated fat) in the meat differs between the species. This should be investigated as well since these factors are two of the proposed mechanisms for disease. The potential differences between the animal species are not mentioned once in the chapter. 1) Zheng C., Pettinger M, Nagana Gowda GA, et al. Biomarker-Calibrated Red and Combined Red and Processed Meat intakes with chronic Disease Risk in Cohort of Postmenopausal Women. J Nutr. 2022(July) doi: 10.1093/jn/nxac067. 2) Geiker N.R.W., Bertram H.C., Mejborn H., et al. Meat and human health – Current knowledge and research gaps. Foods. 2021(July). doi: 10.3390/foods10071556 3) Lescinsky H., et al. Health effects associated with consumption of unprosessed red meat: a Burden of Proof study. Nature Medicine. 2022(Okt). doi.org/10.1038/s41591-022-01968-z 4) Gregório MJ, Rodrigues AM, Eusébio M, et al. Dietary Patterns Characterized by High Meat Consumption Are Associated with Other Unhealthy Life Styles and Depression Symptoms. Front Nutr. 2017(June). doi:10.3389/fnut.2017.00025 5) Matvaretabellen.no	Zeraatkar 2019a, the conclusion is: The magnitude of association between red and processed meat consumption and all-cause mortality and adverse cardiometabolic outcomes is very small, and the evidence is of low certainty. Further, in the conclusion of the Systematic Review from Zeraatkar et al 2019b, which assessed the relationship between of the effect of lower versus higher red meat intake on cardiometabolic and cancer outcomes, the conclusion is Low- to very-low-certainty evidence suggests that diets restricted in red meat may have little or no effect on major cardiometabolic outcomes and cancer mortality and incidence. Data gaps: It is stated that the de novo SR which investigates the association of poultry intake with disease will answer some important questions addressed, and that the result will be included when ready (page 10, paragraph 2). We question why the chapter on meat is published before the de novo SR on poultry is published, when the outcome of the de novo SR potentially could change some of the conclusions related to health and poultry and give answers to some of the data gaps. This section should also address the points highlighted under general comments. 6) Universitetet i Oslo, Mattilsynet, Helsedirektoratet. Norkost 3 - En Landsomfattende Kostholdsundersøkelse blant menn og kvinner i Norge i Alderen 18-70 År, 2010-11. Oslo; 2011. www.helsedirektoratet.no.	- The results from the de novo systematic review on poultry intake has been added. It was not included earlier to manage with the schedule of the NNR.

Christiane Hoffmann	Kjøtt- og fjørfebransjens Landsforbund	KLF supports the scientific input from Animalia and MatPrat. The NNR chapter on meat makes many gaps in our current research apparent and thereby clarifies that more research in this field is needed. We question the interpretation of the NNR mission to focus the food group chapters on health outcomes as only negative outcomes. The positive impacts of food groups should not be disregarded, as nutrition is more than single nutrients. Bioavailability and food matrixes should play a bigger role in a holistic approach of nutritious recommendations. The chapter fails to show a strong connection between any of the diseases and high unprocessed red meat intake, as a high intake of unprocessed red meat very often corresponds with other lifestyle factors. These other lifestyle factors, like smoking and obesity are known factors to influence the overall health and therefore they can implicate a causal relationship without being true. We miss a clear distinction between meat from different animal sources as well as if the meat was processed or un-processed. The definitions and distinction characters are not equal among the studies that have been taken into account and point to a clear weakness in the literature. Furthermore, it should be taken into consideration, whether preparation methods		The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - The different types of meat (unprocessed, processed, and total red meat, and processed meat including white processed meat) and how they are handled in the chapter has been described, the results have been distinguished based on it when possible, and the conclusions have been made accordingly. - Despite the search was intended to capture studies considering different animal species separately, little evidence was present for differences between different animal species (one study that analysed different species separately has been described in Table 1.). - A mention about the role of different species has been added in the limitations section. - The list of nutrients of which meat as a good source has been complemented with some nutrients.

		account for a higher intake of salt and fat and therefore influence the outcome of studies regarding meat and the influence on health. We would like to conclude with pointing out that meat is a foodsource high in protein, vitamin B6, vitamin B 12, zinc and iron and a decrease in meat consumption can therefore lead to deficiencies.		
Swedish Food Agency	Swedish Food Agency	Is game meat included in the definition of red meat – never, sometimes? It would be good with a clarification and some more information on game meat.	Page 6, Cancer, Colorectal cancer: Should it be "100 g per day increase"?	Game meat and reindeer are usually considered as red meat. The studies that provide a definition for red meat, often define it as all mammalian meat (as described in Table 1 for each study). Some studies list species/types included more specifically. When game meat is missing in the definition in Table 1, it is either because it was not categorized as red meat, or because game meat was not consumed in the populations. Some /many studies have not defined what they have categorized as red meat. On a population level, habiatual consumption of game and reindeer is minimal and therefore contributes minimally to the results. The typing error has been corrected.
Erica Lindberg	Svenska Fåravelsförbundet	Svenska Fåravelsförbundet önskar lämna kommentarer på det kapitel om köttprodukter, ett kapitel som vi tolkar är oroväckande vinklat och på flera områden är behäftat med bristande underlag för slutsatser och påståenden. Vi saknar information om det faktum att kött är ett av de mest näringstäta livsmedlen och dess betydelse för grupper som är särskilt utsatta	Vad gäller detaljerade synpunkter ställer vi oss bakom de inspel som lämnats från Svenskt Kött.	Due to language, considered by the NNR Committee.

		när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder), detta bör understrykas. I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas. Det är angeläget att författarna skiljer mellan statistiska skillnader gällande relativ och absolut risk och att denna åtskillnad tydligt framgår när olika studier redovisas. De ökade hälsorisker som kan associeras med en diet high in red meat kan i vart fall i vissa fall ha sin grund i andra faktorer, såsom en generellt ohälsosam livsstil, med låg fysisk aktivitet och ett lågt intag av fibrer, frukt och grönsaker. I sammanhanget bör också nämnas att näringsämnen som kött är rikt på, kan minska risken för diagnoser såsom cancer (se under specifika synpunkter) men också att ett för lågt intag av dessa viktiga näringsämnen, bland annat järn, zink och vitamin B12, i många fall är associerade med mycket allvarliga fysiska och mentala tillstånd. En generell önskan i sammanhanget är att författarna till samtliga NNR-kapitel ska hjälpa läsarna att dra relevanta slutsatser av		

		den information som lyfts fram i respektive kapitel. Det är positivt att författarna uppmärksammar brister i materialet såsom att olika studier har studerat olika saker (rött kött, processat kött eller både rött och processat kött) och frånvaron av rättvisande och jämförbara data från samtliga länder. Men det krävs även att författarna lägger sig vinn om att redovisa också sådan fakta som inte nödvändigtvis stödjer den egna tesen. Varför väljer författarna att inte inkludera de studier som inte visar på ett samband mellan kött och cancer i tabellen? Har författarna inte alls tagit hänsyn till dessa i sitt arbete? Det vore en tveksam metod, och den bör hur som förklaras. Författarna nämner att kött är en bra källa till tiamin (vitamin B1) och riboflavin (vitamin B2). De NNR-kapitel som har presenterats över dessa näringsämnen beskriver vidare tydligt köttets betydelse för intaget av tiamin och riboflavin och samma skrivningar skulle kunna finnas med också i kapitlet om kött och köttprodukter. Även kapitlet om vitamin B6 är tydligt med köttets betydelse – medan kapitlet om kött och köttprodukter inte nämner att kött är en viktig källa till vitamin B6. Det huvudsakliga fokuset för NNR är näring. Kapitlet om köttprodukter bör därför i betydligt större utsträckning lyfta frågan om köttets näringsinnehåll och bidrag i en varierad och hälsosam kost, samt framhäva förekomsten av food matrix. Eftersom animalier är de enda källorna till aktivt vitamin B12 är det särskilt anmärkningsvärt		

		att författarna inte alls nämner vitamin B12. Köttets höga innehåll av järn liksom fördelarna med hemjärn bör understrykas, liksom skillnaden mellan köttets höga biotillgänglighet i förhållande till växtbaserade livsmedel. Det är både olyckligt och missvisande att va…		
Torill Nysted	Animalia	People that have a high meat consumption also often have a less healthy diet, are often less physically active and have an overall less healthy lifestyle than people that consume less meat1–4. It is difficult to conclude the potential negative associations between meat consumption and disease without considering other risk factors, such as lifestyle, diet and clinical factors that may be a confound. Although high intake of red and processed meat might be associated with increased risk of some non-communicable diseases, the chapter should emphasize that this association might not be causal. When meat is part of a healthy diet, the associations seem to weaken and even disappear5. In fact, the benefits of meat in the diet due to the content of essential nutrients and beneficial aspects is hardly discussed in the chapter. The WCRF clearly states in their last report on cancer that «(..) it appears increasingly unlikely that specific foods, nutrients or other components of foods are themselves important singular factors in causing or protecting against cancer: rather, different patterns of diet and physical activity combine (…) the alterations that lead to (…) hallmarks of cancer.»6 Thus, the dietary pattern should be considered when intake of red and processed meat is evaluated as a risk of any	Mechanisms Line 5: PAH and HCA are not specific to red meat. Except for people who barbeque frequently, other dietary sources such as grains, leafy vegetables and contaminated seafood may be more important sources of PAH than grilling meat. Also, the formation of HCA or PAH cannot explain the apparent difference between red and white meats with respect to their carcinogenic potential observed in observational studies since they are formed to the same extent in both white and red meat when grilled. Line 6: "IARC (2018) has classified processed meat as carcinogenic and unprocessed red meat as probably carcinogenic to humans". We would like to comment that it bears noting that of the more than 800 epidemiological studies IARC considered, they based their findings on only 56 studies (29 for red meat and CRC, and 27 for processed meat and CRC). Of these 56, 15 found no connection between red meat and CRC and 9 found no link between processed meat and CRC. Thus, the IARC categorizations were in fact only based on 32 epidemiological studies – 14 for red meat and 18 for processed meat. Observational studies are not experimental, and the associations found in such studies should be tested in experimental studies (RCT or animal models)	Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - This chapter is in line with the report of the WCRF. - The sentence on harmful compounds refers to processed meat (including red meat and poultry) not processed red meat. The sentence has been corrected.

		chronic disease. WCRF recommends limiting the intake of red meat to 350-500 g a week. Even though the report states that it is not necessary to include meat in the diet to meet nutritional requirements, the report emphasizes that the recommendation is not to completely avoid meat. The recommended amount provides a balance between the advantages and the disadvantages of eating red meat7. 1. Pagliai G, Dinu M, Madarena MP, Bonaccio M, Iacoviello L, Sofi F. Consumption of ultra-processed foods and health status: a systematic review and meta-analysis. Br J Nutr. 2021;125(3):308. 2. Gregório MJ, Rodrigues AM, Eusébio M, et al. Dietary Patterns Characterized by High Meat Consumption Are Associated with Other Unhealthy Life Styles and Depression Symptoms. Front Nutr. 2017;4(June). 3. Alexander DD, Weed DL, Miller PE, Mohamed MA. Red Meat and Colorectal Cancer: A Quantitative Update on the State of the Epidemiologic Science. J Am Coll Nutr. 2015;34(6):521-543. 4. Alexander DD, Cushing CA. Red meat and colorectal cancer: A critical summary of prospective epidemiologic studies. Obes Rev. 2011;12(5):472-493. 5. Maximova K, Moez EK, Dabravolskaj J, et al. Co-consumption of Vegetables and Fruit, Whole Grains, and Fiber Reduces the Cancer Risk of Red and Processed Meat in a Large Prospective Cohort of Adults from Alberta's Tomorrow Project. Nutr 2020, Vol 12, Page 2265. 2020;12(8):2265. 6. World Cancer Research Fund/American	to confirm that the associations observed in the observational study is an actual association, not mere coincidence/chance. Furthermore, when evaluating red and processed meat, IARC primarily weighted results of studies from Western countries. Only about 15% of the studies included in the report were studies from Asia. This is worth noting as most Asian studies do not support that meat consumption is linked to colorectal cancer10. In the IARC evaluation, very few animal studies were included. Of the ones that were included, most administered strong carcinogens (AOM, DMH) prior to feeding with meat/meat-components, and the experimental diets were altered to contain very little calcium. 8. Turner ND, Lloyd SK. Association between red meat consumption and colon cancer: A systematic review of experimental results. https://doi.org/101177/1535370217693117. 2017;242(8):813-839. doi:10.1177/1535370217693117 9. Kruger C, Zhou Y. Red meat and colon cancer: A review of mechanistic evidence for heme in the context of risk assessment methodology. Food Chem Toxicol. 2018;118(April):131-153. doi:10.1016/j.fct.2018.04.048 10. Hur SJ, Jo C, Yoon Y, Jeong JY, Lee KT. Controversy on the correlation of red and processed meat consumption with colorectal cancer risk: an Asian perspective. https://doi.org/101080/10408398201814956 15. 2018;59(21):3526-3537. doi:10.1080/10408398.2018.1495615	

		Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective.; 2018. 7. WCRF/AICR. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective.; 2018.		
Karianne Spetaas Henriksen	Animalia		Abstract The abstract should be more precise on the actual findings in the literature. In line 2 in the abstract it is stated that "Here we describe the totality of evidence for the role of meat intake for health-related outcomes, discuss potential mechanistic pathways, knowledge gaps and limitations of the literature, and advice for setting and updating the food-based dietary guidelines for meat." However, the abstract does not describe the limitations that is discussed in the section on limitations, such as what is referred to regarding the lack of RCTs. These types of limitations should be addressed in the abstract. Also, the abstract suggests that there is a probable or suggestive association between red and/or processed meat and several chronic diseases, when in fact the chapter states that the strength of evidence is limited, or suggestive in many cases, and that conclusions cannot be made. The abstract must clearly state whether there is an association or not. The abstract should also emphasize the limitation regarding data gaps such as the health effect of the replacement food for meat (mentioned under data gaps, line 1-3). This is highly significant information and must be emphasized in the abstract. We ask the authors to re-write the abstract with these considerations.	The form of abstract follows the instructions for the authors. - We have included the results from the meta-analyses by Zeraatkar et al. Their interpretation differ from ours because we use different strength of evidence evaluation method based on the reasoning given in Arnesen et al. 2020.

			Introduction Page 1 section 2 «Introduction» line 2 the chapter states that «In Western countries, red meat is a major source of energy». In Norway, meat and meat products contribute to 12 % of the energy intake1. If there is a major difference between the Nordic countries on energy from meat in the diet, this should be described. As we see it, 12 % is not a major source of energy. We also like address that in some of the literature referred to, the authors do not reproduce the research's conclusion entirely correct. This is the case for both the meta-analyses and the SR from Zeraatkar et al. We ask the authors to reconsider the wording in the chapter as the articles conclude that the "The magnitude of association between red and processed meat consumption and all-cause mortality and adverse cardiometabolic outcomes is very small, and the evidence is of low certainty."2 And "Low- to very-low-certainty evidence suggests that diets restricted in red meat may have little or no effect on major cardiometabolic outcomes and cancer mortality and incidence."3 1. Universitetet i Oslo, Mattilsynet, Helsedirektoratet. Norkost 3 - En Landsomfattende Kostholdsundersøkelse Blant Menn Og Kvinner i Norge i Alderen 18-70 År, 2010-11. Oslo; 2011. www.helsedirektoratet.no. 2. Zeraatkar D, Han MA, Guyatt GH, et al. Red and processed meat consumption and risk for all-cause mortality and cardiometabolic outcomes a systematic review and meta-analysis of cohort studies. Ann Intern Med.	

			2019;171(10):703-710. doi:10.7326/M19-0655 3. Zeraatkar D, Johnston BC, Bartoszko J, et al. Effect of lower versus higher red meat intake on cardiometabolic and cancer outcomes a systematic review of randomized trials. Ann Intern Med. 2019;171(10):721-731. doi:10.7326/M19-0622	
Martin Inderhaug	Animalia	Current opinions on red- and processed meat intake and colorectal cancer (CRC) are based largely on evidence from observational studies, usually in populations that consume a westernized diet. Observational studies can link meat and colorectal cancer by association or correlation, but not by causation: alone, these studies cannot demonstrate a cause and effect or elucidate the underlying mechanisms that may be contributing to CRC. Observational studies are also more prone to confounding (e.g., gender, age, medical comorbidities, lifestyle habits), and bias (e.g., healthy user bias, unhealthy user bias, recall bias). Randomized controlled trials (RCT) can establish causal claims, but with endpoints such as CRC, an RCT is not an option. Instead, animal models are used to further investigate the connections between diet and disease. The evidence from experimental studies should be taken into consideration when evaluating the relationship between meat and cancer. A systematic review of experimental studies that examined probable mechanistic data linking red and processed meat to colorectal cancer (including heme iron, NOCs, PAH, HCA) concluded that the evidence is insufficient to show a mechanistic link between red meat and colorectal cancer (1). A review by Kruger and Zhou (2) examined experimental studies that focused on the	Inflammation Under "Inflammation", line 6: "If, however, in the future, a longer-term intervention was found to cause inflammation, one potential mechanism could be through a recently found compound Neu5Gc, which red meat contains high amounts, has been linked with systemic inflammation in mice". This is a highly biased claim and should be omitted. TMAO TMAO is not just an intake marker for meat, it has also been identified as an intake marker of fish, and in a crossover meal study with meals made with meat, fish, and vegetable proteins, TMAO was only seen as an acute marker of fish intake3, indicating that TMAO is only a biomarker for meat-intake if TMAO-containing fish is not consumed. Other studies have shown that TMAO in blood and urine is not only dependent on the diet, but also on microbiota and glomerular filtration rate, among other factors4,5. Thus, TMAO should not have its own heading in a meat-chapter as it is not a true intake biomarker of meat. We ask the authors to consider the NNR-chapter on choline which was on public	The chapter follows a pre-defined protocol described in Christensen et al. 2020 and in the webpages of the NNR2023 () - Confounding and strengths and limitations of different study types are common knowledge in nutritional sciences and have been considered when evaluating the evidence. - A conclusion on the effect of an exposure to an outcome can never be made solely from animal studies. Thus, it is inevitable that the reviews on animal studies could not conclude on the matter. - The sentences regarding evidence from RCTs have been revised. - TMAO is mentioned because it has been suggested as a mechanistic factor. The uncertainty is well reflected in the text. - The point on choline is relevant. We have now included a mention about choline. - We use strength of evidence evaluation method by WCRF as described in Arnesen et al. 2020. - The table with excluded studies has been added (Supplementary table 1)

		potential role of heme iron in CRC, and also found that the evidence that heme from red meat intake would contribute to an increased CRC risk was insufficient. References: 1. Turner ND, Lloyd SK. Association between red meat consumption and colon cancer: A systematic review of experimental results. https://doi.org/101177/1535370217693117. 2017;242(8):813-839. doi:10.1177/1535370217693117 2. Kruger C, Zhou Y. Red meat and colon cancer: A review of mechanistic evidence for heme in the context of risk assessment methodology. Food Chem Toxicol. 2018;118(April):131-153. doi:10.1016/j.fct.2018.04.048	hearing in June. In the chapter on meat, the authors discuss the role of choline in relation to cancer without taking into consideration that choline is an essential nutrient. The chapter on choline states on page 6, line 7-9 that «The global trend to reduce animal-source foods in order to attain sustainability goals implies that it may be difficult to achieve AIs of choline, especially in vulnerable groups….» And line 20-23 «… reported mean choline intakes in Nordic countries were lower than the AIs especially in vulnerable groups such as young women and pregnant and lactating women. This implies that a large proportion of women in pregnancy age are not achieving optimal daily choline intake». We ask that the authors take this into consideration when revising the chapter. Data gaps On page 10: "One of the main issues is that in most meta-analyses of observational cohort studies there is little information on food substitution analyses with other protein sources, although this would be very relevant for public health guidelines. In other words, if the intake of meat is reduced, what (protein-containing) foods should be added to the diet". We ask that the authors take this into consideration when revising the chapter. On page 10, « One of the main limitations is that, as with most dietary factors, there are no long-term RCTs that would have investigated the effects of consuming	

			different kinds of meat on disease outcomes. Such studies would provide the highest quality of evidence, but will likely never be conducted due to financial, practical, and logistic reasons. Therefore, the evidence is based on short-term RCTs with disease risk factors or on observational studies". And "… Most RCTs last only a few weeks or months, which may be too short a time to observe significant effects on disease risk factors". We question why the authors of the chapter conclude that the evidence is probable or suggestive regarding meat and meat products and risk for several non-communicable diseases when the paragraph on limitations clearly states that the evidence may be too weak, and the observational studies included may be biased. Table 2, an overview of excluded literature, is missing 3. Schmidt Andersen M-B, Christine Reinbach H, Rinnan smund, Barri T, Mithril C, Ove Dragsted L. Discovery of exposure markers in urine for Brassica-containing meals served with different protein sources by UPLC-qTOF-MS untargeted metabolomics. 4. Cho CE, Taesuwan S, Malysheva O V., et al. Trimethylamine-N-oxide (TMAO) response to animal source foods varies among healthy young men and is influenced by their gut microbiota composition: A randomized controlled trial. Mol Nutr Food Res. 2017;61(1):1600324. doi:10.1002/MNFR.201600324 5. Manor O, Zubair N, Conomos MP, et al. A	

			Multi-omic Association Study of Trimethylamine N-Oxide. Cell Rep. 20…	
Anna Bergström	Skårve Nytorps småbruk	Jag önskar lämna kommentarer på kapitlet om köttprodukter, ett kapitel som jag tolkar är oroväckande vinklat och på flera områden är behäftat med bristande underlag för slutsatser och påståenden. Det saknas information om det faktum att kött är ett av de mest näringstäta livsmedlen och dess betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder), detta bör understrykas. I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Matproduktion på våra breddgrader kräver djur för att vara hållbar. Vi kan inte odla vegetabilier utan importerade insatsmedel om vi inte har tillgång till gödsel och vi har mycket mark som passar för bete men där det inte kan odlas spannmål, oljeväxter, grönsaker eller baljväxter. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas.		Due to language, considered by the NNR Committee
Gudrun Haglund-Eriksson	Svenska Fåravelsförbundet			

Sara Lopes	UECBV	The chapter is overall focused on the increased health risks of high red meat (RM) consumption with virtually no positive impacts described. Of the studies analysed and included in the document, most of them have heterogeneity between themselves and inconsistent results. Reports of the risks, on many occasions, are not well described and interpretated, with confusions between relative risks and absolute risks, which further contributes for the lack of good evidence. One of the main problems in the studies is that high unprocessed RM intakes often coincide with other dietary and non-dietary factors such as obesity, smoking, low levels of exercise and physical activity as well as reduce intake of whole grains, fruits, vegetables, fish, nuts and seeds. This can implicate an apparent causal relationship between high unprocessed RM intake and increase risk of certain diseases, without it being true. In fact, obesity, smoking, etc are confounder agents not often well considered in many studies, which influences the results. Studies, such as the Global Burden of Disease study, have also shown that underconsumption of nutrients and specific food groups outweighed excess consumption in associations with deaths and DALYS(1). Many of the mechanisms implied are not directly because of RM but because of the cooking methods. The amount of salt and oil, as well as the cooking time can influence the quantity of nutrients that one eats and predispose the individuals to a higher or lower	Red meat (RM) is source of vitamin B1, zinc and iron, as well as the main source of vitamin B12, which is not mentioned in the document. Additionally, unlike what is said in page 2, RM consumption is lower than poultry consumption in western countries, with some exceptions, according to OECD data(1). Moreover, RM consumption has a positive impact throughout the whole life cycle. In newborns, in the first 1000 days, nutrients such as iron, zinc, vitamins from complex B, choline and omega-3 fatty acids are essential for their adequate growth. The inadequate intake of these key nutrients can have long lasting effects such as a lifelong deficit in brain function. In particularly, deficiency of choline can result in alterations in the brain and spinal cord increasing the risk for neural tube defects; deficiency in iron can cause impairments in brain development, smaller placental size and cardiometabolic diseases later in life, deficiency in omega-3 can alter the nervous system and eye development; deficiency in vitamins B6 and B12 can result in congenital malformations and increase miscarriage risk; and deficiency in zinc can slow the development of the placenta, impeding organogenesis and increase the risk of preterm labour, spontaneous abortion and low body weight(2). As for the mothers, omega-3 deficiency can result in impairments in cardiovascular health, B12 deficiency can result in mental slowness, memory problems, numbness and tingling in the extremities, deficiency in magnesium is associated with preeclampsia and pre-term delivery and deficiency in iron can cause	The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been listed. Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - The potential role of cooking has been brought up in the chapter. - Although the data is inconsistent for many outcomes, it is consistent for others. This has now been clarified by adding a table of strength of evidence for each meat type and outcome. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - The evidence is insufficient for the association between meat intake and sarcopenia for making conclusions.

		risk of certain diseases(2,3). This does not mean that the consumption of RM per si increases the risk of developing pathologies, but rather that the potential risk depends more on the cooking method. It is essential to explain to populations the best cooking methods and the best condiments to add, in order to reduce possible risks. The contribution of RM to nutrition is disproportionately higher than its contribution to global food mass - RM provided 11% of global food energy availability, 29% of dietary fat and 21% of protein. For the micronutrients, RM provided high proportions of vitamins: A (24%), B1 and B2 (15% each), B5 (10%), B6 (13%), and B12 (56%). RM also provided high proportions of several trace elements: zinc (19%), selenium (18%), iron (13%), phosphorous (11%), and copper (10%)(4). A decrease in the consumption of RM can implicate an increase in micronutrients deficiency and further increase food insecurity, in particular in infants, children, adolescents, pregnant women, elderly and low-income groups. There are still many gaps in research, and it is essential that future research is adjusted for generally less healthy diets, including ultra-processed plant based foods, and lifestyles to clarify the link, if existent, between unprocessed RM intake and the various pathologies described(5). Drawing conclusions to reduce the consumption of unprocessed RM intake can be, therefore, imprudent and unfair.	lethargy, weakness, irritability and poor work tolerance(2). RM is a great source of the nutrients above mentioned and it is highly available and easy to prepare, which makes it one of the best food sources to prevent deficiencies and assure both mothers' and infants' health. RM intake also shows positive impacts on sarcopenia. Sarcopenia is a syndrome characterized by the progressive and generalised loss of skeletal muscle mass, strength, and function (performance) with a consequent risk of adverse outcome. Older adults with sarcopenia are more prone to suffer from disability, loss of independence, falls, fractures, and death(3), which leads to more time spent in the hospital and more medical care and resources needed. The prevalence of sarcopenia in the elderly population is between 1-29% in adults living in community and of 37% for hospitalized adults. The tendency is for the prevalence to keep rising with the increase of life expectancy(4,5). Good nutrition, especially protein of high bioavailability, helps limit and treat age-related declines in muscle mass, strength, and functional abilities. Protein nutrition in combination with exercise is considered optimal for maintaining muscle function(3). Investigators recommend an increase of the dietary protein for elderly, between 1.0-1.5g protein/kg body weight/day according to state of nutrition, with even higher intake for individuals with severe illness or injury(3,6). Research also indicates that lean RM	

		In summary: • No strong connection was found in any of the diseases and high unprocessed RM intake. • High unprocessed RM intake very often coincides with other dietary and non-dietary factors that influence overall health. Results found may be due to the confounders and not meat intake. • Cooking methods account for more risks than unprocessed RM itself. • RM intake shows positive impacts, in particularly for the decrease of micronutrients deficiency, adequate infant growth and decrease of sarcopenia (see detailed comments). • The limitations and gaps in research are substantial. Reduction of the dietary guidelines for unprocessed RM intake is not advised. • High quality evidence is severely lacking. Bibliography 1. http://dx.doi.org/10.1071/an21235 2. http://dx.doi.org/10.1136/bmjopen-2017-020167 3. https://doi.org/10.3389/fnut.2021.801228 4. http://dx.doi.org/10.3389/fnut.2022.766796 5. http://dx.doi.org/10.1093/ajcn/nqaa043	combined with resistance exercise training increases lean tissue mass and muscle strength(7). Individuals with sarcopenia also present less consumption of B6 and B12 vitamins, comparing to healthy individuals of the same age. The inadequate consumption of these vitamins can lead to the worsening of sarcopenia as well as other medical conditions(7). RM is a food rich in protein of high bioavailability, vitamin B6 and vitamin B12 and its consumption can help to reduce the prevalence of sarcopenia, resulting in healthier ageing and economical gains. Bibliography 1. https://data.oecd.org/agroutput/meat-consumption.htm 2. http://dx.doi.org/10.3390/nu11122891 3. https://doi.org/10.1016/j.clnu.2014.04.007 4. https://doi.org/10.1186/2049-3258-72-45 5. https://doi.org/10.1016/j.jamda.2020.03.006 6. https://doi.org/10.1016/j.clnu.2016.09.004 7. https://doi.org/10.3390/nu12061755	
Elisabet Rytter	Livsmedelsföretagen Service i Sverige AB	The chapter to limited extent include positive nutritional aspects of meat (only marginally mentioned under "Introduction"). Such aspect may not have been included in the aim of the chapter but "to describe the background that is relevant for setting DRVs and FBDGs" (see "Instructions to authors of chapters") we consider it is necessary. Many of the mechanisms mentioned in the	2. Introduction Page 1; It should be mentioned that read meat also is a good source of vitamin B6 and B12. Page 2; The sentence "Compared to red meat consumption, poultry is typically lower in Western countries" is not correct with some exceptions, according to OECD data (1).	The aim is consistent with the instructions to the authors. The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been listed (Supplementary table 1). Food

		chapter are associated to processing methods (including cooking at home). The amount of salt and oil, as well as processing methods, can influence the risk of certain diseases. If the risk of developing chronic diseases depends on processing, added ingredients to the meat product or consumption of meat per se must be taken carefully into consideration. Note that there is a risk for confusions between relative risks and absolute risks in the analysis and conclusion done.	4; Diet intake in Nordic and Baltic countries: The sentence "poultry intake being several times lower" is based on old intake data in Sweden (2010). When looking at statistics from 2012-2021 (2) the consumption of red meat has decreased since more than 10 years back. 6. Mechanisms The risk assessment report about nitrate and nitrite from the Swedish Food Agency (3) should be taken into consideration. - Whether the cancer-causing nitrosamines are also formed in the body when nitrate/nitrite is ingested from food is not clear. - According to calculations in the report, the contribution from charcuterie averages about 10 percent of total nitrite exposure among adults, while exposure from primarily vegetables, after conversion from nitrate, accounts for the largest portion. References 1. Agricultural output - Meat consumption - OECD Data [Internet]. theOECD. [cited 2022 Nov 4]. https://data.oecd.org/agroutput/meat-consumption.htm 2. Konsumtion av kött, Jordbruksverkets hemsida https://jordbruksverket.se/mat-och-drycker/hallbar-produktion-och-konsumtion-av-mat/konsumtion-av-kott 3. https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2017/2017-nr-	can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - The possible role of added ingredients has been brought up (no changes). - While the difference between absolute and relative risk is important, it has not been reported in most of the reviewed studies. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - We have modified the sentence of poultry intake in Western countries to "somewhat lower". The provided reference (OECD) shows: pork 22.9, beef and veal 14.4, sheep 1.3, poultry 33 kg/ capita. Red meat = pork + beef and veal + sheep. The figures of intake of meat types have been checked from faostat and the statement holds. However, increasing intake of poultry has now been mentioned based on data from FAOSTAT food balance sheets. - Concerning nitrites, it would probably not be the nitrate exposure alone but compounds formed in the presence of them. N-nitroso-compounds are a possible, not a confirmed, mechanism for colorectal

			18-del-2-nitrat-0-nitrit-i-livsmedel-och-dricksvatten-fran-egen-brunn-riskvarderingsrapport.pdf	cancer, as discussed by IARC 2018 (available at: https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Red-Meat-And-Processed-Meat-2018).
Puk Maia Ingemann Holm	Danish Agriculture & Food Council	Thanks for this opportunity to comment. These are the main topics - references are under detailed comments: A high intake of meat and mainly processed meat often coincides with other more detrimental lifestyle factors such as smoking, inactive lifestyle, unbalanced meal patterns and abdominal overweight and no or low educational background. All strong indicators of unhealthy lifestyle and increased risk of non-communicable diseases (1,4). These multifaced factors strongly point to other health compromising factors than the intake of meat itself. The US based Institute for Health and Evaluation (IHME), a global reference for health statistics, are using a star rating in evaluating how much a particular risk factor is linked to a health outcome. As the connection between smoking and lung cancer was given the highest five-star rating, the connection between eating a lot of red meat and having a stroke was given a one star, meaning there was no evidence of an association. Links between red meat and colon cancer, breast cancer, ischemic heart disease and diabetes were all given two stars (3) indicating a low risk. This is also recently described in Lescinsky, et al (5) who concluded weak and insufficient evidence that eating unprocessed red meat is associated with increased risk of	There is also a matter of incorrect reproduction of the meta-analysis and the SR from Zeraatkar et al. (14,15) We ask the authors to reconsider the wording in the chapter as the articles conclude that the "The magnitude of association between red and processed meat consumption and all-cause mortality and adverse cardiometabolic outcomes is very small, and the evidence is of low certainty." (14) And "Low- to very-low-certainty evidence suggests that diets restricted in red meat may have little or no effect on major cardiometabolic outcomes and cancer mortality and incidence." (15). We recommend a reconsideration of paragraph in this regard too. References: 1. Geiker et al. Meat and Human Health – current knowledge and research gaps; Review: Foods, June 2021. 2. Alexander et al. Red meat and colorectal cancer: a critical summary of prospective epidemiologic studies. Obesity Reviews. 2011, 12, e472-e493. 3. Alexander et al. Red Meat and Colorectal Cancer: A Quantitative Update on the State of the Epidemiologic Science. J. Amr. Coll. Nutr. 2015, Vol 0, No. 0, 1-23. 4. Biltoft-Jensen, A.P.; Kørup, K.; Christensen, T.; Eriksen, K.; Ygil, K.H.; Fagt, S. Køds Rolle i	Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - We are also aware of the study by Lescinsky et al. 2022, which we have now mentioned in the text. - Regarding the study by Vernooij et al., this chapter is not about dietary patterns but meat intake and its association with chronic disease. - Although the data is inconsistent for many outcomes, it is consistent for others. This has now been clarified by adding a table of strength of evidence for each meat type and outcome (Table 2). - The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. When there is lack of association it has been mentioned. Now a de novo systematic review authorized by the NNR2023 on poultry meat intake and cardiovascular diseases and type 2 diabetes has also been included.

		disease incidence and mortality. More rigorous, well-powered research is needed to better understand and quantify the relationship between consumption of unprocessed red meat and chronic disease. They also found that the heterogeneity was wide: from 0-200 g per day. Vernooij, et al (6) concluded that "Low- or very-low-certainty evidence suggests that dietary patterns with less red and processed meat intake may result in very small reductions in adverse cardiometabolic and cancer outcomes". This relation is too, what we read in the different paragraphs in parenthesis, but not in the conclusion nor the summary of the chapter "Meat and meat products". Repeatedly it is noted in the paragraphs that the "evidence is regarded as limited – no conclusion". It is therefore unexplained why the link between intake of red meat and disease is being made in the conclusion. This also calls for a rewrite of the abstract that takes weak associations and lack of SR´s into account. It is also striking that this chapter leaves out the positive effects of white meat – poultry. In studies on meat, white meat is often not associated with non-communicable diseases. To support the argument of the very low risk of intake of red meat and processed meat, the DTU Food Institute had a conference September 23rd 2022 where Research Group for Risk Benefit presented a risk benefit analysis (helhedsvurdering) of the intake of red meat. In short, it is a matter of 5-40 minutes lost of healthy life, in line with drinking sugar sweetened beverages https://www.food.dtu.dk/nyheder/nyhed?id=c	Kosten; DTU Library: Copenhagen, Denmark, 2016. 5. Lescinsky H, Murray CJL, Afshin A, Ashbaugh C, Bisignano C, Brauer M, Ferrara G, Hay SI He J, Iannucci V: Health effects associated with consumption of unprocessed red meat: a Burden of Proof study. Nat. Med. Oct 2022. https://www.healthdata.org/research-article/health-effects-associated-consumption-unprocessed-red-meat-burden-proof-study 6. Vernooij RWM, Zeraatkar D, Han MA, et al. Patterns of Red and Processed Meat Consumption and Risk for Cardiometabolic and Cancer Outcomes. Ann Intern Med. 2019;(15). doi:10.7326/m19-1583 7. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clinical Nutrition. 2017;36(1):49–64. 8. Deutz NEP, Bauer JM, Barazzoni R, Biolo G, Boirie Y, Bosy-Westphal A, et al. Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group. Clinical Nutrition. 2014 Dec 1;33(6):929–36. 9. Beaudart C, René R, Bruyère O, Reginster J, Biver E. Sarcopenia: burden and challenges for public health. Archives of Public Health. 2014 Dec;70(1). 10. Ligthart-Melis GC, Luiking YC, Kakourou A, Cederholm T, Maier AB, de van der Schueren MAE. Frailty, Sarcopenia, and Malnutrition Frequently (Co-)occur in Hospitalized Older Adults: A Systematic Review and Meta-analysis. Journal of the	- The definitions of meat types have been clarified. The conclusions have been made on the meat type level that there is evidence. - The evidence is insufficient for the association between meat intake and sarcopenia for making conclusions. Stunting is not a public health issue in the Nordic countries. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - We have included the results from the meta-analyses by Zeraatkar et al. Their interpretation differs from ours because we use different strength of evidence evaluation method based on the reasoning given in Arnesen et al. 2020.

		d274e41-182c-4foc-ac3b-1c9c56379690 (presentation no. 5). This chapter is primarily focused on observational data, as the quality of SR´s was on average evaluated as critically low. The literature is overall heterogenic, just as dose response outcome is non-linear. Therefore, the causal links between disease and intake of red meat stands undocumented (1-3). The definitions on meat, red meat and processed meat is among studies heterogenic which results in incomparable conclusions. This underlines the weak associations between illnesses and the intake of meat (3,4). This chapter fails to address health outcomes such as reduction of sarcopenia (7-10), but also reduced stunting (11) and increased muscle health (12) which are conditions positively related to intake of meat. The nutritional contribution of red meat and -products is also missing. Meat is well known to contribute to a broad palette of nutrients such as B-vitamins – especially B12, potassium, phosphor, zinc, iron, selenium and vitamin A from lever and protein of high human bioavailability (1,4).	American Medical Directors Association. 2020 Apr; 11. Ganapathy A, Nieves JW. Nutrition and sarcopenia—what do we know? Vol. 12, Nutrients. MDPI AG; 2020. p. 1–25. 11. Headley D, Hirvonen K, Hoddinott J: Animal Sourced Foods and Child Stunting. Amr. J. Agri Economics, 31 July 2018. https://onlinelibrary.wiley.com/doi/10.1093/ajae/aay053 12. Daly R, Gianoudis J, Prosser M, Kidgell D, Ellis KA, O´Connell S, Nowson CA: The effects of a protein enriched diet with lean red meat combined with a multi-modal exercise program on muscle and cognitive health and function in older adults: study protocol for a randomised controlled trial. Trials. August 2015. 10.1186/s13063-015-0884-x 13. FAO: The State of Food Security and Nutrition in the World. Repurposing Food and Agricultural Policies to Make Healthy Diets More Affordable. ISSN 2663-807X (online). 2022 14. Zeraatkar D, Han MA, Guyatt GH, et al. Red and processed meat consumption and risk for all-cause mortality and cardiometabolic outcomes a systematic review and meta-analysis of cohort studies. Ann Intern Med. 2019;171(10):703-710. doi:10.7326/M19-0655 15. Zeraatkar D, Johnston BC, Bartoszko J, et al. Effect of lower versus higher red meat intake on cardiometabolic and cancer outcomes a systematic review of randomized trials. Ann Intern Med. 2019;171(10):721-731. doi:10.7326/M19-0622	
Soile Käkönen	HKScan Finland Oy	There is only one (1) sentence stating any positive input for red meat regarding nutrition: "Red meat is a good source of, e.g.,		The list of nutrients of which meat as a good source has been complemented with some nutrients.

		protein and essential amino acids, vitamins B1 and B2, iron, and zinc but also a notable source of unfavorable saturated fatty acids" - and even that sentence ends with negative remark. What about vitamin B12, which (red) meat as an animal based food, is an excellent source? Or heme-iron, which e.g. Finnish fertile-aged women are lacking in their diet and being a heme-iron, absorbs better than vegetable-based iron in the body? Or other trace elements, like Magnesium or Selenium, which meat is a good source. Or unsaturated fatty acids, which are the major composition of fat in meat, especially in pork and poultry. (Red) meat is a nutrient dense food, which can enrich the diet, when consumed in moderation, and this is presumably the goal for NNR2022 as well. Nordic meat is tasty, well accepted, allergen and antibiotic free, and in the future even more sustainable than today, thanks to several environmental projects ongoing in all Nordic countries. So, just half a sentence about (red) meat's positive impacts just isn't enough. Considering processed meat, I would point out some facts commonly used in industry, which have an effect when these products are consumed in Nordic countries. In the chapter there is a list of potentially harmful ingredients and nutrients in processed meat and red meat and compounds that may be formed when meat is processed, e.g. heme iron, N-nitroso compounds (NOCs), heterocyclic amines (HCA), polycyclic aromatic hydrocarbons (PAH), N-glycolylneuraminic acid (Neu5Gc) etc. Food industry is regularly taking actions to prevent		- Absorption of iron has now been explained. - This chapter is about the association between meat intake and health/chronic disease outcomes, not about environmental impacts of meat. - The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - We don't have detailed information available from all food manufacturers about these procedures to be able to say what the industry is doing.

		these harmful compounds to exist. For example, we always use oxidants (ascorbid acid) together with nitrites, which reduces the formation of NOCs, PAHs are not present at least in Finnish processed meat products, thanks to low temperatures in processing and using liquid smoke in smoking. Of course, people may process meat in variety of ways at home, but industry takes seriously the risk factors and works determined to decrease at least some of them. As NNR2022 are targeted to Nordic people, it hopefully takes into account Nordic foods as well.		
PAOLO PATRUNO	CLITRAVI	CLITRAVI welcomes the opportunity to respond to the public consultation on NNR 2022 (Chapter on meat) and would like to raise the following comments: 1) Despite the Chapter recognizes at the beginning the positive role of meat, there are not sufficient elements to substantiate the role of meat in a balanced diet. The nutrients found in meat and processed meat are abundant, of high physiological quality, and readily absorbed by the human system. Processed meat contains a sufficient amount of complete and highly digestible proteins with all of the essential amino acids to support growth, development, maintenance and repair of the human body and provides, in most cases, an above average source of vitamin B12, zinc, phosphorus, iron, and zinc. Adequate dietary protein is important for individuals during all stages of life and, in particular, it is critical to meet the requirements for essential or indispensable amino acids. It is recommended to meet dietary protein intakes by ingesting highly digestible and high-quality proteins. Although the recommended intake for total protein has	1) Overall cardiovascular disease and coronary heart disease. The research on CVD has become very controversial in relation to saturated fat. several large studies show that many people with high blood cholesterol levels don't develop CVD , while people with lower cholesterol levels are at risk . This emphasises that saturated fat and cholesterol are not the main story in CVD development. According to newer research, central (visceral) obesity is the underlying factor in the development of a host of conditions including CVD and type 2 diabetes . Visceral obesity is when large deposits of fat are laid down around the abdomen – often called an 'apple shape'. 2) Obesity. Misuse of epidemiology is the issue once again. Most observational studies looking at red meat report associations with obesity, weight gain or body fat. Some do not . The role of diet in the aetiology of over-weight/obesity remains controversial. 3) Cancer. The evidence used for the IARC	The list of nutrients of which meat is a good source has been complemented with some nutrients. - The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. - The evidence presented is based on a systematic literature search and the evaluation of the evidence follows a standard protocol described in Arnesen et al. 2020. The limitations and data gaps have been described. - Confounding is common knowledge in nutritional sciences and have been considered when evaluating the evidence. - We are aware of the studies by NutriRECS. The results of the meta-analyses are in line with other meta-analyses. Their interpretation differs

		been set at 0.8 g/kg body weight/d, this should be seen as a minimum value and not as an optimal one. Older adults, for instance, require intake levels >1.2 g/kg/d for healthy aging , and >1.5 g/kg/d in the case of chronic disease . Suitability of the intake levels of course depends on the quality of the protein, in particular its content of essential amino acids. 2) Statistical and epidemiological extrapolations used to identify risks related to meat and meat products consumption often lack fully clarified biochemical mechanistic evidence, while associations and correlations do not necessarily mean causation. In addition, a follow-up by systematic reviews and meta-analyses often present contradictory outcomes against the initial results that were introduced by early-stage epidemiological studies lacking consistency, biological gradient, and coherence. Thus, such extrapolations can lead to one-sided, premature targeting of risk factors accompanied with consequences, often without the desirable outcomes. Although lipid fractions play a role in cardiometabolic disease, the situation is far more complex than initially believed and is not so much a matter of 'cholesterol' than of general metabolic disruption. Superior sets of risk markers do not focus on total cholesterol but include the small-dense LDL cholesterol fraction (rather than total LDL-cholesterol, which may even be protective in elderly), lipoprotein (a), low HDL levels, and high triglycerides. Such studies provide the rationale for more research about the causes (and not only the risk factors) of chronic	classification is almost entirely observational. These data cannot be used to determine cause and effect due to the likelihood of confounding factors, especially age and genetic make-up which are two of the largest influencers of cancer risk. Indeed, studies show that high RPM consumers tend to be older, male, more likely to smoke and have less healthy diets overall . Statistical manipulations cannot completely correct for these factors, many of which influence cancer risk. Most observational studies do not correct for low fibre intake or insufficient physical activity, both of which are known risk factors for CRC. Finally Dietary Guideline Recommendations from the Nutritional Recommendations (NutriRECS) Consortium using an innovative process focusing exclusively on the results obtained by observing the health effects of moderate consumption of red and processed meat detected no health risk with moderate consumption of red and processed meat. 4) Inflammation. Chronic diseases are also associated to insulin resistance and the so called "hyperinsulinemic syndrome". Postprandial glucose pikes and elevated blood glucose concentrations overwhelm normal mitochondrial processes and thereby result in a chronic overproduction of reactive free radical molecules and a greater release of proinflammatory cytokines. Refined carbohydrates and calories in excess can led to hyperglycaemia and inflammation. While ultra-processed foods can be associated to a high intake of refined carbohydrates and	from ours because we use different strength of evidence evaluation method based on the reasoning given in Arnesen et al. 2020.

		diseases such as atherosclerosis, CVD, and cancer, but also for a re-evaluation of the guidelines for cardiovascular prevention. Targeting a risk factor such as high serum cholesterol usually cannot prevent the causation of chronic diseases. 3)Specific studies on the principles of the Mediterranean diet and relevant data linked to the examples of people living in the Mediterranean countries demonstrate that the key to longevity and the prevention of chronic disease development is not the reduction of dietary or serum cholesterol but the control of systemic inflammation. The inverse association between Mediterranean diet and all causes of diseases and cardiovascular mortality has been attributed to several of its protective effects. For instance, the Mediterranean diet can beneficially influence several risk factors such as lowering body mass index and blood pressure, reducing insulin resistance, reducing lipid levels (i.e., the ratio of cholesterol/HDL cholesterol), and improving HDL-cholesterol functionality. One of its main beneficial impacts is on the improvement of endothelial function and the decrease of the inflammatory milieu. It is also suggested that there is an improvement of oxidative stress, with lower concentrations of oxidised LDL and improved apolipoprotein profiles.	calories, meat and processed meat products are able to provide proteins and micronutrients without triggering insulin resistance and inflammation. Castelli et al. (1996) https://www.ncbi.nlm.nih.gov/pubmed/8831910 Britton et al. (2013) https://doi.org/10.1016/j.jacc.2013.06.027 De Larochellière E et al. (2014) https://www.ncbi.nlm.nih.gov/pubmed/24589564 Nielsen et al. (2018) https://www.ncbi.nlm.nih.gov/pubmed/29337861 Fogelholm M et al. (2015) Eur J Clin Nutr 69: 1060-1065. www.ncbi.nlm.nih.gov/pubmed/25969395 Johnston BC, Zeraatkar D, Han MA, Vernooij RWM, Valli C, El Dib R, Marshall C, Stover PJ, Fairweather-Taitt S, Wójcik G, Bhatia F, de Souza R, Brotons C, Meerpohl JJ, Patel CJ, Djulbegovic B, Alonso-Coello P, Bala MM, Guyatt GH. Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the Nutritional Recommendations (NutriRECS) Consortium. Ann Intern Med. 2019 Nov 19;171(10):756-764. doi: 10.7326/M19-1621. Epub 2019 Oct 1. PMID: 31569235.	
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We are aware that the NNR instructions to authors state that negative health outcomes are to be considered. However, for a more balanced analysis also the positive benefits of including meat in the diet must also be thoroughly discussed. Meat is a good source of several essential nutrients, including iron		The aim is consistent with the instructions to the authors. The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic

		which is of special importance for young girls and women of childbearing age. In addition, the chapter refers to the de novo SR on poultry which is not finalized and therefore not included. This is negative for the interpretation of the present chapter Meat and meat products. Poultry makes up a substantial part of the total meat consumption in Norway (Norwegian Directorate of Health, 2021), and this SR must be integrated into the final chapter. We also ask the authors to consider the NNR chapter no. 35 Choline in their update. It says that choline is an essential nutrient and that it may be difficult to achieve AIs of choline if the global trend to reduce animal-source foods continues, especially for vulnerable groups. The search string for PubMed searches includes several meat-related wordings, where "red meat" is one of them. However, it is important to bear in mind that this group of meat is heterogeneous. The nutrient profiles of different sub-species should be considered, e.g. differences in the amount of saturated fat and heme-iron. In addition, there is no clear and official definition of "processed meat". Processed meat products might significantly differ in nutritional composition both between and within countries. Differences in socio-economic status, lifestyles, dietary patterns, and other risk factors are also important factors. In their latest report on cancer, the WCRF states clearly that factors such as dietary patterns and physical activities need to be taken into consideration when		disease outcomes were not limited. The excluded studies have been listed. Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with red and processed meat and positive health outcomes. No such conclusions could be done concerning poultry either. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - The results from the de novo systematic review on poultry intake has been added. It was not included earlier to manage with the schedule of the NNR. - We have now included text about choline. - Confounding and strengths and limitations of different study types are common knowledge in nutritional sciences and have been considered when evaluating the evidence. - The definition of processed meat used in the chapter has been provided. - The chapter is not in conflict with the report of the WCRH, 2018. - The form of abstract follows the instructions for the authors.

		assessing the risk for chronic disease (WCRF, 2018). Another important limitation is the interpretation of causality and health outcomes based on observational studies instead of experimental studies. All of this must be taken into consideration in the interpretation of the studies and be discussed as limitations in the chapter. Lastly, in our opinion, the abstract does not reflect the discussions in the paragraphs correctly. The different limitations discussed should be referred to in a better way in the abstract along with the proposed conclusions. We ask the authors to consider this. References Norwegian Directorate of Health (2021). Utviklingen i norsk kosthold 2021. World Cancer Research Fund/American Institute for Cancer Research (2018). Diet, Nutrition, Physical Activity and Cancer: A Global Perspective. Continuous Update Project Expert Report.		
Jeanette Elander	Sveriges Grisföretagare	The main focus of the NNR is nutrition. The chapter on meat products should therefore to a much greater extent raise the issue of the nutritional content and contribution of meat in a varied and healthy diet, as well as highlight the presence of food matrix. Since animals are the only sources of active vitamin B12, it is particularly noteworthy that the authors do not mention vitamin B12 at all. The high content of iron in meat and the benefits of heme iron should be emphasized, as well as the difference between the high		The list of nutrients of which meat is a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been

		bioavailability of meat in relation to plant-based foods. It is both unfortunate and misleading that every positive contribution of the meat described is followed by a deficiency. This applies, among other things, to the writings about saturated fatty acids, where no distinction between different types takes place. Meat is one of the most nutrient-dense foods and its importance for groups that are particularly vulnerable when it comes to ingesting and assimilating enough of the necessary nutrients (children, the elderly and weaker, women of childbearing age) should be emphasized. In this context, the positive contribution of the meat factor to the nutrient uptake from vegetables also needs to be mentioned. The authors mention that meat is a good source of thiamine (vitamin B1) and riboflavin (vitamin B2). The NNR chapters that have been presented on these nutrients further clearly describe the importance of meat for the intake of thiamine and riboflavin and the same wording could also be included in the chapter on meat and meat products. Even the chapter on vitamin B6 is clear about the importance of meat – while the chapter on meat and meat products does not mention that meat is an important source of vitamin B6. A general desire in this context is that the authors of all NNR chapters should help readers to draw relevant conclusions from the information highlighted in each chapter. It is		listed (Supplementary table 1). Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with meat and positive health outcomes. - The logic of including and not including studies in the table has been explained in the methods section. The lack of associations have also been described in the results.

		positive that the authors draw attention to shortcomings in the material such as the fact that various studies have studied different things (red meat, processed meat or both red and processed meat) and the absence of accurate and comparable data from all countries. But it is also necessary for the authors to make an effort to present even facts that do not necessarily support their own thesis. Why do the authors choose not to include the studies that do not show a link between meat and cancer in the table? Have the authors not taken these into account at all in their work? That would be a questionable method, and it should be explained however.		
Bjørg Egelandsdal	NMBU	Abstract I appreciate the rather detailed work that Jelena Meinila and Jyrki Virtanen have authored. I could, however, treasured a stricter implementation of the NNR conclusions in part 5 in the abstract: - Example CVD/CHD: "… the strength of the evidence is limited regarding that high intake of unprocessed and processed meat is….." - Since it is the last sentence related to CVD and CVD, it looks like a conclusion from NNR authors regarding CVD and processed / unprocessed meat. - A similar conclusion is stated for myocardial infection, stroke, heart failure, total mortality, T2D (then limited suggestive is used), hypertension, total cancer incidences and cancer mortality. - Despite the frequent use of limited - suggestive evidence and limited evidence in particular, the abstract reads: "our findings indicate strong evidence that processed meat… (after 5 lines this part ends with		The strength of evidence conclusions for CVD outcomes and T2D are the conclusions of us, the authors. The evaluations have now been clarified by adding a table of strength of evidence for each meat type and outcome (Table 2). - The articles of WCRF and IARC have been classified by the NNR2023 committee as "qualified systematic reviews" as described in Arnesen et al. 2020, which has been mentioned in the Methods of this chapter. The abstract has been clarified. - There is no reason to assume that the associations of meat intake and chronic diseases in global context would be different in the Nordic countries when studies from Europe/western countries have been included. The difficulty of reporting and definitions relates to amounts of dietary intake, not the associations

		comments to meat and health outcome)" - To me the above are bias sentences being presented in the abstract, when reference to NNR's own conclusions is considered, and I recommend that you reassess this part of the abstract which otherwise is fine. Nordic and Baltic countries and meat. It is my understanding that NNR's task is to make an assessment of global health research and in particular health research from the Nordic and Baltic region. When it comes to cancer, NNR mostly just refers to WCRF/IARC. I would have liked to see a comment regarding why these organizations conclusions are just adapted. As NNR knows, IARC conclusions, but also WCRF's conclusions, has been powerfully criticized. I am sure you know these critical articles, I therefore think that not revealing clearly what NNR thinks based on reading relevant literature, especially for the region it writes new guidelines for, should be done. I also think writing: "our findings" in the abstract when it is based on IARC/ WCRF should be reconsidered when NNR writes that the reporting and definitions related to meat in this region makes it difficult to make within countries comparisons. I assume this goes for comparisons to countries outside the Baltic and Nordic Region as well. Definitions		between dietary intake and disease. - When the evidence was probable or strong (as it was for some CVD outcomes and colorectal cancer), the amounts related to risks have been described in the text. - The definition of processed meat in this article has been described. - The mechanism section is discussing potential mechanisms mediating the associations between meat intake and disease outcomes. When there is no supporting evidence for the mechanism it is reflected in the strength of evidence evaluation.

		I agree with NNR that definitions are unclear and can lead to wrong conclusions. I find the Data gap/ limitation analysis useful and necessary. But the report needs to reflect that also this report and the reports from where conclusions are extracted also depend on poor definitions. -Higher and lower intake of red meat is often not defined in this report - Processing is not defined properly in this report and many reports from where information is extracted. In our time it may reflect both additives and type and degree of unit processing (like heating, drying etc). Non consistent presentation. - To me the comments throughout the chapter on meat and CVD are confusing and pull away from NNR's early conclusion under Part 5: Health Outcomes.. Pls have a look. Mechanism I understand the motivation for this chapter. But again, it is very complicated as some presumed toxic components are induces by unit processes of protein rich matrixes, and others are affected by additives. Chemical components that are endogenous to fresh meat may be a starting point but remember that concentrations are relevant. The intake ratio between pork meat: beef meat intake can clearly influence the intake of components like Neu5Gc.		

		In concluding, I appreciate the large amount of work done to produce this chapter, but do not forget that your task is to provide conclusions regarding the Nordic/ Balkan region where the limited amount of research and the lack of harmonized definition makes indicating evidence difficult.		
Gudrun Haglund-Eriksson	Bengtstorp Lantbruk	Jag tycker inte det är av stor vikt att skriva om, men om ni vill så > absolut, annars kopiera och klistra in med ert eget namn (jag har Jag och min man Bengt Göran Eriksson, Bengtstorp Lantbruk önskar lämna kommentarer på kapitlet om köttprodukter, ett kapitel som jag tolkar är oroväckande vinklat och på flera områden är behäftat med bristande underlag för slutsatser och påståenden. Det saknas information om det faktum att kött är ett av de mest näringstäta livsmedlen och dess betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder), detta bör understrykas. I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även		Due to language, considered by the NNR Committee

		djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas. Och den som vill kan också skriva i nästa ruta: För detaljerade synpunkter ställer jag mig bakom de inspel som lämnats via Svenskt Kött.		
Dorthe Gill Brudvik / Ingvill Størksen	Coop Norge SA	- The chapter on meat and meat products has a strong focus on the negative effects on health and needs to balance the harms and benefits of consumptions. This includes the risk on health outcomes in certain groups of the populations when reducing or omitting meat/meat products from the diet regarding the robustness of restrictive diets. The chapter should thus include the discussion around that the robustness of restrictive diets depends on knowledge, resources, and careful supplementation – as noted in the NNR2022 chapter on B12 (1). - The inconsistency in studies on meat intake and health outcomes, and the fact that the strength of evidence is regarded as limited, speaks against strong recommendations. This is also described in Lescinsky et al (2), who summarized "While there is some evidence	- The nutritional benefits on health for eating meat/meat products or the potential harm on health in excluding/reducing them in the diet are not discussed and should be included. E.g. and not limited to: o Without vitamin B12 found naturally only in meat, children can suffer neurological damage and developmental delays (5). o Nutrients is especially important for preschool-aged children and women of reproductive age, which are found to have micronutrient deficiencies: § "We estimate that over half of preschool-aged children and two-thirds of non-pregnant women of reproductive age worldwide have micronutrient deficiencies. However, estimates are uncertain due to the scarcity of population-based micronutrient deficiency data (6)".	The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been listed (Supplementary table 1). Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association with meat and positive health outcomes. - The chapter is not about dietary patterns but meat intake. - Although the data is inconsistent for many outcomes, it is consistent for

		that eating unprocessed red meat is associated with increased risk of disease incidence and mortality, it is weak and insufficient to make stronger or more conclusive recommendations. More rigorous, well-powered research is needed to better understand and quantify the relationship between consumption of unprocessed red meat and chronic disease». The paper of Lescinsky should be considered in the chapter. - The wording in the mechanisms section reveals a biased point of view and is speculative, and should be edited accordingly. E.g: o Blood pressure: "(..) this does not necessarily exclude the POSSIBILITY of an effect of red meat on blood pressure over a long period or an effect by processed meat (..)" o Glycemia: "(..) this does not necessarily exclude the POSSIBILITY of a long-term effect by red meat or an effect by processed meat (..)" o Inflammation: "(..) IF, HOWEVER, IN THE FUTURE, a longer-term intervention was found to cause inflammation, one potential mechanism could be through a recently found compound Neu5Gc, which red meat contains high amounts, has been linked with systemic inflammation in mice (..)" - We question that the nutritionally aspects of meat, and their contribution with specific beneficial nutrients to health are not discussed, while in comparison, the NNR2022 chapter on vegetables, fruits and berries recognizes the nutrients found in these foods (3). Given the nutrient density of meat and	§ Norwegian Public Health report 2018 (7): • Nutritional deficiencies Children and adolescents require an extra amount of certain vitamins and minerals for their growth and development. Young women who are planning a pregnancy should have a good nutritional status to ensure healthy foetal development. Nutritional deficiencies are a problem for young women in particular: o The Tromsø study registered that the vitamin D status of 1 in 6 tested in the 15–18 year age group was so low as to be characterised as a deficiency (52). o A low intake of iodine, folate and iron was also registered in young women (53;54). - The chapter should include a recognition that meat/meat products have been part of diets in most of the world for millenniums (8) – in the same regard that this is done in the NNR2022 Chapter on Nuts and seeds, page 1: o "(..) Nuts and seeds have been part of diets in most of the world for millenniums, and also consumed in the Nordic and Baltic countries for centuries. Consumption of nuts and seeds is linked with various health outcomes". - Research (9) conducted shows that ordinary meats are not interchangeable with plant-based meat, but should rather be viewed as complementary in terms of provided nutrients, this needs to be discussed: o "(..) Despite apparent similarities based on Nutrition Facts panels, our metabolomics analysis found that metabolite abundances between the plant-based meat alternative and grass-fed ground beef differed by 90%. (..) Large differences in metabolites within various nutrient classes (e.g., amino acids, dipeptides, vitamins, phenols, tocopherols,	others. This has now been clarified by adding a table of strength of evidence for each meat type and outcome (Table 2). - We are also aware of the study by Lescinsky et al. 2022, which we have now mentioned in the text. - The wordings regarding evidence from RCTs have been revised. - The list of nutrients of which meat is a good source has been complemented with some nutrients. - Absorption of iron has now been explained.

		that some nutrients are exclusively found in meat (4) or are more bioavailable, the chapter on meat should include a discussion of meat and its specific beneficial nutrients to health. References 1. NNR2022 Chapter on B12, page 2. Introduction: "(..) Vegetarian and vegan diets are increasingly popular in Western countries, particularly among young women (3). Although these diets are considered nutritionally adequate and healthy when appropriately planned, substantial amount of nutritional knowledge is needed to achieve an optimal vegetarian diet with regard to vitamin B12 intake and status. However, this happens not to be the case, even among well [1] educated people and a higher prevalence of vitamin B12 deficiency in the Nordic population might be expected (4)". 2. Lescinsky H, Afshin A, Ashbaugh C, et al. unprocessed red meat: a Burden of Proof study. 2022;28(October). doi:10.1038/s41591-022-01968-z 3. NNR2022. Chapter on vegetable, fruits and berries. Page 2: "(..) Although vegetables, fruits and berries comprise a heterogenic food group from a nutritional point of view, they are commonly high in water, low in energy, contain numerous nutrients, and good sources of fibre, vitamin C, vitamin E, vitamin K, folate, and potassium. They also contain a vast range of other bioactive compounds, such as phytochemicals, and the synergistic effects of these are still not fully understood (3, 4)". And the introduction goes even further in highlighting the benefits with the micro and macronutrients of vegetables, fruits and berries". This continues for a whole page.	and fatty acids) with physiological, anti-inflammatory, and/or immunomodulatory roles indicate that these products should not be viewed as truly nutritionally interchangeable, but could be viewed as complementary in terms of provided nutrients. The new information we provide is important for making informed decisions by consumers and health professionals. It cannot be determined from our data if either source is healthier to consume". References 5. https://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/ 6. Gretchen A Stevens, Ty Beal, Mduduzi N N Mbuya, Hanqi Luo, Lynnette M Neufeld: Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys. The Lancet Global Health. Volume 10, Issue 11, November 2022, Pages e1590-e1599 7. https://www.fhi.no/contentassets/d021a759c5ed48ae85fffc94e35785cf/health_status_in_norway_2018.pdf , page 34. 8. Neil J. Mann: A brief history of meat in the human diet and current health implications. Meat Science. Volume 144, October 2018, Pages 169-179 9. Stephan van Vliet, James R Bain, Michael J Muehlbauer, Frederick D Provenza, Scott L Kronberg, Carl F Pieper, Kim M Huffman: A metabolomics comparison of plant-based meat and grass-fed meat indicates large nutritional differences despite comparable	

		4. Suzanne P. Murphy, Lindsay H. Allen: Nutritional Importance of Animal Source Foods. The Journal of Nutrition, Vol. 133, Iss...	Nutrition Facts panels. 2021 Jul 5;11(1):13828. doi: 10.1038/s41598-021-93100-3.	
Mathias Ytterdahl	Animalia		Abstract Last sentence: "There was also suggestive evidence that red and processed meat are risk factors for several other diseases and that poultry intake is associated with a lower risk of some diseases." The last sentence is ambiguous. Limited evidence or no evidence was found for some of the diseases the authors reviewed and only evidence for CRC and not cancer as a whole. The article focuses on the negative outcomes of meat consumption , but no evidence of the benefit of meat consumption is included, eg. the effect on iron deficiency which is a reality also in Western countries. Introduction Page 1 line 6: "Red meat is a good source of, e.g., protein and essential amino acids, vitamins B1 and B2, iron, and zinc but also a notable source of unfavorable saturated fatty acids." Red meat is also a source of B12 and B6 in the Norwegian diet. In addition, meat is a major contributor of unsaturated fats. This should also be considered. Data gaps Page 10 line 4: "In other words, if the intake of meat is reduced, what (protein-containing) foods should be added to the diet". We suggest the chapter authors consider what food high in bioavailable iron to include in the diet to prevent the incidence of anemia specifically in females of child bearing age	The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been listed. Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association between meat and positive health outcomes. - The list of nutrients of which meat as a good source has been complemented with some nutrients.

Eli Gjerlaug Enger	NORSVIN AS	Norsvin supports the scientific input from Animalia / MatPrat		
Malén Gudbrandsgard	MatPrat	The authors state that the aim of this chapter is to describe the totality of evidence for the role of meat intake for health-related outcomes. According to the «Instructions to authors of chapter» published on the NNR website, «health outcomes» are synonymous to negative health outcomes or effects in terms of non-communicable diseases. The chapter on meat has a major focus on negative effects on health and lacks the positive impacts of meat on health. However, according to the chapter, the evidence is limited, and the quality of the SRs is on average critically low. This is recently described in Lescinsky et al 1 who concluded that "While there is some evidence that eating unprocessed red meat is associated with increased risk of disease incidence and mortality, it is weak and insufficient to make stronger or more conclusive recommendations. More rigorous, well-powered research is needed to better understand and quantify the relationship between consumption of unprocessed red meat and chronic disease.» They also found that the heterogeneity was wide: from 0-200 g per day. Vernooij et al concluded that "Low- or very-low-certainty evidence suggests that dietary patterns with less red and processed meat intake may result in very small reductions in adverse cardiometabolic and cancer outcomes"2. We ask the authors of the chapter to include both the Lescinsky and Vernooij papers and consider their findings. Even though some evidence shows that meat		The review concentrates on the associations between meat and disease outcomes and the literature search has been done accordingly. In the literature search, the chronic disease outcomes were not limited. The excluded studies have been listed. Food can have either beneficial or adverse impacts on chronic diseases. Both types of studies would appear in our literature search. Based on the search results, there was little evidence suggesting association between meat and positive health outcomes. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - Although the data is inconsistent for many outcomes, it is consistent for others. This has now been clarified by adding a table of strength of evidence for each meat type and outcome. - We are aware of the study by Lescinsky et al. 2022, which we have now mentioned in the text. - The chapter is not about dietary patterns, which is why Vernooij et al. is not included. - The de novo systematic review on poultry meat intake and CVD outcomes and type 2 diabetes has now been added.

		and meat products may be risk factors for several diseases, evidence on poultry intake is associated with lower risk of some diseases, and we question why this is not highlighted. Also, the SR on poultry is not finalized and added to the chapter on meat. Poultry makes up a substantial proportion of meat consumption in Norway. Thus, it is challenging to comment on this chapter as we do not know the outcome of the SR and how this could impact the overall consumption on meat in relation to health. One clear weakness in the literature, is the definition of meat and processed meat3. Meat and/or processed meat is often treated as homogenous groups respectively4–6. The nutritional content of different types of unprocessed meat is not alike. The content of fat differs between 2-40% depending on type of meat and cut. Thus, a clear emphasis on the lack of separating the different types of meats and types of processing, should be added to the chapter. Meat is a good source of several essential nutrients and contributes to 27 % of protein, 29 % of B12, 20 % of iron, 25 % of polyunsaturated fats and 11 % of monounsaturated fats in the Norwegian diet7. Meat contains high quality proteins, and B vitamins, such as niacin and vitamin B6, and can be a good source of zinc, selenium and iron. Iron from foods of animal origin, such as meat, is more bioavailable than iron found in plant foods. Therefore, consuming meat, and especially red meat, can be important for maintaining a healthy iron status. This is		- The meat type issue has been mentioned in Data gaps.

		especially important for young girls and women of childbearing age, because they need significantly more iron than men due to blood loss associated with menstruation. Thus, meat has an important nutritional value in the Norwegian diet. We ask the authors to take positive health aspects of meat into the consideration in the chapter. 1. Lescinsky H, Afshin A, Ashbaugh C, et al. unprocessed red meat : a Burden of Proof study. 2022;28(October). doi:10.1038/s41591-022-01968-z 2. Vernooij RWM, Zeraatkar D, Han MA, et al. Patterns of Red and Processed Meat Consumption and Risk for Cardiometabolic and Cancer Outcomes. Ann Intern Med. 2019;(15). doi:10.7326/m19-1583 3. Oostindjer M, Alexander J, Amdam G V, et al. The role of red and processed meat in colorectal cancer development: a perspective. Meat Sci. 2014;97(4):583-596. doi:10.1016/j.meatsci.2014.02.011 4. Mejborn H, Hansen M, Biltoft-Jensen A, Christensen T, Ygil KH, Olesen PT. Sugges…		
Anna Törnfelt	Ollajvs Gård	Jag önskar lämna kommentarer på kapitlet om köttprodukter, ett kapitel som jag tolkar är oroväckande vinklat och på flera områden är behäftat med bristande underlag för slutsatser och påståenden. Det saknas information om det faktum att kött är ett av de mest näringstäta livsmedlen och dess	För detaljerade synpunkter ställer jag mig bakom de inspel som lämnats via Svenskt Kött.	Due to language, considered by the NNR Committee

		betydelse för grupper som är särskilt utsatta när det kommer till att få i sig och tillgodogöra sig tillräckligt av nödvändiga näringsämnen (barn, äldre och svagare, kvinnor i fertil ålder), detta bör understrykas. I sammanhanget behöver även köttfaktorns positiva bidrag till näringsupptaget från vegetabilier nämnas. Kapitlets fokus är starkt begränsat. Författarna bör ha ett holistiskt synsätt där även djurhållningens betydelse för en långsiktigt hållbar livsmedelsproduktion i Norden och Baltikum, inklusive dess bidrag till ekosystemtjänster och självförsörjning, lyfts fram. Även den snabba utveckling som sker i branschen för att ytterligare minska påverkan på miljö och klimat, bl a genom metanreducerande foder, minskat svinn och bidrag till en förbättrad cirkulär ekonomi inklusive mer bioenergi behöver beaktas.		
Oda Smeby Christensen	Geno SA	Geno SA supports the consultation inputs from Animalia AS.		
Johanna Eén	Svenskt Kött	Dear NNR Committee, Please find below Svenskt Kötts comments on the chapter on Meat and Meat Products. The focus of the chapter is very limited. Svenskt Kött would like to encourage the authors to have a more holistic approach and to highlight the nutritional contribution of meat, as well as the importance of animal husbandry for long-term sustainable food production, including contribution to ecosystem services and self-sufficiency in the Nordic countries. The rapid development taking place in the industry to further reduce the impact on the environment and climate, including methane-reducing feed, reduced wastage and contributions to an improved	There are more facts and reports to consider. In the Lancet, the article "The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017 (2019)" underlines that a diet low in calcium, milk and dietary fibers, as well as low in physical activity and obesity, are significant risk factors linked to colorectal cancer (as are alcohol and smoking). I diet high in red meat and in processed meat, respectively, were associated with the lowest risks considered in the report. Please also consider C.J. L Murray et al. "The Burden of Proof: Assessing the evidence of	This text is about the association between meat intake and health outcomes, not with environmental impacts. - The list of nutrients of which meat as a good source has been complemented with some nutrients. - Absorption of iron has now been explained. - While the difference between absolute and relative risk is important, it has not been reported in most of the reviewed studies. - The report of the Global Burden of Disease is not in contradict with this text.

		circular economy and an increased bioenergy production needs to be considered. It is of outmost importance to clearly describe and consider the differences regarding relative and absolute risk in the studies presented. Increased health risks associated with a diet high in red meat might as well be influenced by an unhealthy lifestyle with low physical activity and a low intake of dietary fibers, fruits and vegetables. Sufficient intake of nutrients found in high amounts in meat can reduce the risk of specific diagnoses, and a low intake of iron, zinc and vitamin B12, among others, is associated with severe physical and mental conditions. It is of general importance that the authors help the readers to draw relevant conclusions from the information in each chapter. It is positive that the authors underline the shortcomings of the material (differences in the definition of red meat, low quality of articles and the absence of comparable data from each country). The authors would as well need to report relevant facts that do not necessarily support their own thesis. Why do the authors choose not to include the studies that do not confirm a link between meat and cancer in the table? Have these studies not been considered in the chapter? It would be a questionable methodology, and it ought to be explained. The authors note that meat is a good source of thiamine (vitamin B1) and riboflavin (vitamin B2). Since active vitamin B12 is only found in animal food, it is particularly	risk" (2022); S. Mocellin et al, "Vitamin B6 and Cancer Risk: A Field Synopsis and Meta-Analysis" (2017); N. Smith et al, "Modeling the Contribution of Meat to Global Nutrient Availability" (2022); N. Smith et al, "Animal and plant-sourced nutrition: complementary not competitive" (2021); NEP Deutz et al, "Protein intake and exercise for optimal muscle function with aging: recommendations from the ESPEN Expert Group" (2014). The benefits of meat in terms of bioavailability ought to be highlighted. Please see C. Mayer Labba, "Nutritional limitations of a Green Protein Shift with Focus on Iron" (2022). In this context, the nutritional limitations of meat substitutes ought to be considered. Please see C. Mayer Labba, "Nutritional Composition and Estimated Iron and Zink Bioavailability of Meat Substitutes on the Swedish Market" (2022) and S. Bryngelsson et al, "Nutritional assessment of plant-based meat analogues on the Swedish Market (2022). Please also consider how meat and animal husbandry contribute to the environment (K. von Greyerz et al, "A large share of climate impacts of beef and dairy can be attributed to ecosystem services other than food production" [2022]).	- Confounding is common knowledge in nutritional sciences and has been considered when evaluating the evidence. - Answers to other comments can be found form previous aswers.

		remarkable that the authors do not mention vitamin B12. Meat's high content of iron as well as the benefits of heme iron should be emphasized, as should the differences in bioavailability between meat and plant-based foods. It is unfortunate and misleading when every described nutritional contribution of meat is followed by a comment about the food´s deficiency. This applies for example to the comments about saturated fatty acids, where there is also no distinction between the different types. The main focus of NNR is nutrition. The chapter on meat and meat products ought to highlight the nutritional benefits of meat in a varied and balanced diet, as well as emphasize food matrix and the meat factor's positive contribution to nutrient absorption from vegetables. Meat is one of the most nutrient-dense foods and its particular importance for vulnerable groups ought to be described.		
Monica Hunsberger	Göteborgs university	I think it's important that NNR focus on climate but that it doesn't go so far as to demonize meet. I studying nutritional Epidemiology and would argue that meat has a place in the Swedish diet but the type, source and processing should be considered. We should also consider the land trade offs but we should not lose sight of biodynamic farming or the synergic effects of good.		This chapter is about the association between meat intake and health/chronic disease outcomes, not about environmental impacts of meat.

8. Milk and dairy products

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comment from authors
Hanna de Ruyter	HUS	It would be advisable to avoid trusting studies which are sponsored by the dairy industry. There have been many research setups in which dairy consumption is unfairly compared to alternatives which are known to be harmful. If you compare cow's milk to sugary soda, you are bound to find a beneficial effect for dairy even if it doesn't exist. There is a review of current literature published by NEJM where they embraced the evidence and found no reason to recommend dairy consumption. Please take a look at it. The title is Milk and health. https://www.nejm.org/doi/full/10.1056/NEJMra1903547 It would also be advisable to recheck the nutritional values of plant-based milks which have been brought to the market instead of discharging them in one bulk. It is unprofessional. Summarized: your review is biased in favor of dairy. You have not looked at the evidence in a critical fashion. Dairy consumption should not be recommended in modern days.	See above	1) We have only included systematic reviews. The article by Willet is not a SR. 2) Plant-based dairy have been excluded.
Mikael Fogelholm	University of Helsinki	Overall a nice chapter. Would this need a brief paragraph summarizing the environmental aspects of dairy?	Table 2 in a good example of how the intakes in Nordic countries need to be summarized. Use this example when revising all other chapters. :) p. 8, summary: So how is this discrepancy between FBDG (no association between dairy and CVD) and nutrient guidelines (less SFA) explained/interpreted? How can we justify the recommendation of low-fat milk	1) Environmental aspects are included in seperate chapter. 2) The recommendations are set by the committee

			products? Can we just say that it is in line with meeting the nutrient recommendations for fat quality? And that in the cohort studies, the view has mostly been on finding the independent, (fully adjusted models) associations between dairy and the disease outcomes, and this may be different from looking at, e.g., fat substitutions? Would this, btw, imply that the recommendations for SFA in the diet could be higher, if dairy consumption is high? This is, however, perhaps more a theory, than a practical suggestion.	
Juha Lempiäinen	MD, PhD, neurologist (working as a private doctor in Terveystalo Pasila and as a researcher in University of Helsinki and HUCS)	This chapter needs to be updated. It should be mentioned that plant-based milks contain iodine and some of them have even more protein than in cow milk. It is also important to mention that plant-based milks can substitute cow milk and at least in developed countries they also should do that because they are healthier (for example because plant-based milks are not containing saturated fats, not increasing prostate and other cancer risk, not increasing fractures). Writers should also read a review article "Milk and Health" published in NEJM in 2020. https://www.nejm.org/doi/full/10.1056/NEJMra1903547?fbclid=IwAR1MFm7lwiFiiXbSTq3rii8Yau4L-czVfCbLnK7Izg1zyKJarILstXbx6bU "Cow's milk includes a complex combination of macronutrients, micronutrients, and growth-promoting factors that can contribute to human nutrition; however, all these nutrients can be obtained from other sources (as has been the case in many traditional societies with	Page 2. Conclusions should be changed so that they are in line with conclusions of a review article "Milk and Health" published in NEJM in 2020. https://www.nejm.org/doi/full/10.1056/NEJMra1903547?fbclid=IwAR1MFm7lwiFiiXbSTq3rii8Yau4L-czVfCbLnK7Izg1zyKJarILstXbx6bU Page 3. "Compared to milk, the plant-based milk (e.g., soy, oat, almond, rice and pea) have a low content of many micronutrients and protein . Currently, several plant-based milks fortified with calcium, vitamin B12, and vitamin D are available." It should be corrected that plant-based milks have even better content of many micronutrients and also protein. Also iodine should be mentioned. Page 5. Dairy and Cancer. It should be mentioned that dairy intake is also associated with higher risks of liver cancer, female breast cancer and, possibly, lymphoma.	1) Plant-based have been excluded; 2) The NEJM review is not a SR; 3) The article on dairy and cancer is not a SR; 4) We mention that it is not clearly related to weight, diabetes and CVD; 5) We mention the low evidence for dairy and fractures

		histori- cally low intakes of dairy products). For adults, the overall evidence does not support high dairy consumption for reduction of fractures, which has been a primary justification for current U.S. recommendations. Moreover, total dairy con- sumption has not been clearly related to weight control or to risks of diabetes and cardiovascular disease. High consumption of dairy foods is likely to increase the risks of prostate cancer and possibly endometrial cancer but reduce the risk of colorectal cancer. It is important to note that the reported health effects of dairy foods de- pend strongly on the specific foods or beverages towhichtheyarecompared;formanyoutcomes, dairy foods compare favorably with processed red meat or sugar-sweetened beverages but less favorably with plant-protein sources such as nuts. Furthermore, no clear benefit of consuming re- duced-fat dairy over whole dairy products has been established."	https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-022-02330-3?fbclid=IwARobjcv6USufzarkDfM4b2NpQzELW2YgMVIYoeUosLwgEreV-DrUgtrOl-Y Page 5. Dairy and risk of type 2 diabetes, overweight and obesity. Sould be mentioned that dairy con- sumption has not been clearly related to weight control or to risks of diabetes and cardiovascular disease. https://www.nejm.org/doi/full/10.1056/NEJMra1903547?fbclid=IwAR1MFm7lwiFiiXbSTq3rii8Yau4L-czVfCbLnK7Izg1zyKJarILstXbx6bU Page 6. Dairy and bone health. Sould be mentioned that the overall evidence does not support high dairy consumption for reduction of fractures, which has been a primary justification for current recommendations. https://www.nejm.org/doi/full/10.1056/NEJMra1903547?fbclid=IwAR1MFm7lwiFiiXbSTq3rii8Yau4L-czVfCbLnK7Izg1zyKJarILstXbx6bU	
Tanja Kalchenko	Physicians' and nutrition association Food for health	The chapter has not mentioned several important health outcomes, studies and summaries: PROSTATE CANCER - dairy increases not only the risk of getting prostate cancer, but also mortality from prostate cancer. The chapter does mention following: WCRF 2018 concludes with suggestive evidence that dairy increases the risk of prostate cancer. But the chapter does NOT mention that 1)---- dairy increases the risk of dying from prostate cancer, and 2----that those who exclude dairy	On page 1, in INTRODUCTION, I suggest that you write this before "Aim": "Dairy is major source of cholesterol and ruminant Trans fatty acids (TFA). Many population groups – those with risk factors for CBD and those with diabetes - should limit their intake of cholesterol." And then, I suggest citing your collegues from the Fat chapter in NNR 2022 - or writing nearly the same: "Trans fatty acids (TFA), regardless of source,	1) We only include SR and outcomes predefined by the NNR committee; 2) the TFA is described in the fat chapter; 3) We have not included data on comparing dairy with other foods; 4) No our aim to provide FBDG; 5) We exclude text on plant-based dairy

		products from their diet have a 35% lower risk of getting this form of cancer. 1)--Study from 2016, Lu et al, (Dairy products intake and cancer mortality risk: a meta-analysis of 11 population-based cohort studies. Nutr J. 2016;15:91.) concludes that prostate cancer mortality increased with increased intake of milk. Those who consumed the most milk had a 50% increased risk of dying from prostate cancer compared to those who consumed the least. 2)---People that do noet consume dairy, have a lower risk of PC: A prospective analysis of 472,377 participants in UK Biobank, 2022, showed a lower risk of prostate cancer among vegans and vegetarians. (Watling et al. . BMC Med 20, 73. https://doi.org/10.1186/s12916-022-02256-w https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-022-02256-w Diet without dairy (and without meat, eggs or fish) showed a statistically significant protection against the risk of prostate cancer, with a 35% lower risk with a vegan diet (HR: 0.65). Yessenia Tantamango-Bartley, 2015. Are strict vegetarians protected against prostate cancer? Am J Clin Nutr. doi: 10.3945/ajcn.114.106450 MORTALITY: Higher intake of dairy increases risk of premature mortality 1 ---Ding M, Li J, Qi L, et al. Associations of dairy intake with risk of mortality in women and	impairs blood lipid profile compared to unsaturated fat." "The intake of TFA should be as low as possible. Importantly, this applies for both natural TFA in dairy products as well as industrially produced, partially hydrogenated fats. Typically, a reduction in SFA intake also leads to reduced intake of both TFA and dietary cholesterol." "Today the populations in Nordic and Baltic countries consume much more saturated fat then the recommendations (which is below 10 % of total energy intake). In RESULTS I suggest writing following: "Evidence on health effects/outcomes of cow milk and other dairy foods depends strongly on the foods to which dairy are compared. On many outcomes, dairy foods compare favorably with processed meats, eggs or beverages with added sugar. But dairy is less favorably when compared with nuts, legumes, fruits, vegetables and whole grains. " "It is also evidence that partially replacement of saturated fatty acids has favourable health outcomes." As a CONCLUSION, I suggest writing following: "Some amount of dairy products may be included in the diet. AT the same time it is an advantage to reduce the total intake of dairy, especially non-fermented milk, cheese and	

		men: three prospective cohort studies. BMJ. 2019;27:367:l6204. https://www.bmj.com/content/367/bmj.l6204) 217,755 participants: 168,153 women and 49,602 men (Nurses' Health Study, Nurses' Health Study II and Health Professionals Follow-up Study) over 32 years. The study shows that those who had the highest consumption of dairy products had the highest risk of premature death, and the highest risk of dying from a heart attack. Those who replaced dairy products with legumes (beans, lentils, peas, tofu), nuts or whole grains had a reduced risk of early death. But when dairy products were replaced with red meat and meat products, the risk increased. Replacing meat with dairy products may explain why some studies show a reduced risk of early death with increased consumption of dairy products. 2. ---2,7 times higher risk of dying with high dairy consumption. Michaëlsson, Wolk et al, 2017, https://doi.org/10.1093/aje/kww124 61,420 women in a Swedish cohort, 36,714 women from a second survey (1997) of this cohort, and 45,280 Swedish men. Quoted: "Compared with low consumption of milk (<1 glass/day) and high consumption of fruits/vegetables (≥5 servings/day), time-updated information revealed an adjusted hazard ratio for death of 2.79 (95% confidence interval (CI): 2.42, 3.21) in women who	butter, and replace them with healthy plant foods – nuts, legumes, whole grains, fruits, berries and vegetables, and with plant milks." "Although dairy is a source of calcium and iodine, these nutrients can be easily obtained from other - and healthy - sources. Cow's milk contains calcium and iodine because the feed is artificially enriched with these, just like with many other nutrients. Fortified plant milks and other plant dairy alternatives - for example oat milk an oat yoghurt, contains (or can contain) the same amount of iodine and calsium as cow-milk. Several types of cabbage, especially kale, white beans and variaty of other plant foods can can cover the need of calsium and protein." I suggest you remove your current conclusion. Sources: Ding M, Li J, Qi L, et al. Associations of dairy intake with risk of mortality in women and men: three prospective cohort studies. BMJ. 2019;27:367:l6204. https://www.bmj.com/content/367/bmj.l6204 Willett WC, Ludwig DS. Milk and health. N Engl J Med. 2020;382:644-654. Song M, Fung TT, Hu FB, et al. Association of animal and plant protein intake with all-cause and cause-specific mortality. JAMA Intern Med 2016;176:1453-1463. Chen M, Sun Q, Giovannucci E, et al. Dairy	

		consumed ≥3 glasses of milk/day and <1 serving/day of fruit/vegetables and a hazard ratio of 1.60 (95% CI: 1.40, 1.82) in women who consumed the same amount of milk but ≥5 servings/day of fruits/vegetables." ACNE: I suggest mentioning that dairy products increase the risk of getting acne, based on following reviews: 1. Dairy intake and acne development: A meta-analysis of observational studies. Aghasi, Mohadeseh et al. Clinical Nutrition, Volume 38, Issue 3, 1067 – 1075 2. Juhl, Christian R et al. "Dairy Intake and Acne Vulgaris: A Systematic Review and Meta-Analysis of 78,529 Children, Adolescents, and Young Adults." Nutrients vol. 10,8 1049. 9 Aug. 2018, doi:10.3390/nu10081049 Several doctors, i.e. in Norway, encourage trying a dairy-free diet to treat acne, based on the evidence.	consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis. BMC Med 2014;12:215-215. Gijsbers L, Ding EL, Malik VS, de Goede J, Geleijnse JM, Soedamah-Muthu SS. Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. Am J Clin Nutr 2016;103:1111-1124. Bergholdt HK, Nordestgaard BG, Ellervik C. Milk intake is not associated with low risk of diabetes or overweight-obesity: a Mendelian randomization study in 97,811 Danish individuals. Am J Clin Nutr 2015;102:487-496. Karl Michaëlsson, Alicja Wolk, Håkan Melhus, Liisa Byberg, Milk, Fruit and Vegetable, and Total Antioxidant Intakes in Relation to Mortality Rates: Cohort Studies in Women and Men, American Journal of Epidemiology, Volume 185, Issue 5, 1 March 2017, Pages 345–361, https://doi.org/10.1093/aje/kww124 Karl Michaëlsson, Alicja Wolk et al. Milk intake and risk of mortality and fractures in women and men: cohort studies. BMJ 2014;349:g6015 doi: https://doi.org/10.1136/bmj.g6015	
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc)	Finnish Vegan Association	Possible adverse effects of milk are mainly ignored. It is noteworthy that conclusions in this chapter differ somewhat from an article published in NEJM in 2020 (Willet WC, Ludwig DS. Milk and health. N Engl Med 2020;382:644.54). Some points about this NEMJ article, which would be relevant to be	page 2. It is not true that dairy should be included into the daily diet, neither the argument, that plant-based milk alternatives couldn't substitute dairy products. All nutrients found in milk can obtained from other sources, for example from plant-based milk alternatives. In many food guides plant-	1) Willett et al is not a SR. 2) We mention the inconsistent evidence on fractures 3) We report the limited evidence on prostate cancer 4) We do not compare with other foods 5) we describe the weak association

		included in this NNR chapter: - Growth velocity and greater attained height, promoted by milk, have both risk and benefits. - The overall evidence does not support high dairy consumption for reduction of fractures. - High consumption of dairy foods is likely to increase the risk of prostate cancer and possibly endometrial cancer. - It is important to note that the reported health effects of dairy foods depend strongly on the specific foods or beverages to which they are compared. For many outcomes dairy foods compare favorably with processed red meat or sugar-sweetened beverages but less favorably with plant-protein sources such as nuts. - The findings of prospective cohort studies and randomized trials do not show clear effects of milk intake on body weight in children or adults. - In a large meta-analysis, dairy consumption was not associated (or were only weakly associated) with lower risk type 2 diabetes. Chen M, Sun Q, Giovannucci B et al. Dairy consumption and the risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis. BMJ Med 2014;12:215. We also think that following large cohort studies (some of these are Swedish), should be included in this NNR chapter: Feskanich D, Bischoff-Ferrari HA, Frazier L, Willet WC. Milk consumption during teenage years and risk of hip fractures in older adults. JAMA Pediatrics 2014;168:54-60. Kakkoura, M.G., Du, H., Guo, Y. et al. Dairy consumption and risks of total and site-specific cancers in Chinese adults: an 11-year prospective study of 0.5 million people. BMC	bases milk alternatives are already mentioned as an alternative for dairy, for example in US dairy group include fortified so milk and yogurt (https://www.myplate.gov/eat-healthy/dairy.) See also Australian food guide: https://www.eatforhealth.gov.au/guidelines/australian-guide-healthy-eating and Canadian food guide (in where there is no more dairy group at all): https://food-guide.canada.ca/en/guidelines/ page 3 and 9. Nutrient content of plant-based milk alternatives is not up to date in this. Soy milk contain as much protein as cow's milk (about 3 g/100 g). In other plant-based milk alternatives, like in oat, rice, and almond milk the protein content is lower. But most plant-based milk alternatives are nowadays fortified not only with calcium, vitamin B12 and vitamin D, but also with riboflavin and (oat milks) with iodine. page 8. A chapter "Bone health" is lacking all references. Is this a purpose? page 12. It looks like the authors of references 12 and 19 are missing.	with overweight 6) We only include SR; 7) We have changed the sentence "that dairy should be included in a daily diet 8) We have included reference for mechanisms on bone health have been added 9) Ref 11 and 19 have been updated

		Med 2022:20,134. https://doi.org/10.1186/s12916-022-02330-3 Michaelsson K, Wolk A, Langenskiöld S, Basu S, Lemming EW, Melhus H et al. Milk intake and risk of mortality and fractures in woman and men: cohort studies. BMJ 2014;349:g6015. Orlich MJ, Mashchak AD, Jaceldo-Siegl K, Utt JT, Knutsen SF, Sveen LE, Fraser GE. Dairy foods, calcium intakes, and risk of incident prostate cancer in Adventist Health Study-2. Am J Clin Nutr. 2022:4;116(2):314-324. doi: 10.1093/ajcn/nqac093. Tognon G, Nilsson LM, Shungin D, Lissner L, Jansson JH, Renström F et al. Nonfermented milk and other dairy products: associations with all-cause mortality. American Journal of Clinical Nutrition 2017;105:1502-11.		
Armando Perez-Cueto	Umeå University	Allergy to milk should be considered in the recommendations, as it has been reported to affect 6% of EU people, and that independently of the marker, it is higher in Northern Europe (PMID: 24816523). This is missing from the current document. In the document, authors should underscore that in general the evidence favouring the healthiness of milk and dairy is suggestive (moderate, weak or null) e.g. PMID: 32053300; PMID: 33964859). Or conclude each section assessing the strength of the evidence they found thus far. (see below). In the recommendations, authors may want to add that future studies should be more comprehensive, and for the sake of consumers, compare the health effects of dairy vs plant-based alternatives also in the Nordic	On strength of the evidence: . E.g. on page 5 on cardiovascular disease or riks factors, there is not a statement of the strength of the evidence; a bit further the phrase "there is some evidence …" appears on page 6 (on bone health), but the reader cannot see whether this is this strong, weak, or moderate. When it comes to plant-based dairy alternatives, the omission of soy (in page 9) can be misleading (PMID: 32095830). There is plenty of evidence that soy milk has beneficial effects on health, both in the short and the long-term (PMID: 27886135; PMID: 29304010; PMID: 33390391; PMID: 32418173; PMID: 36789932; PMID: 36678260; PMID: 36233223). Therefore, all plant-based dairy alternatives should not be treated in bulk, as if almond, pea, soy and rice drinks were the	1) We do ot take allergy into consideration; 2) We did not assess the strength of evidence individually in all the articles from the search but main focus was put on the high quality SR; 3) We have added that further studies should examine dairy vs plants-based dairy in the knowledge gap 4) We have excluded text on plant-based 5) NNR committee set the FBDG

		populations, so that the evidence does not rely only on studies performed elsewhere.	same (PMID: 36586264). Particularly when it comes to dealing with allergy (PMID: 24816523) or environmental concerns (PMID: 36615871; PMID: 34699813; PMID: 36341862), it is important to provide a honest account of the alternatives available to the mainstream consumer. It is also noteworthy that consumers are preferring plant-based alternatives, not only on basis of health or sustainability, but also on ethical grounds (PMID: 33069414; PMID: 36341862). The guidelines should be therefore formulated in a more inclusive manner, so that it will embrace all citizens and all dietary patterns. Furthermore, NNR should provide adequate recommendations to people choosing different dietary lifestyles (PMID: 35959711), considering that obtention of nutrients is possible without animal sourced foods, and hence ensuring adequate nutrient status in vegans, instead of simply ruling out the right of people to choose their lifestyles according to their beliefs PMID: 35787403; PMID: 35756214; PMID: 33487780). On cancer (page 5), authors may want to indicate that the recommendations are in the context of societies with high consumption of milk and dairy, and that such levels have been shown detrimental in other humans (PMID: 35513801). In the recommendations (page 8), authors focus on the skimmed dairy products, however, this is in opposition to a recent review & statement by Prof. Willett from Harvard University and lead Nutrition Epidemiologist, who suggest: Quote	

			"Pending additional research, guidelines for milk and equivalent dairy foods ideally should designate an acceptable intake (such as 0 to 2 servings per day for adults), deemphasize reduced-fat milk as preferable to whole milk, and discourage consumption of sugar-sweetened dairy foods in populations with high rates of overweight and obesity." (PMID: 32053300). Authors may want to indicate/discuss that there is not universal consensus? This is also important as NNR are trustworthy and should help consumers to navigate the cacophony of conflicting information about the healthiness of foods. Moreover, authors should actually encourage future studies comparing health outcomes between types of milk, not only between milks with different fat content in the same category (e.g. skimmed vs full fat), but also e.g. soy-milk vs cow-milk (PMID: 32095830), and comparing levels of intake from very low to very high (PMID: 35513801) as well. Authors may want to indicate that the use of biomarkers and genetic markers should become the golden standard.	
Department of Health	Oslo New University College	Request to omit the specification for low-fat dairy products.	The recommendation of low-fat dairy is assumed to lower the risk of ASCVD, due to the cholesterol elevating effect of intake of milk fat (butter) shown in RCTs, however, when measuring hard health outcomes these associations do not show up in a consistent manner (1). In the "Dietary Position Statement" from the Australian Heart Foundation, the specific recommendation to choose low-fat dairy for	1) we do not set the FBDG, but we do not agree that full fat dairy products are more sustainable and should be recommended due to less processing than low-fat alternatives. The nutrient including fat composition is most important.

			the healthy population has been omitted due to lack of consistent evidence (2). Also, with the inclusion of sustainability in NNR 2022, we stress that whole foods, like full-fat dairy products, generally provide more energy and require less processing, and are hence sustainable food options. When removing fats from dairy products, the low-fat dairy products tend to be more processed (i.e. yoghurt, flavoured milk). Recent evidence suggests that ultra-processed foods (UPF) are linked with several NCDs (3), as emphasized in the NNR2022 chapter on UPF. Also, the dietary _context_ plays an important role. Accordingly, as referred in the Australian Heart Foundation statement, a trial that included 'full-fat' dairy in a DASH eating pattern resulted in similar blood pressure reduction to 'low-fat' dairy, with no adverse impacts on lipid profile (4). Updated dietary advice regarding dairy fat should apply to the healthy population in general. For children, adults, and the aging population we suggest that the dietary recommendations should include full-fat products including yoghurt, milk and cheese. Especially for children, full-fat dairy products may be of importance to cover their nutritional needs. In the drafted chapter NNR2022 we find that the role of milk and dairy in children's diet is not adequately addressed. The National Health Service in Britain advice	

			against skimmed or fat-free dairy products for children up to 5 years old to ensure the intake of calories and essential vitamins. For children up till 2 years old full-fat dairy products are recommended (5). Some cross-sectional studies also suggest that dietary fat is positively associated with the absorption of calcium (6). Studies are also showing that consumption of full-fat dairy products may protect against obesity in children (7), (8). Current evidence does not support a causal relationship between full fat dairy and ASCVD or obesity. We warn against issuing strong recommendations based on weak epidemiologic evidence. Reduced fat dairy products should not be recommended over full fat products for the healthy population. References: 1. Bonthuis M, Hughes MCB, Ibiebele TI, Green AC, van der Pols JC. Dairy consumption and patterns of mortality of Australian adults. Eur J Clin Nutr. 2010 Jun;64(6):569–77. 2. Nutrition_Position_Statement_-_DAIRY.pdf [Internet]. [cited 2023 March 7]. Available from: https://www.heartfoundation.org.au/getmedia/54b5c4af-d1ba-40aa-ab08-b7c7ac41b8e9/Nutrition_Position_Statement_-_DAIRY.pdf 3. FAO. Ultra-processed foods, diet quality, and health using the NOVA classification system	

			http://www.fao.org/3/ca5644en/ca5644en.pdf 4. Chiu S, Bergeron N, Williams PT, Bray GA, Sutherland B, Krauss RM. Comparison of the DASH (Dietary Approaches to Stop Hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: a randomized controlled trial. Am J Clin Nutr. 2016 Feb;103(2):341–7. 5. Dairy and alternatives in your diet [Internet]. nhs.uk. 2018 https://www.nhs.uk/live-well/eat-well/milk-and-dairy-nutrition/ 6. Bandali E, Wang Y, Lan Y, Rogers MA, Shapses SA. The influence of dietary fat and intestinal pH on calcium bioaccessibility: an in vitro study. Food Funct. 2018 Mar 1;9(3):1809-1815. 7. Beck AL, Heyman M, Chao C, Wojcicki J. Full fat milk consumption protects against severe childhood obesity in Latinos. Prev Med Rep. 2017 Dec;8:1–5. 8. Scharf RJ, Demmer RT, DeBoer MD. Longitudinal evaluation of milk type consumed and weight status in preschoolers. Arch Dis Child. 2013 May;98(5):335–40.	
Anna-Lena Klapp	ProVeg International	Even though cow's milk is a good source of calcium, it is necessary to mention that there are equivalent other sources of calcium. People can cover their calcium needs with calcium-rich mineral water, green leafy vegetables, or calcium-fortified plant milk. Note that the calcium bioavailability of certain green leafy	1) On page 2, the authors write: " Intake of low-fat milk or dairy products are important dietary sources of calcium and iodine and should be included in the daily diet." Please provide evidence for the statement that low-fat milk or dairy products should be	We have excluded the text on plant-based dairy 2) we have modified the sentence on important sources 3) we do not compare to other foods

		vegetables such as kale, broccoli, and turnip greens is even higher than cow's milk (>50%) and dairy products (~30%). [1] Klapp et al. (2022) found that 39% of FBDGs world wide do not discuss plant-based calcium and therefore fail to meet the informational needs of people who can not or do not want to consume animal-based milk and dairy products. [2] The authors should clearly indicate, based on the evidence, that there are plenty of other foods that can be consumed to meet calcium needs. References: [1] Maciej S. Buchowski (2015): Calcium in the Context of Dietary Sources and Metabolism. Calcium: Chemistry, Analysis, Function and Effects, Victor R Preedy [2] Klapp, A.-L., N. Feil & A. Risius (2022): A Global Analysis of National Dietary Guidelines on Plant-Based Diets and Substitutions for Animal-Based Foods. Current Developments in Nutrition 6(11), nzac144. doi:10.1093/cdn/nzac144	included in the daily diet. We suggest the authors rewrite this sentence as follows: "Low-fat milk or dairy products can be an important source of calcium and iodine." There are many other good sources of calcium. The absorption of calcium is about 30% from dairy and fortified foods (e.g. orange juice, tofu, and soymilk) and nearly twice as high from certain leafy green vegetables. [1] 2) On page 8, the authors write: "Dairy products (especially milk, yoghurt and cheese) are important sources of calcium, protein, iodine and other important nutrients. To satisfy the need for calcium, six deciliters of milk alone or two to five deciliters a day of milk, depending on what other foods are included in the diet " Please provide information that there are also other important sources of calcium and that the absorption of calcium is about 30% from dairy and fortified foods (e.g. orange juice, tofu, and soymilk) and nearly twice as high from certain leafy green vegetables. [1] 3) On page 3, the authors write: "Compared to milk, the plant-based milk (e.g., soy, oat, almond, rice and pea) have a low content of many micronutrients and protein . Currently, several plant-based milks fortified with calcium, vitamin B12, and vitamin D are available." Please add a source for this claim and please also add information with evidence that	

			shows a broader picture. In general, each of the different varieties of plant-based milk has a unique nutritional profile and can also offer several health benefits. These can include being a source of plant-based protein, unsaturated fatty acids, fibre, and/or phytochemicals [2,3]. An increasing number of studies suggest that plant-based substitutes are nutrient-rich and can be used as an alternative to dairy milk through fortification [4]. Plant milk can enrich one's diet and add variety. Furthermore, soya drinks naturally contain a similar amount of protein to cow's milk and, due to the fact that many manufacturers fortify soya milk with calcium and other vitamins, it can be used as a nutritionally equivalent and sustainable alternative to cow's milk [5,6]. References: [1] Maciej S. Buchowski (2015): Calcium in the Context of Dietary Sources and Metabolism. Calcium: Chemistry, Analysis, Function and Effects, Victor R Preedy [2] Aydar, E. F., S. Tutuncu & B. Ozcelik (2020): Plant-based milk substitutes: Bioactive compounds, conventional and novel processes, bioavailability studies, and health effects. Journal of Functional Foods 70 103975. doi:10.1016/j.jff.2020.103975 [3] Craig W.J. & U. Fresán (2021): International Analysis of the Nutritional Content and a Review of Health Benefits of Non-Dairy Plant-Based Beverages. Nutrients. Mar 4;13(3):842. doi: 10.3390/nu13030842. PMID: 33806688; PMCID: PMC7999853. [4] Silva, B. Q. & S. Smetana (2022): Review on milk substitutes from an environmental	

			and nutritional point of view. Applied Food Research 2(1), 100105. doi:10.1016/j.afres.2022.100105 [5] Mäkinen O. E., V. Wanhalinna, E. Zannini et al. (2016): Foods for Special Dietary Needs: Non-dairy Plant-based Milk Substitutes and Fermented Dairy-type Products. Crit Rev Food Sci Nutr. 56, p.339–349 [6] Singh-Povel, C. M., M. P. van Gool, A. P. Gual Rojas, et al. (2022): Nutritional content, protein quantity, protein quality and carbon footprint of plant-based drinks and semi-skimmed milk in the Netherlands and Europe. Public Health Nutrition 25(5), 1416–1426. doi:10.1017/S1368980022000453	
Anna-Lena Klapp	ProVeg International	-	1) On page 6, the authors write: "The mendelian randomization analyses provide support for a causal association between lactosecontaining dairy (i.e milk) intake and higher BMI, lower LDL and HDL (13), higher waist circumference, lean body mass (17) and higher insulin (20)." Why do the authors not take this into account in their conclusion? 2) On page 9, the authors write: "For individuals who wish for plant-based dairy alternatives; it is important to note that some of the plant based dairy substitutes (e.g., almond, rice, oat) may contain similar amount of calcium but their overall other nutritional content is not similar to dairy milk and therefore cannot substitute dairy products." Please revise this statement. Soya drinks naturally contain a similar amount of protein	We have already taken the MR results into account in the final summary as part of the total evidence 2) We have excluded the text on plant-based dairy

			to cow's milk and, due to the fact that many manufacturers fortify soya milk with calcium and other vitamins, it can be used as a nutritionally equivalent and sustainable alternative to cow's milk [1,2]. Moreover, there is a clear trend in National Dietary Guidelines for the recommendation of fortified soya milk as an alternative to cow's milk [3]. Please also have a look at the Dietary Guidelines for Americans, 2020-2025 on page 33: "For individuals who choose dairy alternatives, fortified soy beverages (commonly known as "soy milk") and soy yogurt—which are fortified with calcium, vitamin A, and vitamin D—are included as part of the dairy group because they are similar to milk and yogurt based on nutrient composition and in their use in meals." [4] In addition, plant-based milk alternatives can be a healthy choice for people who are lactose intolerant or have a cow's milk allergy, as such products are often more easily digestible than cow's milk. Food-based dietary guidelines should take into account these specific dietary needs and aim to be as inclusive as possible in their recommendations. References: [1] Mäkinen O. E., V. Wanhalinna, E. Zannini et al. (2016): Foods for Special Dietary Needs: Non-dairy Plant-based Milk Substitutes and Fermented Dairy-type Products. Crit Rev Food Sci Nutr. 56, p.339–349 [2] Singh-Povel, C. M., M. P. van Gool, A. P. Gual Rojas, et al. (2022): Nutritional content, protein quantity, protein quality and carbon	

			footprint of plant-based drinks and semi-skimmed milk in the Netherlands and Europe. Public Health Nutrition 25(5), 1416–1426. doi:10.1017/S1368980022000453 [3] Klapp, A.-L., N. Feil & A. Risius (2022): A Global Analysis of National Dietary Guidelines on Plant-Based Diets and Substitutions for Animal-Based Foods. Current Developments in Nutrition 6(11), nzac144. doi:10.1093/cdn/nzac144 [4] https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf	
Berit Elkjær	Fredensborg Sundhedscenter	Tak for jeres gennemgang af mælk og mejeriprodukter. Undrer mig imidlertid over den meget konsekvente udmelding om plantedrikke uden at anføre, hvor heterogent et marked plantedrikkene er. Og uden åbenhed for, at nogle plantedrikke kan være et alternativ til mælk. Plantedrikke er et kraftigt voksende marked, hvilket medfører, at det kan give god mening at forholde sig nuanceret og konstruktivt til plantedrikke. Meningen er vel også, at NNR skal gå en mere klimavenlig vej uden fordomme. Der kommer hele tiden nye drikke på markedet, så en endelig vurdering af alle drikke er forståeligt ikke muligt. Men enkle konstruktive råd, der kan hjælpe folk til at have enkle redskaber til at vælge den for nuværende bedste plantedrik ville være en god hjælp. I den forbindelse må det vurderes, at specielt sojadrik, men også ærtedrik kan være gode	Tak for jeres gennemgang af mælk og mejeriprodukter. Undrer mig imidlertid over den meget konsekvente udmelding om plantedrikke uden at anføre, hvor heterogent et marked plantedrikkene er. Og uden åbenhed for, at nogle plantedrikke kan være et alternativ til mælk. Plantedrikke er et kraftigt voksende marked, hvilket medfører, at det kan give god mening at forholde sig nuanceret og konstruktivt til plantedrikke. Meningen er vel også, at NNR skal gå en mere klimavenlig vej uden fordomme. Der kommer hele tiden nye drikke på markedet, så en endelig vurdering af alle drikke er forståeligt ikke muligt. Men enkle konstruktive råd, der kan hjælpe folk til at have enkle redskaber til at vælge den for nuværende bedste plantedrik ville være en god hjælp. I den forbindelse må det vurderes, at specielt sojadrik, men også ærtedrik kan være gode klimavenlige alternativer til mælk. Sojadrik indeholder betydelig mere jern end	We have excluded the text on plant-based dairy

		klimavenlige alternativer til mælk. Sojadrik indeholder betydelig mere jern end almindeligt mælk. Proteinindhold, magnesium og selen indholdet er rigtig godt. Beriget sojadrik indeholder kalk, B12 og D-vitamin. Desuden indeholder sojadrikken phytosteroler, som ser ud til at have en mulig god sundhedsværdi. Det kan i denne sammenhæng anføres, at de amerikanske "Dietary Guidelines for Americans 2020-2025" (1) har beriget sojadrik med i deres anbefalinger på linje med mælk. Konlusion: Det giver mening ikke blot at betragte og vurdere alle plantedrikke som en enhed. De er meget forskellige og det må være vigtigt, at give enkle fordomsfrie råd om, hvilke typer plantedrik, der giver det bedste alternativ til mælk. 1: https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf	almindeligt mælk. Proteinindhold, magnesium og selen indholdet er rigtig godt. Beriget sojadrik indeholder kalk, B12 og D-vitamin. Desuden indeholder sojadrikken phytosteroler, som ser ud til at have en mulig god sundhedsværdi. Det kan i denne sammenhæng anføres, at de amerikanske "Dietary Guidelines for Americans 2020-2025" (1) har beriget sojadrik med i deres anbefalinger på linje med mælk. Konlusion: Det giver mening ikke blot at betragte og vurdere alle plantedrikke som en enhed. De er meget forskellige og det må være vigtigt, at give enkle fordomsfrie råd om, hvilke typer plantedrik, der giver det bedste alternativ til mælk. 1: https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf	
Marika Laaksonen	Fazer	We thank the NNR committee for the opportunity to comment on the draft of this chapter. The conclusions in the chapter on milk and dairy products strongly states that the overall nutritional value of plant-based milks is not similar to dairy milk and therefore cannot substitute dairy products. However, the background paper "Integrating sustainability into food based dietary guidelines" states clearly that for reduction of greenhouse gas emissions, red meat and dairy consumption need to be decreased and the share of plant-	The following sentences would need revision. "Compared to milk, the plant-based milk (e.g., soy, oat, almond, rice and pea) have a low content of many micronutrients and protein." In this context, it should also be discussed that protein intake in the Nordic countries is sufficient and therefore it can be asked whether high protein intake from this category is crucial and recommended. Especially if other plant protein sources are encouraged to be increased in the daily diet. In addition, some plant-based alternatives contain naturally same amount of protein as	We have excluded the text on plant-based dairy

		based foods, including those rich in protein, need to be increased. These two chapters are very conflicting and the wordings in the final recommendations should contain a clear consensus on how plant-based alternatives should be adopted in the recommended diet. The chapter concludes that most studies suggest that intake of milk and dairy is not associated with increased risk of cardiovascular diseases and there are some suggestions of inverse association. The strong statement that plant-based alternatives cannot substitute dairy products is justified only with reference to their limited nutritional value. However, the statement of the limited nutritional value of plant-based alternatives is partly misleading information when looking at the products currently in the Nordic market, since majority of them are fortified with vitamins D, B2 and B12 and calcium and even iodine and protein. Furthermore, the positive aspects on the nutritional value of plant-based alternatives should also be included in the comparison with milk and dairy products. Plant-based milk and dairy alternatives are for example better in fat quality. The evidence on the health outcomes of substituting milk and dairy products with plant-based alternatives is limiting, and there is no clear scientific consensus that increasing plant-based alternatives would not result in similar neutral or positive health outcomes as milk and dairy product consumption.	milk products (e.g. soy products) and some products are fortified with plant-based protein. "Currently, several plant-based milks fortified with calcium, vitamin B12, and vitamin D are available". Most fortified plant-based alternatives are fortified also with vitamin B2 and even iodine and protein in addition to calcium, vitamin B12 and vitamin D.	
Ellen Kathrine Ulleberg	Norwegian Dairy Council	The draft gives a good overview of the impact of milk and dairy products on the risk of different health outcomes. It is very good that the authors tap into the importance of the dairy matrix by stating that health effects are more	Page 3: Dairy products are mentioned as a major source of trans fat in countries where industrial trans fatty acids have been reduced. While this is true, the doses achievable by the consumption of the low	1) We have included the main nutrients of dairy products but not listed all nutrients. 2) The data on bone health are inconsistent 3) We were only

		than the sum of its parts, thus the health effect of different dairy products may not be explained by the presence or absence of certain compounds such as saturated fat in cheese. According to the authors the scientific literature suggest that the risk of cardiovascular disease (CVD) is not increased by consumption of milk and dairy products, and that especially cheese and yoghurt seem to be inversely association with some risk factors of cardiometabolic disease. Nevertheless, the authors conclude that due to the content of saturated fatty acids lean dairy products should be recommended over full-fat variants. We would like to argue that the dietary guidelines on dairy products should take the substantial evidence on dairy products and CVD and T2D into account and thereby give separate advice for different dairy products such as hard cheese and yoghurt. E.g. it is unnecessary to recommend low-fat cheese due to its content of saturated fat when cheese, regardless of fat content, has been found to be inversely associated with CVD. We would also suggest that the chapter should include a complete list of all the nutrients provided by milk and dairy products. Furthermore, it should be mentioned that milk and dairy products are one of the two main providers of iodine and calcium in the Norwegian diet (1). The section on dairy and bone health is surprisingly brief. While it is mentioned that milk and dairy products contain nutrients that are important for bone health, it is stated that the evidence for a beneficial effect of dairy	level of inherent ruminant trans fatty acids in dairy products alone has no adverse effect on coronary heart disease risk (1,2). Page 3: We ask that the authors add potassium and phosphorus to the list of nutrients of which milk and dairy products are good sources. Some fermented dairy products also contain vitamin K such as particular types of cheese and fermented milk (3-5). Page 3: Plant-based beverages are referred to as "plant milk". We ask that the authors align with The Codex General Standard for the Use of Dairy Terms where it is clearly stated that milk is a term reserved for "normal mammary secretion of milking animals obtained from one or more milkings" (6), and thus the authors should avoid naming drinks/beverages of plant origin, milk. In addition, it would be worth mentioning that plant drinks are rarely fortified with iodine (7,8), while at least in Norway milk and dairy products together with white fish provide the majority of iodine in the diet (9). Table 2 and related text on page 4 (DIET INTAKE IN NORDIC AND BALTIC COUNTRIES): The table should contain data for the intake of milk and dairy products among children. The year of the surveys should be included in the table. It should be clearly stated that these are old data and that the intake of especially milk is reduced drastically in most of the included countries (10). References	provided with intake among adults from the NNR committee.

		products on bone health for adults is limited. In a systematic review from 2021 the evidence for a positive role of dairy products in bone mineral density for older adults is graded moderate (2). In 2018 a meta-analysis found that yogurt and cheese consumption were associated with reduced hip fracture risk (3). Another meta-analysis found that the highest intakes of cheese and yogurt were associated with a reduced risk of fractures at any site for Europeans and Non-Hispanic whites from North America (4). A recent randomized controlled trial performed in sixty aged-care facilities with over 7000 residents over 2-years found a 33 % reduction in all fractures, a 46 % reduction in hip fractures, and an 11 % reduction in falls in the group that increased the intake of dairy products (5). Unfortunately, this study is too recent and has not yet been included in any meta-analyses. Ensuring sufficient supply of nutrients associated with bone health such as calcium and proteins as part of the daily diet for older adults could be a valuable measure to reduces the risk of falls and fractures. Milk and dairy products are good sources of calcium, protein, phosphorus, potassium, magnesium, zinc, and vitamin K2 (and vitamin D in the case of fortified dairy), all important for bone health. References 1. Carlsen MH et al. New Iodine Food Composition Database and Updated Calculations of Iodine Intake among Norwegians. Nutrients. 2018; 10(7):930. 2. Wallace TC et al. Dairy intake and bone health across the lifespan: a systematic review and expert narrative. Crit Rev Food Sci Nutr.	1. Uauy R et al., (2009). WHO Scientific update on trans fatty acids: summary and conclusions. EJCN 63, S68-75 2. Gayet-Boyer C et al, (2014) Is there a linear relationship between the dose of ruminant trans-fatty acids and cardiovascular risk markers in healthy subjects: results from a systematic review and meta-regression of randomised clinical trials. Br J Nutr.;112(12):1914-1922 3. Jensen MB et al. Content and Bioaccessibility of Vitamin K (Phylloquinone and Menaquinones) in Cheese. Foods. 2021; 10(12):2938. https://doi.org/10.3390/foods10122938 4. Walther B et al. Quantitative analysis of menaquinones (vitamin K2) in various types of cheese from Switzerland. Int. Dairy J. 2020, 112, 104853. 5. Lundberg HE et al. Effect on bone anabolic markers of daily cheese intake with and without vitamin K2: a randomised clinical trialBMJ Nutrition, Prevention & Health 2022;e000424. 6. Joint FAO/WHO Codex Alimentarius Commission. Codex Alimentarius. General standard for the use of dairy terms (CXS 206-1999) 7. Mattilsynet og Havforskningsinstituttet (2022). Analyse av næringsstoffer og uønskede stoffer i plantebaserte middagsprodukter og drikker 8. DTU Fødevareinstituttet (2022). Næringsstofindhold i plantedrikke 9. Carlsen MH et al. New Iodine Food Composition Database and Updated Calculations of Iodine Intake among	

		2020. 3. Bian S et al. Dairy product consumption and risk of hip fracture: a systematic review and meta-analysis. BMC Public Health. 2018; 18: 165. 4. Matia-Martin P et al. Effects of Milk and Dairy Products on the Prevention of Osteoporosis and and Osteoporotic Fractures in Europeans and Non-Hispanic Whites from North America: A Systematic Review and Updated Meta-Analysis. Adv Nutr. 2019: 10; S120-S143. 5. Iuliano S et al. Effect of dietary sources of calcium and protein on hip fractures and falls in older adults in residential care: cluster randomised controlled trial. BMJ 2021.	Norwegians. Nutrients. 2018 Jul 20;10(7):930. 10. Bulletin of the IDF N°518/2022: The World Dairy Situation Report 2022	
Merete Myrup	Danish Agriculture & Food Council	The chapter covers the health effects related to dairy products, but there are issues that must be added on children, fracture risk and bioavailability. Regarding children, a systematic literature review assessed the effect of children's dairy consumption on their bone mineral content (BMC) and concluded that supplementing the usual diet with dairy foods increases BMC in children (1). In a meta-analysis of prospective observational studies, it was investigated whether dietary factors have an impact on osteoporosis and found that 'appropriate consumption of dairy products … can reduce the risk of osteoporosis (2). A systematic review and meta-analysis of dietary patterns found that a 'milk/dairy' pattern was associated with a reduced risk of low bone mineral density and fracture (3). Another systematic review suggests that 'the use of dairy products could substantially reduce the burden of osteoporotic fractures' (4).	-	We have focused on adult data. However, the data are inconsistent.

		All dairy products may not exert the same benefits on fractures. A meta-analysis of observational studies found that in both men and women, yogurt and cheese consumption were associated with a reduced hip fracture risk (5). This equated to a 32% lower risk between the highest and lowest cheese consumers and a 25% reduced risk between the highest and lowest yogurt consumers. No consistent results for milk. A meta-analysis of studies of osteoporotic fractures from North America shows that the highest intakes of cheese and yogurt were associated with a reduced risk of fractures, whereas there was no relationship with milk (6). Many fracture prevention trials have focused on calcium and vitamin D supplementation and not real food products. Meta-analyses report a modest result when calcium and vitamin D are combined (7). However, a recent food-based intervention trial with older people in long-term residentialcare, suggests that a dairy food-based approach has the potential for fracture prevention (8). Sixty older people's care facilities were randomized to provide residents with their usual menus or menus with extra dairy incorporated (from 2 to 3.5 servings/day) for two years. The intervention group with extra dairy had a 46% reduction in hip fractures, a 33% reduction in fractures overall and an 11% reduction in falls. This study is unfortunately not part of any meta-analysis at present, but the results are so important that they deserve to be included here. These results also led to the conclusion that the nutrients in dairy (and other whole foods) have several advantages compared to supplements and enriched food products. Few other foods		

		naturally contain as much calcium as dairy products, and dairy sources are some of the most bioavailable (9). It is often assumed that supplementation with the same amount of calcium from different sources (milk, foods fortified with calcium and calcium supplements) have comparable effects on bone health, but there is evidence of a beneficial 'dairy matrix effect' (10,11), showing a better effect when calcium is naturally present. This dairy matrix effect does not only include calcium, but all the nutrients in dairy products: protein, phosphorous, magnesium, zinc, and vitamin K2 (12), that together are responsible for the positive effects of dairy products in relation to bone. References: 1: de Lamas C et al. Adv Nutr. 2018; 10: S88–S96. 2: Feng W et al. Crit Rev Food Sci Nutr. 2021, Oct 13;1-10. 3: Fabiani R et al. Adv Nutr. 2019, Mar 1;10(2):219-236. 4: Hiligsman M et al. Arch Osteoporosis 2017; 12:57. 5: Bian S et al. BMC Public Health. 2018; 18: 165. doi: 10.1186/s12889-018-5041-5. 6: Matia-Martin P et al. Adv Nutr. 2019: 10; S120-S143. 7: Yao P et al. JAMA Netw Open. 2019; 2: e1917789. 8: Iuliano S et al. BMJ 2021; doi.org/10.1136/bmj.n2364 9: Guéguen L & Pointillart A. J Am Coll Nutr. 2000; 19: 119-136. 10: Thorning TK et al. Am J Clin Nutr 2017: 105:1–13. 11: Geiker NRW et al. Osteoporos Int. 2020; 31:		

		601–615. 12: Lundberg HE et al. Int J Clin Trials. 2020; 7: 55-65.		
Merete Myrup	Danish Agriculture & Food Council	Thanks a lot for the opportunity to comment in the NNR public consultation regarding 'Milk and Dairy Products' The chapter covers the health effects related to milk and dairy products. There are, however, issues that needs revision. This especially concerns the mentioning of saturated fat and the effects on heart health. In the abstract (the introduction part) this sentence is present: 'Saturated fat is an important determinant of plasma total and LDL- cholesterol levels, and a causal relationship between high LDL-cholesterol and atherosclerotic cardiovascular disease has consistently been documented'. This is not documented in the chapter, and therefore has no place in the abstract – on the contrary - page 5: 'The systematic reviews overall conclude that milk or dairy consumption is not associated with increased risk of CVD'. Saturated fat from dairy is different from saturated fat from other food sources. In relation to heart health (page 5), it will be relevant to include stroke in this chapter, it seems to be miss-ing. These references are valuable: Milk and Dairy Product Consumption and Cardiovascular Diseases: An Overview of Systematic Reviews and Meta-Analyses - PubMed (nih.gov) Food groups and risk of coronary heart disease, stroke and heart failure: A systematic review and dose-response meta-analysis of prospective studies - PubMed (nih.gov)	-	1) The SFA - LDL- CVD connection is described in introduction. We would like to emphasize that saturated fat from dairy are equal to saturated fat from other sources. The matrix and content of other nutrients and/oe factors influencing bioavailablity and metabolism may be different in different foodgroups. 2) Regarding blood pressure we have changed changed some studies to most studies. Now the sentence reads. A modest beneficial effect on blood pressure was reported in some most studies

		Regarding blood pressure (page 6) it seems like the authors have overlooked what is found in the men-tioned studies. Please find the conclusions below as documentation: Ding: CONCLUSION: The weak inverse association between dairy intake and systolic blood pressure in observational studies was not supported by a comprehensive instrumental variable analysis and systematic review of existing clini-cal trials. Dong: CONCLUSION: In summary, the present meta-analysis suggested that probiotic fermented milk has BP-lowering effects in pre-hypertensive and hypertensive subjects. Hidayat: In CONCLUSION, this meta-analysis provides further evidence that milk proteins slightly but significantly lower both systolic and diastolic BP. Ralston: CONCLUSION: This meta-analysis supports the inverse association between low-fat dairy foods and fluid dairy foods and risk of EBP (elevated BP). Soedamah-Muthu: CONCLUSION: This meta-analysis of prospective cohort studies suggests that low-fat dairy and milk could contribute to the prevention of hypertension, which needs confirmation in randomized controlled trials. Usinger: CONCLUSION: The review does not support an effect of fermented milk on blood pressure. Despite the posi-tive effect on SBP the authors conclude, for several reasons, that fermented milk has no effect on blood pressure. The effect found was very modest and only on SBP. In the mechanisms paragraph (bottom of page		

		6) it is concluded that 'milk and full-fat milk are associated with unfavorable lipid profile'. This is not substantiated and is not aligned with the conclusion from page 5: 'Few studies have however, directly compared the effect of low- versus high fat dairy products; however, one meta-analysis investigated the consumption of full-fat or low-fat and found no association with either type of dairy to all-cause mortality or CVD incidence (41), whereas one systematic review showed that intake of high fat milk compared to low-fat milk was associated with increased CVD risk (28).' In the Summary (page 8) it is concluded: 'To avoid consuming to much saturated fat, low-fat milk and cheese should preferably be chosen.' This is not validated in the chapter, there is no scientific documenta-tion that saturated fat from dairy products (apart from butter) is harmful, increase total or LDL cholesterol, or increase risk of CVD.		
Swedish Food Agency	Swedish Food Agency	"However, since the health effect of different types of dairy products may differ, the aim of this chapter is to describe the totality of evidence for the role of milk and dairy products for health-related outcomes as a basis for setting and updating food based dietary guidelines." Given the aim, there was on occasion surprisingly little information about different dairy foods. For several of the outcomes only the exposure "dairy products" was mentioned. It is therefore unclear whether the associations between specific dairy foods have been examined or not, and if not, if this is because	Page 3 "A causal relationship between LDL-cholesterol and atherosclerotic CVD has consistently been documented (1, 2). Replacing SFA with polyunsaturated fat (PUFA) reduces risk of coronary heart disease (3-5) and effectively reduces plasma cholesterol levels (5, 6)." Although it comes in the middle of a paragraph about the fat content of milk, it is not explicit what this has to do with dairy products. Page 3 "The health effects are also likely more than the sum of the nutrients in dairy foods." and Page 4 "However, since the health effect of different types of dairy	1) We have moved this sentence 2) We don`t need references for these statements. 3) We have specified the dairy products in table 2 (Sjekk med Anne). 4) We have focused on main outcomes given by the committee where adequate studies were availbale. 5) we have changed Table 2 to table 1 6) The These studies were recently evaluated in the World Cancer Research Fund were given most weight. 5) We have mentioned as example the need

		studies are lacking or not. The abstract conclusion does not reflect the summary accurately and the last sentence is problematic: "Intake of low-fat milk or dairy products are important dietary sources of calcium and iodine and should be included in the daily diet." "Intake of low-fat milk or dairy products" - do the authors mean low-fat milk and low-fat dairy products, or low-fat milk and all dairy products? It can be interpreted both ways. The summary (page 8) states it very differently and clearly: "Dairy products (especially milk, yoghurt and cheese) are important sources of calcium, protein, iodine and other important nutrients." and "Dairy products that are not a major source of essential nutrients, nor have been associated with health effect, i.e., cream and butter, should be limited." The abstract does not reflect this. All milk, yoghurt and cheese are sources of calcium, protein, iodine and other nutrients, but the evidence for what "should" be included is limited to lower-fat dairy products. Even if the sentence is changed to just mention yoghurt and cheese, we would suggest something less prescriptive than "should be included in the daily diet", e.g. "are fully compatible with a healthy dietary pattern." A note about other products commonly used in the Nordic regions such as crème fraiche or sour cream would be useful (i.e. that they are not well studied, or that they can be considered	products may differ," No reference given for either of these statements, which are the first such statements on this, and also related to the aim. Page 4 and Table 2 – Please clarify what "Milk and dairy products" includes – assume "all dairy products" but when cheese is listed separately it raises the question if cheese is included in "dairy products". Page 5 "In the current chapter we focused on the association between dairy intake and cardiovascular risk, type 2 diabetes, cancer, osteoporosis, hypertension, overweight/obesity and all-cause mortality. For the remaining outcomes, few data were available.The main findings are described in more detail below." What are the "remaining outcomes"? Outcomes have not been previously defined. Page 10 "Tables" and "Table 2" - but no Table 1? Page 5 The entire section on cancer reads: "We identified 31 new systematic reviews (14, 42-71). The world cancer fund reported that there was evidence that intake of dairy products probably reduced risk of colorectal cancer (72). There was limited evidence suggesting that dairy products decreases the risk of premenopausal breast cancer and limited evidence for a positive association between high intake of dairy products and risk of prostate cancer (72)." The summarised results appear to be those from the World Cancer Research Fund's report "(72)"	for more studies on sour milk as research gap

		together with butter and cream etc). Similar to previous point, when "low-fat dairy, yoghurt and cheese" occurs in the text it is not clear if the yoghurt and cheese are also low-fat or not. It would be worth specifying, to avoid confusion.	- But what do the 31 new reviews say? Do they support this or not? Page 7 "the dairy matrix is different." Please explain what the dairy matrix is. Page 8 "nor have been associated with health effect, i.e., cream and butter," With "positive health effects"? Page 9 "Current evidence suggest no association between milk/dairy intake and CVD thus it could be argued that the consequence of shifting from low to more high fat dairy could be explored further." The word "thus" is confusing – why is it used here? Do they mean "although"? General: Please use "high-fat" and "full-fat" consistently to avoid confusion. High-fat dairy usually means butter cheese etc and full-fat means not fat-reduced. "High fat milk" is used frequently when it should be "full-fat", which is also used. Elsewhere – a mixture of names and numbers are used to cite references. The reference list is incorrect as it only includes numbered citations. Example "Itkonen 2021" cited in text but not listed. Occasionally reference is "(Refs)". A very large number of spelling, formatting and grammatical errors are present and need to be corrected.	

Ann-Kristin Sundin	LRF	Dear NNR Committee, Thank you for this opportunity to comment on the Milk and Dairy Products draft. Here are the comments (1/2) from LRF. Page 1; Abstract: The authors claim that "Milk and dairy products are also major dietary sources of saturated fatty acids and contribute with approximately half of the total intake of saturated fat." From a dairy matrix perspective, the SFA in dairy, with some exceptions such as butter and ghee, are not associated with adverse health biomarkers. The text would benefit from making a clear distinction between the sources of SFA, just as is stated/implied in the Result section. Page 2: We welcome the acknowledgement of milk and dairy products regarding the statement that they should be included in the daily diet. However, we suggest the authors also acknowledge that dairy products with a higher fat content, such as cheese and full-fat yoghurt, are also associated with beneficial health outcomes such as decreased risk of CVD. Soedamah-Muhtu SS, de Goede J. Dairy Consumption and Cardiometabolic Diseases: Systematic Review and Updated Meta-Analyses of Prospective Cohort Studies. Curr Nutr Rep. 2018; 7(4): 171–182. Tillgänglig online från: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6244750/ Page 3, Introduction, second paragraph: We kindly ask the authors to refer from using the term "plant-based milk" accordingly to Council Regulation EU 1308/2013, supplement VII, parts	Page 5: Abstract (Results), Abstract (Conclusion), and Dairy and risk of T2D and overweight: Suggest correcting to: "Some suggestion of an inverse association with intake of dairy and type 2 diabetes or markers of impaired glucose homeostasis were reported for some MOST studies". Current phrasing is repetitive with both "Some suggestion" AND "for some studies". In addition and not least, when reading conclusions from all the cited references used by the authors, there is not "only some suggestions" and not "some studies", it is rather the vast majority of studies showing reduced risk of T2D from dairy consumption: Aune: CONCLUSION: that there is a significant inverse association between intakes of dairy products, low-fat dairy products, and cheese and risk of type 2 diabetes. Chen: CONCLUSION: Higher intake of yogurt is associated with a reduced risk of T2D, whereas other dairy foods and consumption of total dairy are not appreciably associated with incidence of T2D. Gao: CONCLUSION: A modest increase in daily intake of dairy products such as low fat dairy, cheese and yogurt may contribute to the prevention of T2DM, which needs confirmation in randomized controlled trials. O'Connor: In CONCLUSION, evidence suggests that elevated dairy product intake is associated with increased fasting plasma glucose concentrations together with reduced HbA1c in nondiabetic subjects. Hence, the clinical significance of these results remains uncertain.	1) We exclude all text on plant-based milk 2) TFA is not described in more detail in this chapter 3) there is limited evidence for increased risk of prostate cancer and intake of dairy according to The world cancer research report: Diet, Nutrition, Physical activity and prostate cancer revised in 2018. 4) We have changed the wording some to most and the sentence now reads: An inverse association with intake of dairy and type 2 diabetes or risk factors for type 2 diabetes (e.g. Homeostatic Model Assessment for Insulin Resistance; HOMA-IR) was suggested for most studies specifically for low-fat dairy, yoghurt and cheese.

		III and IV. Also, using the term "milk" on plant drinks is likely to contribute to the confusion among consumers, who may believe that the products are equal when it comes to nutrition and health (which they are obviously not). Page 3, Introduction. The authors state that "…milk /is/ the major source of transfat in countries where the industry-produced transfat have been reduced or eliminated". The text would benefit from a clarification on the differences between industrial TFA (i-TFA) and ruminant-originating TFA (r-TFA) from a health perspective, or the reader may think they have the same heath effect. Recent meta-analyses of both observational and randomized studies have shown that the current intake level of natural trans fatty acid is not associated with health issues. Bendsen et al. Consumption of industrial and ruminant trans fatty acids and risk of coronary heart disease : a systematic review and meta-analysis of cohort studies. Eur J Clin Nutr. 2011 Gayet-Boyer et al. Is there a linear relationship between the dose of ruminant trans-fatty acids and cardiovascular risk markers in healthy subjects: results from a systematic review and meta-regression of randomized clinical trials. Br J Nutr. 2014;112(12):1914-22. Page 3, last paragraph: We welcome the recognition of the dairy matrix and we encourage authors of other chapters to include a food matrix perspective in all of the nutrient and food chapters. Page 5, Abstract (Results), Abstract (Conclusion), and Dairy and cancer section: We	Sochol: CONCLUSION: Our findings suggest that dairy intake, especially low-fat dairy products, has a beneficial effect on HOMA-IR, waist circumference, and body weight. This could impact dietary recommendations to reduce DM risk. Tong: CONCLUSION: An inverse association of daily intake of dairy products, especially low-fat dairy, with T2DM was revealed, indicating a beneficial effect of dairy consumption in the prevention of T2DM development. Turner: CONCLUSIONS: In adults, four of the dairy interventions showed a positive effect on insulin sensitivity as assessed by Homeostasis Model Assessment (HOMA); one was negative and five had no effect. As the number of weight stable intervention studies is very limited and participant numbers small, these findings need to be confirmed by larger trials in order to conclusively determine any relationship between dairy intake and insulin sensitivity. Salari: CONCLUSION: In general, our findings showed that kefir beverages may have beneficial effects on glycemic control. Abstract (Introduction): Suggest deletion of the latter sentence ("Saturated fat is an important determinant of plasma total and LDL- cholesterol levels, and a causal relationship between high LDL-cholesterol and atherosclerotic cardiovascular disease has consistently been documented"). The reason is that it is not sufficiently relevant in an abstract, especially since this association is not documented for SFA in/from dairy.	

		kindly suggest the authors to correct "There was evidence….colorectal cancer" to "There was strong evidence….colorectal cancer". The evidence for a protective effect of dairy on colorectal cancer is, indeed, strong according to WCRF: "There is strong evidence that consuming dairy products decreases the risk of colorectal cancer" https://www.wcrf.org/diet-activity-and-cancer/risk-factors/meat-fish-dairy-and-cancer-risk/	Abstract (Results): Suggest striking "Some suggestion of" in the sentence "…an inverse association with intake of dairy and type 2 diabetes or markers of impaired glucose homeostasis were reported for some studies". Current phrasing is repetitive with both "Some suggestion" AND "for some studies". Page 3 (Introduction, top): According to Nordic food databases, carbohydrate/lactose content in milk is 4.7-4.9 gram: SE: http://www7.slv.se/SokNaringsinnehall FI: https://fineli.fi/fineli/en/elintarvikkeet?q=milk DK: https://frida.fooddata.dk/food/search?q=m%C3%A6lk Page 4 (top): Suggest adding: "…and decreased risk of colorectal cancer", as the NNR 2012 review stated the following: "suggestive evidence (low-grade) for colorectal cancer and for dairy consumption being associated with decreased risk of type 2 diabetes and increased risk of prostate cancer (low-grade evidence)". https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3795297/pdf/FNR-57-22790.pdf	
Ann-Kristin Sundin	LRF	Here are the comments (2/2) from LRF:Page 5 (top): Suggest to include Metabolic syndrome as a relevant health outcome either within "CVD or risk factors" or "Risk of T2D, overweight and obesity". Page 5 (mid): For dairy specifically, it seems that it is related more strongly with stroke than	P7 (bottom); Suggest adding 'theoretically': "Full fat dairy products such as butter, (sour) cream and full-fat cheeses are energy dense food and high intake of these may THEORETICALLY lead to energy surplus." Since no studies confirm this in practice to our knowledge. Otherwise add a reference to support the statement.	

		with the other CVDs. Hence, a specific mentioning of the association between dairy and stroke seems prudent. Page 6 (top); For body weight in adults, these meta-analysis may be overlooked (not part of reference list): 1) https://pubmed.ncbi.nlm.nih.gov/27376321/ 2) https://pubmed.ncbi.nlm.nih.gov/22249225/ 3) https://pubmed.ncbi.nlm.nih.gov/29058378/ For body weight in children, this meta-analysis (neither high-fat not low-fat increase obesity): 1) https://pubmed.ncbi.nlm.nih.gov/32119732/ Page 6 (Bone); What about effect on bone mineral density? This 2020 meta-analysis is not part of reference list: 1) https://pubmed.ncbi.nlm.nih.gov/32185512/ What about fracture prevention?: This 2017 systematic review, is not part of reference list: https://pubmed.ncbi.nlm.nih.gov/28634891/ Page 6 (other health – BP) and Abstract; Suggest deleting "No evidence of a detrimental effect related to intake of dairy products was seen". Did you hypothesis this? Milk is included in the science-based DASH (Dietary Approach to Stop Hypertension) diet, suggesting a beneficial effect, rather than only not being detrimental. Suggest rephrasing "in some studies" in the sentence "A modest beneficial effect on blood pressure was reported in some studies", as only one reference does not support a reduced risk on BP from dairy consumption: Ding: CONCLUSION: The weak inverse association between dairy intake and systolic	P8 (bottom); Based on the overall chapter content, is this statement then scientifically substantiated?: "To avoid consuming to much saturated fat, low-fat milk and cheese should preferably be chosen." As evident from this chapter, there is NOT robust scientific documentation that SFA in dairy (butter excluded) is harmful/increase total or LDL cholesterol/increase risk of CVD.	

		blood pressure in observational studies was not supported by a comprehensive instrumental variable analysis and systematic review of existing clinical trials. Dong: CONCLUSION: In summary, the present meta-analysis suggested that probiotic fermented milk has BP-lowering effects in pre-hypertensive and hypertensive subjects. Hidayat: In CONCLUSION, this meta-analysis provides further evidence that milk proteins slightly but significantly lower both systolic and diastolic BP. Ralston: CONCLUSION: This meta-analysis supports the inverse association between low-fat dairy foods and fluid dairy foods and risk of EBP (elevated BP). Soedamah-Muthu: CONCLUSION: This meta-analysis of prospective cohort studies suggests that low-fat dairy and milk could contribute to the prevention of hypertension, which needs confirmation in randomized controlled trials. Usinger: CONCLUSION: The review does not support an effect of fermented milk on blood pressure. Despite the positive effect on SBP the authors conclude, for several reasons, that fermented milk has no effect on blood pressure. The effect found was very modest and only on SBP. P6 (bottom); Suggest add 'generally': "...of SFA, which GENERALLY increases plasma total...", as it apparently isn't the case for SFA when in dairy. P6 (bottom); Suggest deleting latter part of this sentence: "...butter and full-fat milk are associated with unfavourable lipid profile", as it is not backed up scientifically, as you state		

		yourselves at P. 5 (milk is part of 'dairy'): "Few studies have however, directly compared the effect of low- versus high fat dairy products; however, one meta-analysis investigated the consumption of full-fat or low-fat and found no association with either type of dairy to all-cause mortality and CVD incidence (41), whereas one systematic review showed that intake of high fat milk compared to low-fat milk was associated with increased CVD risk (28)."		
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	The authors state that the health effects of different dairy products differ, even for dairy products with high fat content, and that the food matrix and content of bioactive compounds should be considered. In particular, cheese and yogurt seem to show inverse associations with some risk factors. Consequently, we ask for separate dietary advice for different dairy products.	p. 3 Naming of plant-based dairy alternatives We kindly ask that the authors align with The Codex General Standard for the Use of Dairy Terms (Codex Alimentarius (1999)). Therefore, plant-based dairy substitutes should not be named "milk" in the chapter. p. 4 and Table 2, p. 10 – Diet intake The referred diet intakes in Norway are old, from 2010. The intake of milk in the Norwegian population is significantly reduced in this period. From 2011 to 2021 there was a 21,9 % reduction (at food supply level) for full-fat and low-fat milk combined (The Norwegian Directorate of Health, 2022). This should be commented on in the chapter. Moreover, data on milk and dairy intake for children in Norway is lacking. Reference: Norwegian Directorate of Health (2022). Utviklingen i norsk kosthold 2022. Codex	We have added the timeperiod when the surveys were conducted.

			Alimentarius (1999). The Codex General Standard for the Use of Dairy Terms, CXS 206-1999	
Michela Bisonni	European Plant-Based Foods Association (ENSA)	We would encourage the NNR to recognise the contribution of plant-based alternatives toward achieving balanced and varied diets. We thus urge the NNR to review its conclusions and make adjustments to include plant-based options as viable alternatives to milk. Please refer to the comments provided in question 5.	PAGE 3 - INTRODUCTION, PAGE 9 - FOOD BASED DIETARY GUIDELINES The background paper in the NNR2022 project about Milk and Dairy Products states that plant-based alternatives to milk have lower micronutrient and protein properties than milk. Hence, the paper concludes that plant-based milk alternatives differs notably from dairy milk and therefore cannot be considered as dairy product substitutes. Plant-based alternatives to milk can (and should) be part of balanced, varied, and nutritious diets that contribute to achieving sustainable and resilient food systems. Those products can provide essential nutrients to citizens with milk allergy, lactose intolerance, and those who follow vegan, vegetarian, or flexitarian diets for health, ethics, or sustainability reasons. For example, soy milk is naturally high in protein and contains important minerals like calcium and iron. Almond milk is a good source of vitamin E and unsaturated fats, while oat milk is rich in fiber and beta-glucans, which can help lower cholesterol levels. Plant-based alternatives to milk have lower saturated fat and higher unsaturated fat content across the board. A diet high in saturated fats has been linked to an increased risk of heart disease, while unsaturated fats have been shown to help lower cholesterol levels and thus reduce the risk of heart disease. Although certain plant-based drinks contain less protein than dairy milk, they are	We have excluded all with plant-based dairy

			suitable for the Nordic and Baltic populations who follow diets that tend to be low in fiber and high in fats. In order to cater to the dietary needs of consumers who choose to opt for plant-based alternatives to milk, manufacturers have taken steps to make these products more nutritionally relevant. One of the ways this is achieved is through the fortification of plant-based alternatives to milk with nutrients like calcium, iodine, and vitamins D, B2, and B12. By fortifying plant-based alternatives with these nutrients, manufacturers are able to offer a more complete nutritional profile, making it easier for consumers to meet their daily dietary requirements. Plant-based alternatives are either fortified through the addition of vitamins and minerals by using nutritional additives or through the usage of natural ingredients that are naturally rich in vitamins and minerals (e.g. the lithothamnium alga that is naturally rich in calcium). We would therefore encourage the NNR to recognise the contribution of plant-based alternatives toward achieving balanced and varied diets. We thus urge the NNR to review its conclusions and make adjustments to include plant-based options as viable alternatives to milk. By recognising and promoting the benefits of plant-based alternatives, the NNR can provide consumers with the knowledge necessary to make informed dietary choices that are both nutritious and sustainable.	
Malina Andersson Lee	OATLY AB	Oatly welcomes the recognition of plant-based drinks in this chapter, however, we strongly disagree with the conclusion that the	ABSTRACT Introduction: - Suggest adding "fortified plant-based	We have excluded all with plant-based dairy

		nutritional content of fortified plant-based drinks is dissimilar to dairy milk and, therefore, cannot substitute dairy products. Cow's milk and other dairy products have historically stood for a significant part of the diet in many parts of the world and, hence, have been an important source of vitamins and minerals. Though low-fat dairy milk contains several important nutrients its environmental impact is high. The draft NNR chapter on Overview of food consumption and environmental sustainability in the Nordic and Baltic Region (p 80) concludes: "Reducing dairy milk consumption would provide the greatest environmental benefits across the range of metrics… Hence, a reduction in consumption could be considered a first order priority". Oatly produces a range of plant-based drinks. For example in Sweden and Finland our drinks are fortified with calcium, iodine, vitamin D2, riboflavin, vitamin B12. Moreover, the majority of Oatly oat drinks are unsweetened and contain oat fibre. As Oatly uses rapeseed oil, an oil with a high proportion of monounsaturated fats and omega-3's, many of these drinks can claim to be, not only low in saturated fat, but also rich in unsaturated fats. The protein content is lower in Oatly oat drinks compared to soy drinks and dairy milk. According to the draft NNR chapters on Protein, Fiber and Fats and oils, our drinks are well aligned with the nutritional needs for the Nordic and Baltic people; where fiber and fat intakes are inadequate, and, in contrast, protein intake is high. It is important that this	drinks", as follows: "Fortified plant-based drinks offer a good alternative for people who cannot or do not want to drink dairy milk." INTRODUCTION Oatly strongly object to: "Compared to milk, the plant-based milk … have a low content of many micronutrients and protein." Many plant-based alternatives provide the same amount of micronutrients as dairy milk. Thus, a wider description of plant-based drinks, including also fortified drinks, should be provided. The description of cow's milk, presently includes fatty acids, sugars, protein, vitamins and minerals, and fortification. We recommend the same consistent approach is applied to plant-based drinks, with the additional mentioning of dietary fiber. Also, protein should not be high-lighted as this is in direct conflict with the conclusions in the draft NNR chapters on protein, stating: - "Dietary proteins of animal origin (meat, fish, milk, and eggs) or a combination of plant proteins from, for example, legumes and cereal grains, give a good distribution of indispensable amino acids. With the current Nordic relatively high protein intake, replacing part of animal proteins with plant proteins would probably lead to somewhat lower protein intake and lower bioavailability but still provide enough protein and indispensable amino acids." (p. 4-5).	

		current chapter is aligned with these chapters, to ensure the NNR is consistent and clear. Animal-derived foods and plant-based foods are not nutritionally equivalent, either in terms of advantageous or disadvantageous nutrients, therefore aiming for nutritional equivalence would be inappropriate. A recent Swedish report compared the nutrient density of dairy products and plant-based milk alternatives based on nutrient rich food (NRF) index (1) and concluded that fortified plant-based drinks and fortified milk products have equivalent nutrient density. The Swedish Food Agency has acknowledged plant-based dairy in "Kostcirkeln" (Food circle) within the food group "Dairy and vego-products". They state: "This group includes dairy products such as milk, cheese and yogurt, but also plant-based vego drinks and gurts. Dairy products provide many vitamins and minerals, for example calcium, which is important for bones and teeth. A slice of cheese provides approximately as much calcium as 1 deciliter of milk or a calcium-enriched vegan drink. If you only choose plant-based alternatives, you need to choose ones that are enriched with, among other things, calcium, vitamin B and vitamin D in order to get similar nutrients as from milk products." (2). Support for fortified plant-based drinks is given by their inclusion also in other countries dietary recommendations, for example, the UK (3) and Australia (4). Furthermore, EFSA categorizes plant-based drinks as core foods along with	- "It should be considered that replacing animal protein with plant protein for aspects of sustainability may also be a public health strategy to lower the risk of CVD mortality and T2D" (p. 9) - In relations to total mortality: "the literature supports current dietary recommendations to increase the intake of plant protein in place of animal protein." (p. 11) - "there is suggestive evidence that animal protein intake, especially from dairy products, has a stronger association with growth, particularly with weight gain, than plant protein." (p. 12) SUMMARY Oatly strongly object to: "For individuals who wish for plant-based dairy alternatives; it is important to note that some of the plant based dairy substitutes (e.g., almond, rice, oat) may contain similar amount of calcium but their overall other nutritional content is not similar to dairy milk and therefore cannot substitute dairy products." Animal-derived foods and plant-based foods are not nutritionally equivalent, either in terms of advantageous or disadvantageous nutrients, with each having a place within a healthy, balanced diet Fortified plant-based drinks should be recognized as a good alternative from a nutritional perspective for the significant percentage of consumers who	

		milk and dairy (5). As more people opt for plant-based drinks, this chapter is an opportunity to ensure NNR dietary recommendations for the Nordic and Baltic regions meet the needs of today and tomorrow. The recommendations should be based on the latest science and the chapter on Milk and Dairy should be aligned to other NNR chapters, to ensure a clear and consistent approach. There are several dietary guidelines which acknowledge plant-based drinks as a nutritionally relevant substitute for dairy milk. We suggest that the same consistent approach should be applied in the NNR. We therefore recommend that this NNR chapter should include a more detailed description of plant-based drinks in the introduction and amend its conclusion (suggestions in Detailed comments). References in Detailed comments.	cannot or choose not to consume conventional dairy milk. DATA GAPS FOR FUTURE RESEARCH Plant-based drinks should be acknowledged in this section: The current body of evidence does not reflect the current consumption of plant-based dairy products in the Nordic and Baltic region, thus hindering firm conclusions on plant-based drinks in regard to nutrient intake and health. Future epidemiological research need to include data on different categories of plant-based dairy both in their dietary surveys and in their data analysis. Moreover, in order for this to be feasible, global food composition databases should be updated to reflect the current product brands in the segment within plant-based dairy. REFERENCES 1. Jacobsen, et al. Näringstäthet i mjölk och växtbaserade drycker. SLU Future Food Reports 20. 2022, Uppsala. https://www.slu.se/ew-nyheter/2022/12/ny-rapport-om-naringstathet-i-mjolk-och-vaxtbaserade-drycker/ (accessed 2023-02-23) 2. https://www.livsmedelsverket.se/matvanor-halsa—miljo/kostrad/matcirkeln (accessed 2023-02-23) 3. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/528193/Eatwell_guide_colour.pdf 4.	

			www.eatforhealth.gov.au/guidelines/australian-guide-healthy-eating 5. Turck et al. Tolerable upper intake level for dietary sugars. EFSA Journal 2022;20(2):7074.	
Celiah Ruthberg	Plant-food Sweden and Plantebranchen	In total general comments will be sent in in two parts. Part 1. We welcome the recognition of plant-based drinks in this chapter. However, we question the conclusion that the nutritional content of fortified plant-based drinks is dissimilar to dairy milk and, therefore, cannot substitute dairy products. Cow's milk and other dairy products have historically stood for a significant part of the diet in many parts of the world and, hence, have been an important source of vitamins and minerals. However, an increasing number of people are integrating plant-based foods in their daily diets. There are today a wide range of plant-based drinks available in the market. Many of them are fortified with, e.g., calcium, iodine, vitamin D2, riboflavin, vitamin B12 and several of them contain i.a. oat fibre. In several countries plant-based foods have been included in food-based dietary guidelines (FBDG) According to the draft NNR chapters on Protein, Fiber and Fats and oils, fortified plant-based drinks are well aligned with the nutritional needs for the Nordic and Baltic people; where fibre and fat intakes are inadequate, and, in contrast, protein intake is high. This current chapter should be aligned with the other chapters to ensure the NNR is consistent and clear.	Specific comments will be sent in in 3 parts. Part 1. P 1. ABSTRACTIntroduction:Much focus on CVD. Around 60% of calcium intake in the Nordic and Baltic diet are from milk products. Calcium is essential for bone health, and inadequate intakes have also been linked to other health outcomes, such as pregnancy complications, cancers, and cardiovascular disease (8). This should be mentioned.Results:- Evidence of an association is only presented once in the results section. All other results are "suggestive". Does suggestive mean non-conclusive? Please clarify.- "Some suggestion of … were reported for some studies". Please clarify what "some suggestion" means and the totality of evidence. Also, the leap from dairy (generally) to low-fat dairy, yoghurt and cheese makes it further unclear.Conclusion:- Last sentence: The "or" in "Intake of low-fat milk or dairy products" is understood to include full fat dairy as well, e.g. full-fat fermented yogurts, cheese and cream. Is that correct?- Suggest deleting "Intake of" and adding "fortified plant-based drinks" as follows:"Low-fat milk or dairy products are important dietary sources of calcium and iodine and should be included in the daily diet. Fortified plant-based drinks offer a good alternative for people who cannot or do not want to drink dairy milk." P. 3. INTRODUCTION- In the first sentence butter and cream are not included, but they are	1) We have excluded all text for plant-based dairy 2) We do not inted to bring up health effects of calcium 3) WE have modified the sentences presenting different dairy products

		Animal-derived foods and plant-based foods are not nutritionally equivalent, neither in terms of advantageous nor in disadvantageous nutrients, therefore aiming for nutritional equivalence would be inappropriate. A recent Swedish report compared the nutrient density of dairy products and plant-based milk alternatives based on nutrient rich food (NRF) index (Jacobsen, et al. Näringstäthet i mjölk och växtbaserade drycker. SLU Future Food Reports 20. 2022, Uppsala. https://tinyurl.se/6wC) and concluded that fortified plant-based drinks and fortified milk products have equivalent nutrient density. The Swedish Food Agency has included plant-based dairy in the dairy category in their recently published "Kostcirkeln" (Food circle) within the food group "Dairy and vego-products". They state: "This group includes dairy products such as milk, cheese and yogurt, but also plant-based vego drinks and gurts. Dairy products provide many vitamins and minerals, for example calcium, which is important for bones and teeth. A slice of cheese provides approximately as much calcium as 1 deciliter of milk or a calcium-enriched vegan drink. If you only choose plant-based alternatives, you need to choose ones that are enriched with, among other things, calcium, vitamin B and vitamin D in order to get similar nutrients as from milk products." (Den grönare Matcirkeln (livsmedelsverket.se)).	included in the second. Please clarify.- In the second sentence fermented milk and yoghurt are both listed, while further down yoghurt is part of the fermented milk group (suggest excluding yoghurt in sentence 2).- Second last and last sentence in paragraph 2: As argued in our General comment 1 and 2, a better description of plant-based drinks is warranted. We suggest that the same principle is applied to plant-based drink, with the additional mentioning of dietary fibre. #1 There are fortified plant-based beverages with equivalent nutrient density as fortified low-fat dairy milk, as assessed by the nutrient rich food index, NRF (NRF 11.3; almond and soy, and NRF 21.3; oat and soy) (3). #2 Plant-based drinks (e.g., soy, oat, almond, rice, coconut and pea) generally contain fiber and can assist Nordic and Baltic consumers increase fibre intake towards recommended levels. #3 With the exception of coconut, many plant-based drinks are low in saturated and trans fats and rich in unsaturated fats, and are available with the same range of fat content as dairy milk. #4 Unfortified plant-based drinks have a lower content of some micronutrients compared to milk. However, currently several plant-based drinks are fortified with vitamins B2, B12 and D and with the minerals calcium and iodine. Within the EU, it is mandatory to enrich milk and plant-based alternatives with a fat content of up to 3% with vitamin D in many countries. The mandatory fortification requirement for vitamin D also applies to organic milk and organic plant-based alternatives in Sweden (3). Organic milk and organic plant-based alternatives may not be enriched in other	

			Nordic and Baltic counties. #5 The bioavailability of the fortificants calcium and plant-based vitamin D2 has been examined and the conclusions are that regular intake, supports a satisfactory calcium uptake (1) and vitamin D status (2, 9). #6 Plant-based drinks offer a range of protein contents, with the highest being soya and pea drinks. With the high protein intake in the Nordic and Baltic countries, replacing part of animal proteins with plant proteins for example, would probably lead to somewhat lower protein intake but still provide enough protein and indispensable amino acids to meet dietary recommendations. (reference to NNR Protein chapter).	
Derya Özgün	Plant-food Sweden and Plantebranchen	Part 2. Fortified plant-based drinks are acknowledged as core foods by their inclusion also in other countries dietary recommendations, for example, the UK (https://tinyurl.se/6wD) and Australia (https://tinyurl.se/6wE). Furthermore, EFSA categorizes plant-based drinks as core foods along with milk and dairy (Turck et al. Tolerable upper intake level for dietary sugars. EFSA Journal 2022;20(2):7074). Plant-based products should be included in the Dairy chapter since they are consumed in the same way as dairies and can bring key nutrients of the dairy category like calcium, B vitamins, and for some of them high quality proteins. In addition, more Plant-based dietary patterns with reduced meat and other animal products and higher intakes of healthful plant-based foods are the key recommendations for a sustainable diet for people and planet (Gazan 2022; Broekema 2020). An analysis of national	Specific comments will be sent in in 3 parts. Part 2. - The sentence "Compared to milk, the plant-based milk (e.g., soy, oat, almond, rice and pea) have a low content of many micronutrients and protein." should be replaced with a more detailed description, for example according to #1 - #6. The text is in direct conflict with the conclusions in the draft NNR chapters on protein, stating: a) "Dietary proteins of animal origin (meat, fish, milk, and eggs) or a combination of plant proteins from, for example, legumes and cereal grains, give a good distribution of indispensable amino acids. With the current Nordic relatively high protein intake, replacing part of animal proteins with plant proteins would probably lead to somewhat lower protein intake and lower bioavailability but still provide enough protein and indispensable amino acids." (pages 4-5). b) "It should be considered that replacing animal	We have excluded all text for plant-based dairy; 2) We have removed the sentence regarding lactose and calcium bioavailability.

		food-based dietary guidelines (FBDG) from around the world suggests that adding concrete recommendations for plant-based dairy alternatives to FBDGs could substantially lower greenhouse gas emissions from the dairy food group. (Klapp 2022) Multiple evidence on health benefits of plant-based dairy alternatives – especially those from soy – are available: • Implementing more plant-based products alternatives, being in line with standard dietary guidelines could reduce global mortality by 6-10% and food-related greenhouse gas emission by 29-70%. (Springmann 2016) • Plant-based drinks are generally lower in saturated fats than cow's milk (coconut based being the exception) and containing mono and poly-unsaturated fat. • Multiple studies shown soy consumption was lowering Cholesterol levels. • Most plant-based drinks are fortified with calcium and vitamin D, vitamin B12 and vitamin B2, to similar level than in cow's milk. A recent simulation study in which dairy intake was replaced with plant-based dairy alternatives showed that nutrient adequacy was globally maintained especially when calcium fortified soy-based dairy substitutes were used (Salomé 2021).	protein with plant protein for aspects ofsustainability may also be a public health strategy to lower the risk of CVD mortality and T2D" (page 9) c) "there is suggestive evidence that animal protein intake, especially from dairy products, has a stronger association with growth, particularly with weight gain, than plant protein." (page 12) Studies showing protein deficiency in the Nordic and Baltic countries are missing in the Protein chapter, and the chapter also only present benefits of reducing the currently high protein intakes, particularly so for animal proteins, for a number of conditions ranging from obesity to total mortality. We hope that the statement on page 3 (Advising against plant-based drinks due to "low protein content") will be changed accordingly to better reflect the Protein chapter. However alternatives (oat, almond, rice, etc.) are needed due to allergies or intolerances to both. MECHANISMSP. 7. Cancer. With respect to lactose and casein, and the postulated effects on calcium bioavailability, we suggest that this hypothetical evidence be omitted. There are multiple nutritional factors affecting the uptake and biological effects of calcium. The importance of the two selected nutrients (lactose and casein) as compared to other factors is not known, nor is it of particular relevance to cancer. To determine the bioavailability of calcium rich foods, one must take into account both the amount of calcium and all nutrients/anti-nutrients within a food. Silva et al demonstrated that fortified plant-based drinks presented comparable values for total calcium content and higher calcium	

			bioaccessibility compared to cow's milk (1) arguing against the postulated importance of lactose and casein. SUMMARYP.9We suggest the last part of this sentence to be removed: "The evidence suggest that the health effects of different dairy products vary, even for dairy foods with high fat content (i.e., butter and cheese), and the food matrix and content of bioactive compounds need to be considered to clarify the potential beneficial effect of dairy products.", e.g., to delete the text ", and the food matrix….". We object to the present writing:"For individuals who wish for plant-based dairy alternatives; it is important to note that some of theplant based dairy substitutes (e.g., almond, rice, oat) may contain similar amount of calcium buttheir overall other nutritional content is not similar to dairy milk and therefore cannot substitute dairy products." - It is unreasonable to suggest that a product should, for example, contain lactose, dairy proteins and saturated and trans-fats in order to be considered a good alternative for dairy products. Plant-based alternatives for dairy milk are specifically designed to avoid these nutrients, and to provide nutrients that are better suited for human and planetary health.	
Karin Pousard	Plant-food Sweden and Plantebranchen	-	Specific comments will be sent in in Part 3. - As previously pointed out, it is vital to take the nutritional needs in the Nordic and Baltic region into consideration including, but not limited to, calcium. For example, fibers and unsaturated fats. These are unquestionable qualifying nutrients for human health, and intakes in the population are insufficient. In	We have excluded all text for plat-based dairy

			contrast, the animal protein and total protein intake is high, and diary matrix is only valid for explaining differences within traditional dairy foods (cheese, milk etc). Bioactive peptides may be either positive or detrimental to health. We have argued that fortified plant-based drinks can, and ought to be, recognized as a good substitute from a nutritional perspective for the significant percentage of consumers who cannot or choose not to consume conventional dairy. - We have also pointed out the importance that the up-coming NNR chapters, such as the one on Milk and dairy, are mutually aligned with remaining chapters (e.g. protein, fiber and fats and oils) and is up to speed with the latest scientific and legal developments in relation to nutrition. DATA GAPS FOR FUTURE RESEARCHP. 9.High-light the role of product development and innovations in food processing, including to support the nutritional composition of plant-based products, and to outline priorities for more comprehensive research on the nutrients of these products and the sustained effect of modern plant-derived diets on long-term health (10). REFERENCES 1. Silva, et al. (2020) In vitro digestion effect on mineral bioaccessibility and antioxidant bioactive compounds of plant-based beverages. Food Res Int, 130:108993.2. Bouillon, et al. (2016) Is Vitamin D2 Really Bioequivalent to Vitamin D3? Endocrinology, 157, pp. 3384–3387.3. Jacobsen, et al. Näringstäthet i mjölk och växtbaserade drycker. SLU Future Food Reports 20. 2022, Uppsala. https://www.slu.se/ew-nyheter/2022/12/ny-rapport-om-	

			naringstathet-i-mjolk-och-vaxtbaserade-drycker/ (accessed 2023-02-23)4. https://www.livsmedelsverket.se/en/food-habits-health-and-environment/dietary-guidelines/adults/dairy-products-advice (accessed 2023-02-23)5. Dietary Guidelines for Americans, 2020-2025. Chapter 1: Nutrition and Health Across the Lifespan, pp. 30. www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf (accessed 2023-02-28)6. Turck et al. Tolerable upper intake level for dietary sugars. EFSA Journal 2022;20(2):7074.7.https://www.fda.gov/regulatory-information/search-fda-guidance-documents/draft-guidance-industry-labeling-plant-based-milk-alternatives-and-voluntary-nutrient-statements (accessed 2023-02-28)8. Shlisky et al. Calcium deficiency worldwide: prevalence of inadequate intakes and associated health outcomes. Ann N Y Acad Sci. 2022 Jun;1512(1):10-28.9. https://www.livsmedelsverket.se/livsmedel-och-innehall/naringsamne/vitaminer-och-antioxidanter/d-vitamin (accessed 2023-02-28)10. Grossmann et al. Standardized methods for testing the quality attributes of plant-based foods: Milk and cream alternatives. Compr Rev Food Sci Food Saf. 2021 Mar;20(2):2206-2233.	
Ewa Kurowska-Chappell	Danone	We welcome the opportunity to comment on this chapter aiming at describing the totality of the available evidence regarding milk & dairy products in relation to health-related outcomes. We suggest considering in this chapter the plant-based alternatives to milk and yoghurt, as	We share the conclusions on the major benefits of dairy products described in the chapter including inverse association with some cardiometabolic risk factors, such as total and LDL cholesterol especially regarding fermented dairy products (such as yoghurt) , as well as type 2 diabetes or	We have excluded all text for plat-based dairy

		more and more people choose to include these products in their diets for various reasons. Including Plant-based alongside dairy More and more people are integrating plant-based foods in their daily diets, and in several countries these foods have been included in Food Based Dietary Guidelines (FBDGs) alongside the Dairy foods. Plant-based products should be included in the Dairy chapter because they are consumed in the same way as dairies and can bring key nutrients of the dairy category like calcium, B vitamins, and for some of them high quality proteins. In addition, more plant-based dietary patterns with reduced meat and other animal products and higher intakes of plant-based foods are the key recommendations for a sustainable diet (Gazan 2022; Broekema 2020). An analysis of national FBDGs suggests that adding concrete recommendations for plant-based dairy alternatives to FBDGs could substantially lower greenhouse gas emissions from the dairy food group. (Klapp 2022) Multiple evidence on health benefits of integrating plant-based dairy alternatives – especially those from soy – as part of the diet/alongside dairy products, are available: Transitioning towards more plant-based diets being in line with standard dietary guidelines could reduce global mortality by 6-10% and food-related greenhouse gas emission by 29-70%. (Springmann 2016) Plant-based drinks are generally low in saturated fats (coconut based being the exception) and containing mono and poly-	markers of impaired glucose homeostasis, and the evidence of association between intake of dairy products and reduced risk of colorectal cancer. In addition to these benefits, we recommend investigating the benefits of consumption of fermented dairy products (especially yoghurt) on weight management & satiety. Additional benefit: Weight management & Satiety Several studies over the last decade demonstrated that dairy products intake and specifically yoghurt consumption - plain or sweetened, low-fat or full-fat - were associated with beneficial effects on long-term weight management, waist circumference (Mozaffarian 2011, Mozaffarian 2016, Sayón-Orea 2017) or body fat composition (Keast 2015, Moreno 2015, Calleja 2020) A recently published meta-analysis revealed that a linear association was observed between the intake of total dairy, milk, and yoghurt and the risk of overweight or obesity (Feng 2022). The risk decreased by 25%, 7%, and 12% per 200-g/d increase for total dairy, high-fat dairy, and milk, respectively, and by 13% per 50-g/d increment of yoghurt , confirming previous observations. These studies covered different geographies, including Europe, and results were confirmed within different target populations (adults, children or adolescents, men or women, healthy or already overweight/obese people). In regard to the specific effect of yogurt on	

		unsaturated fat. Multiple studies have shown soy consumption to be lowering cholesterol levels (Mejia 2019) Most plant-based drinks are fortified with calcium and vitamin D, vitamin B12 and vitamin B2, to similar level than in cow's milk. A recent simulation study in which dairy intake was replaced with plant-based dairy alternatives showed that nutrient adequacy was globally maintained especially when calcium fortified soy-based dairy substitutes were used (Salomé 2021) For the above reasons, we believe plant-based alternatives to dairy should be included in the NNR alongside the dairy foods. References: Broekema R, Tyszler M, van 't Veer P, Kok FJ, Martin A, Lluch A, Blonk HTJ. Future-proof and sustainable healthy diets based on current eating patterns in the Netherlands. Am J Clin Nutr. 2020 Nov 11;112(5):1338-1347. doi: 10.1093/ajcn/nqaa217. Gazan R, Vieux F, Lluch A, de Vriese S, Trotin B, Darmon N. Individual Diet Optimization in French Adults Shows That Plant-Based "Dairy-like" Products May Complement Dairy in Sustainable Diets. Sustainability. 2022; 14(5):2817. https://doi.org/10.3390/su14052817 Klapp AL, Feil N, Risius A. A Global Analysis of National Dietary Guidelines on Plant-Based Diets and Substitutions for Animal-Based Foods. Curr Dev Nutr. 2022 Sep 20;6(11):nzac144. doi: 10.1093/cdn/nzac144. Salomé M, Huneau JF, Le Baron C, Kesse-Guyot E, Fouillet H, Mariotti F. Substituting Meat or Dairy Products with Plant-Based Substitutes	weight management, previous studies have already demonstrated an effect of yogurt on satiety leading to reduced hunger, increased fullness and delayed subsequent eating (Douglas 2013). Yoghurt's protein content may provide an explanation of these findings; but it was also shown that yogurt consumers tend to choose healthy diets and healthier lifestyles compared with non-consumers (Cifelli 2020, Santaliestra-Pasías 2020, Possa 2017) and that the substitution of nutrient-poor, energy-dense items with nutrient-rich foods such as yoghurt may have a beneficial impact on weight maintenance and obesity (Bowman 2004). The evidence available on Weight management & Satiety should be considered to confirm the relevancy to integrate dairy, and specifically yoghurt in the daily diet of consumers. REFERENCES: Bowman SA, and Vinyard BT. Am Coll Nutr 2004; 23(2):163-8. Cifelli CJ, Agarwal S, Fulgoni VL. Nutrients 2020;12:3435. Calleja, M, Caetano Feitoza, N, Falk, B, et al. Pediatric Obesity. 2020; 15:e12690. Douglas SM, Ortinau LC, Hoertel HA, Leidy HJ. Appetite. 2013 Jan;60(1):117-122. Feng Y, Zhao Y, Liu J, et al. Adv Nutr. 2022 Dec 22;13(6):2165-2179. Keast DR, Hill Gallant KM, Albertson AM, et al. Nutrients 2015;7:1577–93. Moreno LA, Bel-Serrat S, Santaliestra-Pasías A, et al. Nutr Rev 2015;73(Suppl 1):8–14.	

		Has Small and Heterogeneous Effects on Diet Quality and Nutrient Security: A Simulation Study in French Adults (INCA3). J Nutr. 2021 Aug 7;151(8):2435-2445. doi: 10.1093/jn/nxab146. Springmann M, et al Analysis and valuation of the health and climate change cobenefits of dietary change. PNAS 2016;113:4146-4151. Mejia SB, Messina M, Li SS, et al . A Meta-Analysis of 46 Studies Identified by the FDA Demonstrates that Soy Protein Decreases Circulating LDL and Total Cholesterol Concentrations in Adults. The Journal of Nutrition. 2019:149(6);968–981. https://doi.org/10.1093/jn/nxz020	Mozaffarian D. Circulation 2016;133:187–225 Mozaffarian D, Hao T, Rimm EB, et al. N Engl J Med 2011;364:2392–404. Possa G. Corrente JE, Fisberg M. BMC Nutrition 2017;3:29. Santaliestra-Pasías AM, González-Gil EM, Pala V, et al. Nutrition Metabolism and Cardiovascular Disease 2020;	
Stella Staunstrup	Plantebranchen	We welcome NNR's recognition of plant-based drinks in this chapter. However, we do not agree with the draft conclusion that the nutritional content of fortified plant-based drinks is not similar to dairy milk and, therefore, cannot substitute dairy products. Firstly, we would like to present arguments for why fortified plant-based drinks can, and ought to be, recognized as a good option from a nutritional perspective for the significant percentage of consumers who cannot or choose not to consume conventional dairy. Many plant-based drinks are fortified with vitamins B2, B12 and D and with the minerals calcium and iodine. The bioavailability of the fortificant calcium (1) and vitamin D2 (2) has been assessed and the conclusions offer considerable support. On average, the protein content is lower in plant-based beverages compared to dairy milk. However, the natural content of fibre is an added value, not present	Secondly, we wish to illustrate the increasing global recognition of plant-based drinks as core foods along with milk and dairy, and present examples on legal harmonisation on nutrient standards that are currently under way. An outlook on current dietary guidelines, shows that the Swedish Food Agency state that "Drinks made of oats and soya are environmentally friendly. Choose the ones enriched with vitamins and minerals" (4). In the American Dietary Guidelines, fortified plant-based beverages are included in the dairy group (5) and also in the Australian Guide to Healthy Eating and UK Eatwell guide. The EFSA Scientific Opinion on Tolerable upper intake level for dietary sugars acknowledges plant-based drinks as core foods along with milk and dairy (6). Hence, there are several dietary guidelines which acknowledge plant-based drinks as a nutritionally relevant substitute for dairy	We have excluded all text for plant-based dairy

		in dairy milk. Moreover, most plant-based drinks are low in saturated fats and rich in unsaturated fats. According to the draft NNR chapters, plant-based drinks are well aligned with the nutritional needs for the Nordic and Baltic people where fiber and fat intakes are reported to be inadequate, whereas, in contrast, protein intake is reported to be high. This is illustrated in the following quotes from the draft NNR chapters on i) Protein, ii) Fiber and iii) Fats and oils: i) With the current Nordic relatively high protein intake, replacing part of animal proteins with plant proteins would probably lead to somewhat lower protein intake and lower bioavailability but still provide enough protein and indispensable amino acids (our note: elderly exempted). Dietary proteins of animal origin or a combination of plant proteins from, for example, legumes and cereal grains, give a good distribution of indispensable amino acids. Replacing animal protein with plant protein may be a public health strategy to lower the risk of CVD mortality and type 2 diabetes. ii) New studies since NNR 2012 confirm the current view on dietary fibres being health beneficial, advocating intakes of at least 25 g/day. The studies also suggest that additional benefits can be expected with even higher intake of dietary fibres. In the Nordic and Baltic countries, the current recommended intake is 25g/d for women and 35 g/d for men, whereas the actual intake is significantly lower, ranging from 16 g/d to 22 g/d in women, and 17.7 g/d to 26 g/d in men.	milk. On this point it is noteworthy that both soy and dairy are major food allergens, and that many consumers have allergies or intolerances to both, and that non-soy dairy alternatives may also support a healthy diet. Several initiatives are on-going aiming to harmonise the nutrient profile of plant-based drinks and, so, to ensure a seamless switch between dairy milk and plant-based drinks. A proposal has now been presented by Canada and the US, calling for international guidelines for the nutritional composition of plant-based foods and beverages (7). Similar guidelines have been discussed in the FAO now in March. Such guidelines will assist countries, including the Nordic and Baltic countries, that seek to establish policies, or regulations, aimed to harmonise the nutritional composition of plant-based drinks. Guidance on the nutritional composition of plant-based foods and beverages is very timely. Today, more people are opting for plant-based drinks. Moreover, the draft NNR chapter on Overview of food consumption and environmental sustainability in the Nordic and Baltic Region (page 80) concludes: "Reducing dairy milk consumption would provide the greatest environmental benefits across the range of metrics (e.g., agricultural land use, GHGs, nutrient pollution, biodiversity loss). Hence, a reduction in consumption could be considered a first order priority". Hence, we strongly suggest that NNR include a more detailed description of plant-based	

		iii) Intake of saturated fatty acids is above the recommendation of 10 percent of energy in all countries, ranging from 13% in Norway and Sweden to ~15% in Denmark and Finland, with intakes slightly higher in men than women. Adding healthy plant oils to the diet will improve the overall fat composition of the diet (our note: particularly so if replacing saturated fats). Moreover, the environmental impact is less for plant-based compared to animal-based sources of fat. Whether a food is a nutritionally relevant substitute depends on whether it is aligned with the nutritional needs. In this respect, we suggest dismissing the idea that being a relevant substitute is the same as being "equivalent", e.g. the same consistent approach as for example butter vs. margarine. A Swedish report in 2022 compared the nutrient density of 5 dairy products and 10 plant-based milk alternatives based on nutrient rich food (NRF) index (3), e.g., on basis of nutrients in relation to RDI. For NRF11.3, two fortified almond drinks came out on top, followed by a fortified soy drink, mini milk (fortified) and skimmed milk (fortified) in the upper third. For NRF21.3 enriched oat drink (unsweetened, fat 3%) and skimmed milk (fat 1.5%, enriched) came in the upper third. Products without enrichment ended up further down in the ranking with both indices. The report concluded that fortified plant-based drinks and fortified milk products have equivalent nutrient density. (References are found at the end of Specific comments.)	drinks in the introduction, and ensure that the messaging in the conclusion is aligned with the other chapters (e.g. protein, fiber and fats and oils). Fortified plant-based drinks are, and should be, recognized as, a good alternative from a nutritional point of view for the significant percentage of consumers who cannot or choose not to consume dairy milk. We remain at your disposal for any additional information (www.plantebranchen.dk). 1. Silva, et al. (2020) In vitro digestion effect on mineral bioaccessibility and antioxidant bioactive compounds of plant-based beverages. Food Res Int, 130:108993. 2. Bouillon, et al. (2016) Is Vitamin D2 Really Bioequivalent to Vitamin D3? Endocrinology, 157, pp. 3384–3387. 3. Jacobsen, et al. Näringstäthet i mjölk och växtbaserade drycker. SLU Future Food Reports 20. 2022, Uppsala. https://www.slu.se/ew-nyheter/2022/12/ny-rapport-om-naringstathet-i-mjolk-och-vaxtbaserade-drycker/ (accessed 2023-02-23) 4. https://www.livsmedelsverket.se/en/food-habits-health-and-environment/dietary-guidelines/adults/dairy-products-advice (accessed 2023-02-23) 5. Dietary Guidelines for Americans, 2020-2025. Chapter 1: Nutrition and Health Across the Lifespan, pp. 30. www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf (accessed 2023-02-28) 6. Turck et al. Tolerable upper intake level for dietary sugars. EFSA Journal 2022;20(2):7074.	

			7.https://www.fda.gov/regulatory-information/search-fda-guidance-documents/draft-guidance-industry-labeling-plant-based-milk-alternatives-and-voluntary-nutrient-statements (accessed 2023-02-28).	
Silvia Alunni	European Alliance for Plant-based Foods EAPF	EAPF would like to comment on the section dedicated to "Milk and Dairy Products" stressing the importance of acknowledging and including fortified plant-based drinks (e.g. made of soy, pea, rice, oat, almond) as a relevant substitute to dairy milk for consumers, taking into consideration nutritional needs within a balanced diet and the need to provide options to consumers who cannot or choose not to consume dairy milk. The relevance of a product should be linked to the dietary needs of the overall population accounting for the average intake of nutrients. In this regard, many plant-based drinks are fortified with vitamins B2, B12 and D, as well as with minerals such as calcium and iodine. Fortification enriches the nutritional profile of plant-based drinks, which are already naturally rich in fibre and often higher in unsaturated fats than their animal-based counterpart. At the same time, intake of fibres and fats is recognised as insufficient in the Nordic region, while there is a clear overconsumption of proteins (see dedicated sections of the draft NNR). Therefore, products such as plant-based drinks – in the context of a well-balanced diet – could contribute to filling the gap in fibres and fats intake, while supporting a more balanced animal/plant-based proteins consumption. Demand for plant-based drinks is also on the rise, driven by environmental, health and/or	No specific comments	We have excluded all text for plant-based dairy

		ethical concerns. Moreover, there are consumers who cannot consume dairy products due to, for instance, medical reasons (e.g. intolerance or allergy). Fortified plant-based drinks provide a relevant alternative for this increasing share of the population, and can be integrated effectively in a nutritionally-balanced diet.		
Elisabet Rytter	Swedish Food Federation	x	ABSTRACT P 1, Results Clarify what the use of "suggestive" means. INTRODUCTION P 3 – paragraph 2. The description of plant-based drink should follow the same principles as for milk; fatty acids; sugars; protein; vitamins and minerals; fortification and with the addition of dietary fiber. SUMMARY P 8 - paragraph 1 The two conclusions below are in conflict: - "… milk or dairy consumption has not been associated with increased risk of cardio-vascular disease." - "…replacing full-fat dairy products with low-fat products are associated with a dietary pattern more beneficial for cardiovascular health." It is questionable if the statement "To avoid consuming to much saturated fat, low-fat milk and cheese should preferably be chosen." is scientifically substantiated. P 8, paragraph 2: As the question if a food is a nutritionally	1)We have excluded all text for plant-based dairy 2) We have clarified that the reference "The dietary patterns in including low-fat:" refers to the chapter in NNR on dietary pattern.

			substitute or not, more have a practical focus than being strict scientific, the last part of the sentence ("and therefore cannot substitute dairy products") below should be removed: "For individuals who wish for plant-based dairy alternatives; it is important to note that some of the plant based dairy substitutes (e.g., almond, rice, oat) may contain similar amount of calcium but their overall other nutritional content is not similar to dairy milk and therefore cannot substitute dairy products.	

9. Eggs

Name	Organization	General comments	Detailed comments	Comment from authors
Ingrid Gjelstad, Joanna Andersson, Stella Rasmussen	Oslo University hospital	We would like to get more information about potential positive health effects of eating egg.	You describe the nutrient content of egg, and with all these nutrients, we would expect more positive health effects of including egg in the diet. Is it possible to say more about that from existing litterature? Are there any risk-benefit analysis on egg?	The studies listed in this scoping review give the picture of the current evidence regarding the health effects of egg intake. The only potentially beneficial association has been observed with the risk of stroke, whereas the associations with other chronic diseases have mainly been neutral. We do mention in the *Data gaps* section some potential benefits of egg intake, e.g., regarding cognitive decline and macular degeneration, but at the moment there is not enough research to draw conclusions on these outcomes.
Jørgen Nyberg Larsen	Danish Egg Association	Reading through the chapter on eggs carefully the conclusion must be that there is no scientific evidence that egg consumption is associated with an increased risk of cardiovascular disease, type 2 diabetes, or cancer in European studies. Therefore, there should be no limitation on egg consumption in the revised Nordic Nutrition Recommendations (NNR2022). Furthermore, eggs are a very nutrient-dense and protein-rich food with high nutritional value and a low carbon footprint, and eggs should play a central role as food if Denmark and the other Nordic countries are to achieve the climate goals.		There is indeed little evidence for an association with disease risk in the European studies, but the limitation of the current evidence is that there is very little research data about long-term effects of egg intake higher than about 1 egg/day. Although experimental studies have used higher intakes, they have usually lasted just a few months. Therefore, to err on the side of caution, unlimited egg intake cannot be recommended (even if they would have a lower carbon footprint compared to other animal products).

		Danish Egg Association have had Blonk Consultants from Nederland make a report to compare the carbon foot print on Danish egg production in 2000 and 2020, and the results show a reduction in the carbon footprint on app. 30 % across the four production methods.		
Karianne Spetaas Henriksen	Animalia/OEK	The potential effect that eggs have on heart health has remained elusive in the literature, with some studies showing eggs have a protective effect on heart disease and other studies showing an adverse association. This is also clear from this chapter on eggs. Interpretation of evidence from these studies has been complicated by the methodological challenges in nutritional epidemiology. For example, it has been difficult to separate any potential independent associations between egg consumption and heart disease risk from the demographic, clinical, dietary, and lifestyle factors that may mediate or confound the results. This level of uncertainty has resulted in variable dietary recommendations, particularly among subgroups of patients with, or at high risk for, heart disease. Given the significant abundance of data on eggs and heart health from several recently published large-scale studies, we nominated this topic early in the NNR 2022 process. Such a systematic review could have clarified the potential relationship between egg intake and heart health among the general population as well as specific segments of the population, such as those with	We question why the positive aspects of eggs in the diet is not further discussed and emphasized. Also, a more holistic approach rather than a reductionistic focus is missing. In Norway the consumption of eggs is approximately 30 g per day (1). The consumption has increased since the last dietary survey ten years ago, but the intake has been stable since 2016. Even though eggs contribute to approximately 30 % of the cholesterol in the Norwegian diet (2), it also contributes to 17 % of the vitamin D and 12 % of vitamin E, but only 2% of the energy. This demonstrates the important value of eggs as a source of nutrients in the Nordic diet, particularly regarding vitamin D. The Nordic countries experience limited access of sun several months each year and depend on vitamin D being available in foods. Non-western immigrant populations in all Nordic countries are in the risk of vitamin D insufficiency and deficiency (3) and one in three pregnant women in Norway has a vitamin D deficiency at the end of the pregnancy (4). Eggs also contain high quality proteins. In 2022, Animalia has carried out amino acid analyses of eggs. The results show that the intake of essential amino acids from egg consumption, contributes to approximately 10 – 25 % of the requirements (adult person, 70 kg). This is quite substantial, considering that eggs only contribute to 3 % of the protein in the diet.	We do mention in the Introduction the potentially beneficial nutrients (including high-quality protein and vitamin D) and other compounds in eggs. However, ultimately the health effects of a food cannot be reliably determined just by looking at the nutrient content. The current evidence (with all its limitations) does not support major benefits of moderate (up to 1 egg/d) egg intake, perhaps excluding risk of stroke. We mention in the TMAO section that choline is an essential nutrient and that the choline content in one egg is about 35% of the recommended amount by the EFSA panel. However, the reason for emphasizing choline in the egg chapter is that is has been suggested to be one of the potentially harmful compounds in eggs in addition to dietary cholesterol. However, we also mention in the *Data gaps* section that choline may be one of the beneficial nutrients that could explain the observed inverse association of egg intake with cognitive decline.

		diabetes or existing heart conditions. The authors of the chapter state that the purpose is to describe the evidence related to the impact of egg intake on health. According to the «Instructions to authors» published on the NNR website, it is clear that «health outcomes» are synonymous to negative health outcomes in terms of chronic diseases. From the chapter, a major focus is the negative effect of cholesterol and to some extent choline, in terms of possible effects on chronic diseases. However, the authors state that the evidence is too weak, and data is limited on the association between consumption of more than one egg per day and risk of diseases. The benefits of eggs in the diet related to the content of essential nutrients and beneficial aspects is hardly discussed in the chapter.	We also question why choline is emphasized to such an extent, while the chapter on choline previously published for public hearing, is not taken into account. Thus, the chapter on eggs should take into consideration that choline is an essential nutrient. The chapter on choline also states on page 6, line 7-9 that «The global trend to reduce animal-source foods in order to attain sustainability goals implies that it may be difficult to achieve AIs of choline, especially in vulnerable groups….» And line 20-23 «… reported mean choline intakes in Nordic countries were lower than the AIs especially in vulnerable groups such as young women and pregnant and lactating women. This implies that a large proportion of women in pregnancy age are not achieving optimal daily choline intake». We ask that the authors take this into consideration when revising the chapter. References 1. Animalia. Kjøttets Tilstand 2022. Oslo; 2022. 2. Universitetet i Oslo, Mattilsynet, Helsedirektoratet. Norkost 3 - En Landsomfattende Kostholdsundersøkelse Blant Menn Og Kvinner i Norge i Alderen 18-70 År, 2010-11. Oslo; 2011. www.helsedirektoratet.no. 3. Itkonen ST, Andersen R, Björk AK, et al. Vitamin D status and current policies to achieve adequate vitamin D intake in the Nordic countries. https://doi.org/101177/14034948196878. 2020;49(6):616-627. doi:10.1177/14034948196878 4. Gustafsson MK, Romundstad PR, Stafne SN, et al. Alterations in the vitamin D endocrine system during pregnancy: A longitudinal study of 855 healthy Norwegian women. 2018. doi:10.1371/journal.pone.0195041	We now mention in the TMAO section that more infomration on choline is available in a separate chapter.

Christiane Hoffmann	Kjøtt- og fjørfebransjens Landsforbund	KLF supports the scientific input from Animalia / MatPrat.		
Guro Waage	Nortura SA	The authors of the chapter state that the purpose is to describe the evidence related to the impact of egg intake on health. In the protocol "Instruction for chapter authors", published on the NNR website, it seems clear that the instruction is not to assess the food groups in a holistic perspective, but solely in terms of risk of negative health outcomes (chronic diseases). We are surprised by this approach and believe that the food groups should be assessed and discussed in a balanced way, where you consider the positive factors against the negative ones. The beneficial effects of egg and its content of essential nutrients are hardly mentioned or discussed in the chapter. As stated by the authors as well, the health effects of egg cannot be determined solely by its content of cholesterol or choline. We ask how it is possible to evaluate and consecutively make dietary guidelines for food groups based on this narrow approach? Nortura supports the input form Animalia and Matprat.		The current research evidence describes whether egg intake has beneficial, neutral or harmful effects on or association with health outcomes. The traditional point of view has been that because of its high cholesterol content, egg intake would rather be harmful than beneficial for health and that's why the research has mainly investigated whether egg intake associates with increased disease risk. However, as it seems, it has mainly neutral associations with the risk of most chronic diseases and may have beneficial associations with some health outcomes, but the current research evidence is not strong enough yet to draw strong conclusions about these. There is also not enough evidence to conclude that what nutrients or other compounds in eggs might be explaining these possible benefits. Therefore, we have not emphasized the individual dietary components in eggs very much.
Anna Maria Karlsen	NHO Mat og Drikke	The chapter focuses on negative health outcomes. However, the nutritional composition of eggs should also call for a thorough discussion of the benefits of including eggs in the diet. For example, eggs are an important source of vitamin D in the diet, as well as high-quality		Please see the previous responses

		proteins. We ask that the authors should consider including this aspect in the revising of the chapter. Second, we ask why this chapter discusses choline in eggs to such an extent without referring to the separate NNR-chapter no. 35 - Choline. The chapter on choline states that choline is an essential nutrient, and that mean choline intakes in Nordic countries are lower than the adequate intake for several subgroups. This should also, in our opinion, be considered in the discussions about eggs in the diet.		
L.M. Granskog	concerned citizen	Normal Plasma Cholesterol in an 88-Year-Old Man Who Eats 25 Eggs a Day — Mechanisms of Adaptation https://www.nejm.org/doi/full/10.1056/NEJM199103283241306 N Engl J Med 1991; 324:896-899 DOI: 10.1056/NEJM199103283241306		This scoping review considered only meta-analyses. Case studies were not used and other individual studies were only mentioned if no meta-analytical evidence was available.
Marit Kolby	Oslo New University College	- The chapter on egg intake should include a discussion on total dietary quality, as eggs in an ultra-processsed dietary context is likely to affect individuals diffently than in a whole foods dietary context, e.g. driven by differences in gut microbial metabolism. - The emphasis on cholesterol content and effect on serum cholesterol is unbalanced and insufficient. - Also, the significance of eggs in the diet does not harmonize with the chapter on choline.	For several of the health outcomes, risk estimates are higher for the US population than for EU and Asian populations. As studies have shown a higher intake of ultra-processed foods in the US population than in European and Asian populations, it is likely that the dietary context could influence these associations. E.g., the precence or absence of phytochemical rich foods eaten with whole eggs has the potential to influence microbial formation of chemical compounds in the gut, as described by Barabási et al.: https://www.nature.com/articles/s43016-019-0005-1 Hemce, a discussion on the impact of total dietary quality should be included when	We agree that dietary context may be an important factor when considering the health effects of a single food item. This may at least partly explain the observed higher risk of some outcomes in the US studies compared to studies conducted in Europe or Asia. We do acknowledge in the text the correlated food intakes as a potential explanation for the results in the US studies and also mention the need to consider the comparison food(s) when assessing the health impact of egg intake in

			considering geographical differences. The emphasis on dietary colesterol and effect on serum cholesterol seems unbalanced and insufficient. Several studies have shown that dietary intake of cholesterol has little or no influence on serum cholesterol and/or total body cholesterol. The topic of hyper-responders is brought up, but studies showing that hyper-responders can turn into hypo-responders later on and vice versa, in the context of egg intake, has been omitted. See Katan et al.: https://academic.oup.com/aje/article-abstract/123/2/221/57769?redirectedFrom=fulltext&login=false "..quite a number of subjects who appeared hyperresponsive in one experiment proved to be hyporesponsive in another experiment". Such observations do not support the continued emphasis on _dietary_ cholesterol as a nutrient of concern. The chapter on choline emphasises this as an essential nutrient, with a high risk of vulnerable groups getting too little choline. In this chapter, choline is only discussed as a precursor for TMAO, not as an essential nutrient. TMAO has been _associated_ with ASCVD, but no mechanistic evidence supports this association. TMAO is also elevated after fish consumption, which is associated with positive health outcomes. Hence, increased TMAO levels could be a marker of animal sourced foods intake, rather than a mediator of ASCVD progression. A more nuanced discussion, including the beneficial role of choline, should be included in the egg chapter to make sure consumers are not staying away from eggs on a fallacy.	observational studies. The reason for emphasizing dietary cholesterol in this chapter is because that has traditionally been the reason for the recommendations to restrict egg intake. Although several studies have shown a lack of an effect of dietary cholesterol on serum cholesterol concentrations, the meta-analyses do suggest an effect, although quite small and with significant inter-individual variability. However, as higher serum LDL cholesterol is only one risk factor for diseases (especially for CVD), the most important question is that does high egg intake associate with disease risk. That cannot be confidently interpreted just by investigating the effect on serum cholesterol concentrations. And the current research suggests that egg intake is not a risk factor for most disease outcomes and may even associated with lower risk of some. We also agree that there is no strong evidence whether TMAO is an independent predictor of CVD. However, as the high choline content has been suggested as a potentially harmful compound in eggs, we wanted to bring the choline-TMAO link up. We also do mention some potential benefits of

				choline intake, such as in the case of cognitive decline.
Hanna Hamina	Finnish Poultry Association	Based on the scientific evidence on the health benefits of eggs and the low environmental impacts on egg production, we state, that there should not be restrictions on egg consumption in the Nordic Nutrition recommendations. Eggs play a significant role in a healthy, natural Nordic diet.		As mentioned above, because there is very limited research data on the health effects of long-term high egg intake (higher than on average 1 egg/day), it is not possible to recommend unlimited intake of eggs

10. Fats and oils

Name	Organization	General comments	Detailed comments	Comment from authors
David Iggman	Uppsala University	I congratulate the authors to their outstanding effort. The overall conclusions seem sound. I wonder whether the methodology would allow also for including some relevant grey literature e.g. the WHO documents by Mensink and Brouwer? I.e.: World Health Organization & Mensink RP. Effects of saturated fatty acids on serum lipids and lipoproteins: a systematic review and regression analysis. Geneva. 2016. World Health Organization, Brouwer I. Effect of trans-fatty acid intake on blood lipids and lipoproteins: a systematic review and meta-regression analysis. Geneva. 2016. The certainty of evidence is assessed for some but not all outcomes. Did you rely on previous authors´ grading or perform own? Consider providing this information in Methods. If possible, consider providing information regarding certainty of evidence in th Sumamry of evidence and Abstrac sections. Regarding oils and cancer, the report has followed a methodology not unsimilar to WCRF/AICR. Consider putting the results in relation to what evidence is available from wcrf.org.	Methods: "In case of multiple and overlapping SRs we chose the most recent and most up-dated SRs over the older, or used both if they were complementary." I think this is crucial as is it usually not sufficient to rely only on the most recent SR, as indicated by the low quality of included SRs and sometimes focus on different populations/diagnoses. It may be preferable to base overall conclusions on all previously published SRs. If this is it not practically possible, considering mention this a limitation. In the section Reasoning and considerations relevant for setting the FBDGs, regarding rapeseed oil, consider discussion also the Lyon Heart Study which included rapeseed oil in its Mediterranean diet intervention. Although effects cannot be specifically related to this food, the clear beneficial effects in that study adds to the overall understanding that rapeseed oil seems cardioprotective. Foods with added phytosterols or/and stanols seem not to be mentioned, although they are highlighted in some dietary patterns i.e. Portfolio diet, for their cholesterol-lowering qualities. Consider explaining why these were not included in this chapter. The same reasoning goes for cholesterol-rich foods e.g. eggs, which have been included in previously published SRs.	Adjusted accordingly in part; partly rejected

			Some minor typos need correction, e.g. in the T2DM section, there are too many spaces before "aged 55" and between "eight cohort".	
Martin Inderhaug	Animalia and Matprat	According to this chapter, it is concluded that from both an environmental perspective and health perspective, vegetable oils is preferred over animal-based fat sources. In this comment we will primarily respond to the part related to the environmental impact of plant-based fat compared to animal-based sources of fat, which is briefly discussed in a single paragraph of the chapter with title 'Integration'. In the conclusion part of the paragraph, it is written: "Collectively, the conclusions from an environmental perspective would overall be the same as from a health perspective, I.e. to preferentially use vegetable oils rich in unsaturated fat over animal-based fat sources rich in saturated fat." We dispute this conclusion for several reasons. First, the conclusion is only based on a single study, which in and of itself should make room for a far more cautious wording. Moreover, the chapter does not describe any scientific process that has been used to select this study. In the study, four factors are chosen to compare the environmental impact for animal and plant fats. These are carbon footprint, land footprint, biodiversity footprint and blue water footprint. It appears that all the indicators are based on some global averages. Thus, they have very little relevance for sustainable consumption of fats in the Nordic countries, which have very different food production and resource base then global averages. Also, there are great differences in dairy production between the Nordic countries	Cont.: It is also noted that the chapter consistently ignores all positive contributions from animal production in terms of sustainability. This includes biodiversity (grazing animals are important for sustaining biodiversity of pasture landscapes, e.g., in Norway: several red listed plants and pollinating insects (NIBIO, 2019)), cycling of nutrients and production of natural fertilizers, as well as local food production, employment and economy. Additionally, the chapter fails to consider current innovations of reducing methane emissions from cattle through feeding supplements, breeding, and methane trapping. In the recent IPCC report on climate mitigation (IPCC, 2022b) feeding supplements to reduce methane emissions from ruminants have been described as promising, e.g., "there is robust evidence and high agreement that chemically synthesised inhibitors are promising emerging near-term measures with high mitigation potential reported and commercial availability expected within two years in some countries." An important factor in sustainable food systems is to provide a stable production of food for the human population (Ref. FAO's definition of sustainable food system: a food system that delivers food security and nutrition for all in such a way that the economic, social, and environmental bases to generate food security and nutrition for future generations are not compromised) (FAO,	Rejected; sustainability issues were integrated by the committee

		themselves. For example, the document claims that the number of extinctions per Mt of fat is roughly 30-fold higher for dairy fat compared to vegetable oils. This is a meaningless claim, as it is not addressed to the local context. For example, of the 2 355 threatened species in Norway, almost 1 out of three (685) are negatively affected by the fact that grazing and mowing have ceased or been reduced (Artsdatabanken, 2015). Reduction of dairy farming and grazing livestock, and a shift in consumption from animal fat to vegetable fats, would thereby be a direct threat for biodiversity in Norway. In other words, a shift towards vegetable oils could lead to increased number of extinctions of threatened species. When it comes to freshwater resources, Norway is one of the countries in the world with the largest resources per capita, and total water consumption corresponds to around 0.8 percent of available freshwater (United Nations Association of Norway, 2022). As vegetable oils cannot be produced in Norway in sufficient volumes due to climate and topography, a shift from animal fats towards vegetable oils would inevitably result in more imports and decreased self-sufficiency, leaving Norway more dependent on food production in countries which may indeed have problems with freshwater availability. Environmental sustainability is certainly a complex topic, and it is challenging to provide general advice on both individual foods and complete diets. All foods, both plant- and animal-based, may be produced in either sustainably or non-sustainably. This is not reflected in the document, where instead both animal- and plant-derived oils and fats are	2018). There is currently an international concern regarding the increasing pressure on global food production due to increasing population size and effects of climate change (FAO, 2022). As the population has been estimated to reach 10 billion by 2050, and increased drought, flooding, plant diseases and heat waves have been predicted to reduce crops and cultivable land area in the future (IPCC, 2022), there is an urgent need to increase the production of food in suitable regions. As pointed out in the paper referred to in the paragraph regarding sustainability (Bajželi, 2021); the global production of fats and oils must increase in the upcoming years. It is therefore crucial that the advice on fats and oils takes national resources and conditions for local production into account to avoid risk of increased import from countries more vulnerable regarding climate change. In this chapter production of plant-based oils and fats is presented as more advantageous as it occupies a smaller area than animal-based food production. The fact that animal production often is based on land areas unsuitable for cultivation of plants for human consummation is not considered. In several countries, e.g., Norway, there is a limited amount of land suitable for crop production and the pastures are therefore vital for food production. Hence, restricting animal-based oils and fats from the diet would cause a reduced total production in such countries since it would not be possible to replace by plant-based production. It should also be noted that a recent report regarding climate change and risks for the Norwegian food production system, indicate an increased risk	

		described as static elements in terms of sustainability. To conclude, the purported evidence that vegetable oils are preferential from an environmental perspective are very weak. Animals represent an important element of sustainable food production systems and provide a nutrient source of food for the population. The generalizations in this document are not only scientifically questionable but may also cause great harm to a sector important for the economy, employment and food security for the Nordic countries. As for the health aspect, the authors point out that the evidence is limited and the literature is of low quality, and therefore findings should be interpreted cautiously. Thus, the evidence is not strong enough to give food based dietary advice from environmental or health p…	of drought in the areas most suitable for plant-based food production in Norway (north-east region of southern Norway) (NIBIO, 2022). Hence, reduced intake of animal-based derived fats and oils may increase import rates, reduce national self-supply and potentially increase the pressure on production in more climate vulnerable regions. This may cause reduced sustainability in food supply chains. References: NIBIO, 2022. Klimaendringer utfordrer det norske matsystemet. Rapport 8 (110). IPCC, 2022. AR6 Climate Change 2022: Impacts, Adaptations and vulnerability. Bajželi B., Laguzzi F., Roos E. 2021. The role of fats in the transition to sustainable diets. Vol5:9. FAO, 2022. Climate change impacts and adaptation options in the agrifood system. NIBIO, 2019: Mange planter trenger dyr på beite, NIBIOpop; Vol. 5:31. Artsdatabanken, 2015: Norsk rødliste for arter 2015. FAO, 2018: …	
Marte Gjeitung Byfuglien	Mills As	We support the complementation of NNR by including specific analysis and recommendations of fats and oils from a food level perspective. We observe that the documentation used in this chapter has strong limitation because most of the systematic reviews are rated as low or critically low quality. With this in mind, is it then prudent to add this chapter? We highly recommend including a chapter with fats and oils as a theme, but could it be based on other documentation?		Adjusted accordingly in part; partly rejected

		Introduction: Fatty acid composition has the most important impact on the risk factors. Other components with bioactive effect, related to processing grade of the fats and oils and also different fractions of the oils, description of palm oil is discussed. This gives good insight, but we find that this is not reflected in the following evaluations and discussions. We would appreciate an overview of sources of fats and oil in the Nordic and Baltic countries, compared to other parts of the world, including content of trans fatty acids from partially hydrogenated fats and oils. Partially hydrogenated fats and oils have rarely been used in the Nordic countries in the last decades. IMACE, the European Margarine Association might be helpful with information and references. Due to different sources of fats and oils, and different content of trans fatty acids, it is not relevant to include studies from different parts of the world, for instance USA, which still uses partially hydrogenated fats and oils. Methods: Should more words be included in the literature search, like spreads, dressings, … Maybe a discussion around which products is contributing to high intake of fat and oils in the Nordic and Baltic countries, and eventually differences in the patterns in different countries will be of interest? Are all the main sources for fats and oils included in the search? Concerning margarine, which we consider an important source for oils and fats in all countries, it might be difficult to search for, as margarine in many countries are restricted to 80 % fat (full fat) or 40 % margarine (low fat), whereas everything		

		between, or even higher or lower is called spreads. The literature search might thus have excluded some studies/reviews. Health outcomes relevant for Nordic and Baltic countries Palm oil: What is the source of palm oil? Which fractions are discussed? What is the food matrix, or is it used palm oil as cooking oil? Referring to the discussion in the introduction. Olive oil: Are all the studies done with extra virgin olive oil, or is it also other grades of refinement? Is there any discussion whether the significant effects are due to fatty acid composition or bioactive compounds, or interaction effects? Food based dietary guidelines We miss a discussion about replacement effect under the "associations with diseases and mortality" For food, the amount of calories and nutrients should be stable to maintain a stable body weight and to get the right food. It is not only a question of adding an ingredient, or stop eating specific food, but rather a replacement effect.		
Ellen Kathrine Ulleberg	Norwegian Dairy Council	The authors of this chapter describe limited evidence from studies on fats and oils as food sources. In the abstract they state "All identified systematic reviews and meta-analyses were of low methodological quality, thus the findings and conclusions presented within this chapter should be interpreted cautiously". We find it unfortunate that the authors make conclusions when there is limited evidence. As for some of the other chapters that have been released so far this chapter also prematurely concludes on what is most sustainable. The NNR		Rejected; sustainability issues were integrated by the committee

		background article identifying a sustainable diet in a local context has not been released and we ask that all matters regarding sustainability be revised according to the conclusions in the background papers.		
Plant-food Sweden	Plant-food Sweden	The review was clear and transparent, using sound methodology. We welcome the integration of environmental impact, as it gives the authors the possibility to directly link their results (summary of evidence) to environmental impact, which of course will be updated in upcoming sustainability papers as well. The Intergovernmental Panel on Climate Change (IPCC) describes plant-based diets as a major opportunity for mitigating and adapting to climate change (https://www.ipcc.ch/srccl/).	We appreciate the quality work done. Here are some minor comments on the abstract and methods section. Abstract It would add to the clarity if the presentation of the findings were harmonized, such as using "may" for limited evidence, and to continuously use "associated with increased/decreased risk", rather than "negative/positive associations" and to exhange "weak association" with small effect (or "slighly"). Example: Current text: "Intake of butter was not associated with risk of CVD but showed a weak inverse association with risk of T2D and a weak positive association with risk of total mortality in prospective cohort studies." Suggested text (from Summary of evidence, with minor adjustments): Consumption of butter may not be associated with risk of CVD but may be related to slightly lower risk of type 2 diabetes and higher risk of total mortality in prospective cohort studies. Also, the last sentence in the abstract might better reflect the Summary of conclusions if "butter and palm oil" is exchanged for "butter and tropical oils", as the latter include both palm oil and coconut oil.	Adjusted accordingly in part; partly rejected

			Methods If correct, it might be valuable to state that evidence deemed as "very low evidence" according to AMSTAR, were not included in the summary of evidence.	
Puk Maia Ingemann Holm	The Danish Agriculture & Food Council	We, once again, address the fact the disclaimer states that sustainability aspects… will be integrated at a later stage…This is not the case. The single article used (your reference no 58) to argue that vegetable oils are preferential from an environmental perspective, is certainly a weak pool of evidence. It is a striking observation that the article consistently ignores the positive contributions from animal production in terms of sustainability. This includes circularity of biodiversity (grazing animals are important for sustaining biodiversity of pasture landscapes, production of manure for plant production, etc. Sustainable food systems are an immensely complex topic. All foods, both plant- and animal-based, may or may not be produced in sustainable way, and thus it is challenging to provide general advice on both individual foods and complete diets. This issue is not reflected in the article, whereas both animal- and plant-derived oils and fats are described as static elements in terms of sustainability. To exemplify, the article fails to take into account, the current innovations of reducing emissions from the animal production. In fact, the World Resources Institute evaluated the Danish milk and pig production and found it to	References: Bajẑeli B., Laguzzi F., Roos E., 2021. The role of fats in the transition to sustainable diets. The Lancet Planetary Health. Vol 5:9. WRI, 2020. Comparing the Life Cycle Greenhouse Gas Emissions of Dairy and Pork Systems Across Countries Using Land-Use Carbon Opportunity Costs https://www.wri.org/research/comparing-life-cycle-greenhouse-gas-emissions-dairy-and-pork-systems-across-countries IPCC, 2022. AR6 Climate Change 2022: Impacts, Adaptations and vulnerability. FAO, 2018: Sustainable food systems https://www.fao.org/sustainability/en/ Meijaard E., et al. 2022. Dietary Fats, Human Nutrition and the Environment: Balance and Sustainability. Front Nutr. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9083822/	Rejected; sustainability issues were integrated by the committee

		be one of the most climate efficient among the included countries (WRI, 2020). There are examples of feeding supplements and breeding that lowers methane excretion from cattle along with methane trapping in stables. To underpin this, the recent IPCC report on climate mitigation (IPCC, 2022) feeding supplements to reduce methane emissions from ruminants have been described as promising, e.g. "there is robust evidence and high agreement that chemically synthesised inhibitors are promising emerging near-term measures with high mitigation potential reported and commercial availability expected within two years in some countries." An important factor in future sustainable food systems is to provide a stable production of food for the increasing human population (Ref. FAO's definition of sustainable food system: a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised) (FAO, 2018). As for the health aspect, the authors point out that the evidence is limited and the literature is of low or very low quality, and therefore findings and conclusions should be interpreted cautiously. Connecting to the above text on overall sustainability, we therefore argue that both for environmental and health aspects, the evidence is far from strong enough to build food based dietary advice upon in the way the conclusions are drawn. We additionally address the recent and ongoing discussion on a more broad perspective on saturated fat and the maybe overstated impact on human health in an overall		

		dietary aspect. And a more diversified approach to the role of oils and fats in the diet and impact on the environment. We refer to a more recent and balanced article than the protocol behind this present article could catch (Meijaard et al, 2022) Animals, all in all, represent an important element of sustainable food production systems that provide nutritious sources of food for the population. The type of generalizations and conclusions made in this chapter is first of all scientifically questionable, unbalanced and may harm a sector of great importance to the economy, employment and food security of many regions around the world.		
Christiane Hoffmann	Kjøtt- og fjørfebransjens Landsforbund	KLF supports the scientific input from Animalia / MatPrat.		Rejected
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	NHO Mat og Drikke/FoodDrinkNorway will, on behalf of the Norwegian food and drink industry, submit the following four comments to the public consultation of the NNR2022 chapter 13 Fats and oils: 1. The chapters "Fats and oils" and "Fat and fatty acids" should preferably be in public consultation at the same time It seems to us that the food group chapter 13. Fats and oils is strongly connected to nutrients chapter 5. Fat and fatty acids. It is most unfortunate that the chapters are not in public consultation at the same time. As a result, the interface between the themes belonging to the two different chapters may cause confusion. This makes it difficult to give well-founded comments to the chapter Fats and oils.		Rejected

		2. The available scientific evidence is of low or critically low methodological quality The authors of this chapter are clear that there are few relevant systematic reviews and meta-analyses available, and that these are of low or critically low methodological quality. Nevertheless, the studies are included, and findings and conclusions are presented, even though it is written that they should be interpreted cautiously. It is therefore possible to question the overall quality of this chapter for inclusion in the NNR2022. 3. An overview and discussion of all relevant dietary sources of fats and oils in the Nordic diet are sparse The intake of fats and oils in the Nordic and Baltic countries is briefly discussed, and there is no comprehensive overview of dietary sources of fats and oils, or differences in dietary patterns, in these countries. In our opinion, this should preferably be included in the revised chapter. Moreover, as stated in the chapter, margarine and butter mixes are commonly used products (page 14). It is important that the discussion of health effects takes into account the correct formulation of spreads and margarine on the market in Nordic countries. For example, the use of partially hydrogenated fats and oils has been rare in the Nordic countries in the last decades. 4. Conclusions regarding the integration of sustainability should not be part of this chapter at this time		

		We have noticed that the paper states that vegetable oils are preferred over animal-based sources of dietary fat from an environmental perspective. The chapter also includes a brief paragraph that explains different carbon footprints emitted per kg of fat, with only one single study as a reference. Moreover, the local context relevant to the Nordic countries is not discussed at all. The NNR2022 food-based dietary guidelines will integrate environmental sustainability aspects, and several background papers are under preparation. So far, only the first paper is released for public consultation. We ask that the NNR2022 chapter on fats and oils should omit to discuss and conclude sustainability until all background papers are completed.		
Ann-Kristin Sundin	LRF Mjölk	Dear NNR Committee, Again, thank you for the opportunity to submit comments to the NNR draft chapters. Here are the comments from LRF Dairy Sweden and LRF Väst on Fats and oils: 1. We respectfully question the using of the sentence "a weak positive association with risk of total mortality in prospective cohort studies" in the abstract, based on the references 8 and 26 for this claim. This claim is also used under FBDG, in our opinion equally unsuited due to the same reasons. 2. The authors specifically mention the reference diet proposed by the EAT Lancet Commission in 2019 under Requirement and recommended intakes. This diet has been widely and heavily criticized due to the lack of scientific support. Thus, it would be unsuited to mention this study in general and reference diet in particular		Adjusted accordingly in part; partly rejected

		without also mentioning the criticism. We also find it worrying that the EAT Lancet study is mentioned among the national FBDG references under Reasoning and considerations relevant for setting the FBDGs), since that falsely gives the impression that it holds the same standard and credibility, which is not true. 3. The authors state that margarines are preferred over butter and butter mixes due to lower content of saturated fatty acids and trans fatty acids. We therefor would like to turn the attention to studies like Da Silva et al (2015), associating ruminal tFAs with cardiac health markers rather than the opposite, on the other hand true for industrial tFAs. Da Silva, M.S., Julien, P., Pérusse, L. et al. Natural Rumen-Derived trans Fatty Acids Are Associated with Metabolic Markers of Cardiac Health. Lipids 50, 873–882 (2015). https://doi.org/10.1007/s11745-015-4055-3 4. The authors claim that the effects of interesterification on health is in general unstudied ("…the evidence is scarce and more studies are warranted.") Yet, they claim that plant-based fats submitted to this food processing is preferred over butter. We miss the references supporting this opinion. 5. The authors claim that the environmental impact is less for plant-based than animal-based sources of fat, and compare CO_2 equivalents of dairy fat and plant-based oils. Using climate as a proxy for environment is very problematic, especially since the calculations are yet uncomplete (e.g. they do not consider carbon sequestration), and no other positive environmental impact is considered, such as biodiversity. The authors also precede the work on the sustainability chapter, despite stating in		

		the introduction that this aspect will be integrated at a later stage. 6. Continuing on the point above, we notice that the calculations seem to based on global averages, not local or regional ones, further complicating the matter. We lack the aspect of Swedish grazing animals feeding on crops and roughage and byproducts that are not suited for human consumption, often grown in locals not suited for growing human food. 7. In this chapter, there is a reasoning on a nutrition level, despite being clear from start that the nutrition level will be treated in another chapter, and that this chapter will focus on the food level of fats and oils.		
Andreas Finnøy	NA	The chapter concludes that vegetable oils that are rich in unsaturated fat are to be preferred over tropical plant oils and animal fats. This conclusion does not follow from the presented evidence in the result section. There were several limitations in the presented results, as also pointed out in the limitation section, the summarized evidence should be interpreted with caution. First, the results presented in the chapter for vegetable oil rich in unsaturated fat are primarily from research on olive oil. Associations with health outcomes that are observed for olive oil, cannot be generalized to all vegetable oils rich in unsaturated fats. There were limited or no studies presented on associations between health outcome and canola oil or other vegetable oils. It is therefore not possible to conclude that these oils should be preferred over tropical oils or animal fats based on the presented results.		Rejected

		In the presented results, there was no conclusive association between butter and risk for cardiovascular disease or total mortality. Butter was associated with lower risk for type 2 diabetes, but increased risk for some types of cancer and for endometriose. Possible mechanisms for these associations were not discussed. The evidence that vegetable oils rich in unsaturated fats are to be preferred over butter is therefore not conclusive. Palm oil was assoaciated with increased risk for cardiovascular disease, but the certainty of evidence was graded as 'very low' and should be interpreted with caution. Furthermore, the chapter presents results for how consumption of different oils and fats relate to effects on risk markers. Canola oil was shown to decrease LDL-cholesterol, while butter increased LDL-cholesterol. However, the expected health outcome with increase in LDL-cholesterol from butter is not in line with the inconclusive association between butter and cardiovascular disease. The association between LDL-cholesterol and health outcome is complex and not definite. Canola oil and other vegetable oils are recent food items with a short history of consumption by humans. Effects of long-term consumption are therefore limited. The chapter does not provide sufficient evidence to support a nutrition guideline that recommends replacing traditional foods like butter and coconut oil with recent foods like canola oil.		

Elisabet Rytter	Swedish Food Federation	As this chapter (Fats and oils) is related to the chapter on Fats and fatty acids it would be beneficial if the two chapters could be consulted at the same time.	We welcome the integration of environment impact in NNR 2022 but since it stated that sustainability aspects (and other issues such as obesity, physical activity, and burden of diseases) will be integrated at a later stage, if relevant, it is surprising that this chapter contains such aspects. As we understand this should wait to until the three background articles on sustainability are available. The sustainability aspects could be found at - page 13, line 1-3; EAT Lancet and its recommended figures (not comparable with national dietary guidelines). - Page 13, line 12; "as well as being locally produced" - Page 14, line 16; "influencing both the fatty acid- and sustainable profile. - Page 14, headline "Integration". ABSTRACT The presentation of the findings would be clearer if they were harmonized by consistently using "may" for limited evidence, "associated with increased/decreased risk", rather than "negative/positive associations" and to exchange "weak association" with small effect (or "sligthly"). An examples: Current text: "Intake of butter was not associated with risk of CVD but showed a weak inverse association with risk of T2D and a weak positive association with risk of total mortality in prospective cohort studies." Suggested text (from Summary of evidence, with minor adjustments): "Consumption of butter may not be associated with risk of CVD but may be related to slightly lower risk of type 2 diabetes and higher risk of total mortality in prospective cohort studies."	Adjusted accordingly

			REASONING AND CONSIDERATIONS RELEVANT FOR SETTING THE FBDGS The paragraph on page 13 starting with "processing of oils…" focus on how different factors influence bioactive compounds in oils. Time, light exposure and temperature (together with other factors) also influence oxidation/rancidity of fatty acids which in turn can affect health. We suggest that these causations also should be described in the chapter. The paragraph on page 13 starting with "processing of oils.." needs to be complemented (some text added - see CAPITAL LETTERS, some words removed) to be in accordance with knowledge in food science: "Processing of oils, such as extraction method, cold-pressing, heating and refining, have no effect on fatty acid composition of oils but they impact on how other bioactive compounds are preserved (2). REFINING HOWEVER REMOVE TASTE, UNWANTED COMPOUNDS AND REDUCES OXIDATION PRODUCTS THAT WILL INDUCE FURTHER OXIDATION IF NOT REMOVED. MODERN REFINING IS DONE UNDER CONDITIONS THAT AIM TO RETAIN AS MUCH AS POSSIBLE OF BIOACTIVE COMPOUNDS. Further, cooking temperature, light exposure during storage as well as storage temperature and time influence bioactive compounds in oils since they are sensitive to heating and light. LIGHT AND HEAT ARE ALSO FACTORS THAT INCREASE OXIDATION. In general, oils are suitable for frying and cooking (despite	

			their relatively high content of unsaturated fatty acids) (57) but they should not GIVE smoked at high temperatures when cooked. The temperature during normal PAN frying is typically 140-175°C, and negative effects of frying vegetable oils high in unsaturated fatty acids are marginal even at 200°C for extended time periods (57)."	
Cecilie Arnesen Hultmann	Nortura	This hearing response solely concerns the section entitled "INTEGRATION" in the NNR 2022 article on fats & oils on page 14 and 15. - Nortura backs the hearing response provided by Animalia to the chapter on "Fats and Oils". - Nortura expresses serious concerns with the arguments and conclusions provided in the section relating to the environmental impacts of "fats and oils" for several reasons. The conclusions presented in the article are generic and lack a robust scientific foundation relating to the particular local context of production and consumption of fats and oils in Norway. - Nortura strongly recommends NNR 2022 to conduct a more robust scientific analysis of the broad sustainability and environmental impacts of dietary fats & oils in the local / national context rather than referring to generic global data as the basis for its conclusions. In order to understand the sustainability / environmental impacts of the consumption of dietary fats & oils in Norway, it is critical to review and base conclusions on assessments conducted in Norway. In recent years, the agricultural sector in Norway has invested significant resources to produce local assessment and data on the sustainability impacts of our operations (third-party assessed and certified). As such, it is entirely feasible for NNR 2022 to base its recommendations on actual and real data from Norway.	Norway has unique climatic and geographic conditions suitable for animal husbandry. With less than 3% arable land, it is impossible for Norway to achieve a high level food self-sufficiency, as recommended by the UN, based on the its own natural resources. Moreover, the animal agriculture is far more sustainable than most other countries across a range of sustainability indicators, such as climate emissions, deforestation, impact on biodiversity and ecosystems, freshwater use as well as a broad range of socio-economic indicators. Nortura strongly believes that presenting a rationale for sustainable food consumption in the Nordic region and in Norway specifically based on one single source of information (although this is a meta-analysis) is scientifically not robust and runs the risk of generating serious unwanted consequences in terms of impacting other and equally important dimensions and aspects of sustainability negatively. As a responsible corporate citizen, it is Nortura's duty to ensure that our impact on sustainable development broadly, is assessed when developing our own strategy for sustainable agriculture and food production	Rejected; sustainability issues were integrated by the committee

		§ Nortura challenges the basic premise that "In general, the environmental impact is less for plant-based products compared to animal-based sources of fat" for several reasons. 1. The article refers to one single source "Bajželj B, et al. The role of fats in the transition to sustainable diets. The Lancet Planetary Health. 2021». Although the article has searched a wide range of scientific studies between 2020-2021, the scientific articles researched are only published in English (and thus as ha biased towards research developed in English speaking regions). 2. Nortura generally agrees with the argument that the production of animal protein (and fats) generally generates higher climate emissions than some plant-based alternatives. However, this cannot be said when assessing broader environmental metrics, and certainly not when looking at a broader range of sustainability indicators across environmental, social and economic dimensions. Contrary to the statement in the article, resent research conducted by recognized research institutes (NMBU, NIBIO, SSB) conclude that the broad environmental impact of locally produced animal products are more sustainable than imported plant-based alternatives (across the nine planetary boundaries). 3. A major challenge facing the Norwegian agricultural sector is that "global" research or research conducted in other countries than Norway is often and uncritically transferable to or valid in Norway. However, this is not the case: - Cimate emissions: GHG emissions from Norwegian livestock production (SSB/NMBU/NIBIO) are approximately half of generic international estimates (FAO).	for the future. This is reflected in our "Sustainability strategy for 2030" released in May 2022. It is therefore critical that official guidance takes a similar responsible citizenship role and reviews impacts and data in the local and national context when providing recommendations for the public. Nortura, as one of Norways largest food producers and owned by 17.000 Norwegian small-scale farmers, is willing to work in close partnership with relevant governmental agencies and share all the assessments and data we have produced with regards to the impacts of our production to ensure that the recommendations presented in NNR2022 with regards to the environmental impact of our food products are determined correctly.	

		- Land use: In a country with only 3% arable land, and where 45% of land is suitable for grazing, it is less sustainable from a land-use perspective to import plant-based proteins produced in other countries (which in many cases result in soil degradation, deforestation, freshwater stress) than using Norway's own natural resources to produce animal protein. - Biodiversity: In Norway, 24% of red-listed species are dependent on grazing (Sabima). Henceforth, removal of grazing animals in Norway is a threat to biodiversity rather than a source (assessing threat to biodiversity cannot be meaningfully calculated on a global level) - Finally, regarding water footprint, it is far less sustainable to import plant-based alternatives (from regions experiencing severe and increasing water stress) than producing animal products in a country which does not an will not experience serious water shortages.		

11. Sweets

Name	Organization/Affiliation	General comments	Detailed comments	Comment from authors
Anne-Mette Nielsen	Nordic Sugar	General remarks 1. The authors refer to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars stating that EFSA stratified their results on added sugar (and free sugar) intake by sugar source (solid vs. liquid) to compare low and high added sugar intake on health outcomes. However, this was not the case, as EFSA's evaluation did not separate between foods and beverages (see studies below). Therefore, it is not appropriate to rate the effects of sweets and sugar-containing foods based on EFSA´s report, and EFSA's assessment should be deleted from this chapter. Effects of low added/free sugars intake vs high added/free sugars intake: Fasting glucose (19 studies: 8 mixed, 7 beverages, 4 foods) Total cholesterol (29 studies: 12 mixed, 7 beverages, 10 foods) HDL cholesterol (23 studies: 10 mixed, 7 beverages, 6 foods) Fasting triglycerides (29 studies: 11 mixed, 7 beverages and 11 foods) Uric acid (8 studies: 1 mixed, 3 beverages, 4 foods 2. The conclusions, abstract and the chapter does not summarise the evidence very well, and conclusions are contrary to the available evidence also found in the authors own literature review. a. EFSA did not separated between sugars in solid foods and sugars in beverages in their scientific opinion. The authors need to separate out results from solid foods and beverages on health outcomes. The general opinion among experts is that sugars in solid form better promote satiety compared to the	Page 3: Introduction 1. The authors statement "formerly known evidence for associations between sugars, sweets and bakery products and chronic disease…". a. Available evidence does not justify this statement which is also disproved by the systematic reviews included in this chapter. For example, different kinds of sweets (including chocolate, ice cream as well as different types of sugars) are not associated with the incidence of type 2 diabetes (Neuenschwander et al., BMJ 2019). b. Intake of sweets does not affect markers of glycemic control, blood uric acid levels or markers of non-alcoholic fatty liver diseases in controlled intervention studies (Choo et al. BMJ 2018, Ayoub-Charette et al., J Nutr, Lee et al., Nutrients 2022). c. In systematic reviews and meta-analyses sugars did not show any effect on body weight (Te Morenga et al., BMJ 2013, Fattore et al., AJCN 2017) under isocaloric conditions. Body weight increases if sugars are consumed as an excess source of calories. However, it is well-known that the effect of energy on body weight is independent of energy source (macronutrients) (Hall and Gou, Gastroenterology 2017). d. EFSA did not investigated the effects of sugar-containing food groups on metabolic diseases. Therefore, the authors statement should be rephrased or deleted. Page 6: Chocolate and bodyweight As sugar is only one ingredient contained within the food groups discussed in the chapter, it is imperative that the authors also make comment on the contribution of the other energy-containing ingredients (e.g., fat, starch) to energy intakes. Other ingredients which may be linked to detrimental health	Partly adjusted

		equivalent amount of sugars from beverages (Cassady et al., AJCN 2021, Houchins et al., Obesity 2012). This observation is considered in the Dutch Health Council, SACN and ESPGHAN guidelines and should be considered here. In the literature, evidence exists that the effects of sugars from solid and liquid foods are different (Almiron-Roig et al., Nutr 2013, Van den Boer et al., Foods 2017, Cheung et al., Curr Dev Nutr 2020, Zurbau et al., Curr Dev Nutr 2020). b. The conclusions of the authors own literature review of chocolate consumption on health outcomes, which shows mostly positive results – i.e., chocolate consumption seems not to effect body weight - should be mentioned in the conclusion. c. The conclusion should also mention – based on authors literature review – that sweets do not seem to be associated with incidence of type 2 diabetes mellitus as evaluated at the beginning of chapter "other sugary foods". d. Any detrimental health effects may not be due to sugars per se but rather the calorie content or dietary pattern associated with the consumption of these foods. The effect of energy on body weight is independent of energy source (i.e., independent of macronutrient source). Fat-content of these foods, and the possible implications to health in terms of calories and saturated fat, should be highlighted in this chapter. e. For sweets and sugary foods, the authors give only a limited indication of the certainty of the evidence in the summary and abstract (only provide a certainty for flavonoid-rich chocolate). A robust discussion is needed on the limitations inherent in the evidence base they have reviewed: Role of energy vs. role of sugars per se (whether trials were addition/substitution/ad libitum), sugars dosage,	effects (e.g., salt) should also be discussed. Calorie reduction should be the end goal of any reformulation target, reformulating these products to reduce the content of sugars may not bring any health benefit if the overall calorie content of these foods is not reduced. It is well-known that the effect of energy on body weight is independent of energy source (macronutrients) (Hall KD et al., Gastroenterology 2017). Page 8: Other sugary foods 1. The systematic reviews and meta-analyses of controlled intervention studies by Choo et al., BMJ 2018 and Ayoub-Charette et al. J Nutr., 2021 should be included in this paragraph since they have the highest quality of evidence, and published in the period during the literature search, and clearly show that intake of sweets have no impact on type 2 diabetes and gout. 2. The authors included EFSA´s final recommendation "based on the risk of development of chronic metabolic diseases and on dental health". However, the following point should be considered: a. EFSA´s analysis in only valid for added and free sugars in the range of 10 to 30%. Below this level, there is high uncertainty, and EFSA cannot make a scientifically validated statement on risk of various metabolic diseases. b. As dental caries is a multifactorial disease, it is an unscientific example to justify EFSA´s recommendation. It is well-known that dietary sugars are cariogenic, but this applies for all fermentable carbohydrates. The most important aspects for prevention of dental caries are regular toothbrushing with fluoridated toothpaste. This is evidenced by the development of children's dental health. Sweden, Denmark and Finland have experienced a decline in respectively: 78%, 92%, 82,5% in decayed, missing or filled teeth among 12-year-old-children between 1980-2019. For Estonia and Latvia the decline has been 34% and 50%. (WHO Europe. Health for all	

		participant population groups, food composition data etc. This helps to put the evidence in context. For example, addition trials which add extra calories to the baseline diet, can have different effects to substitution trials. f. Micronutrient dilution is briefly discussed. However, emerging evidence suggests that very low intakes of sugars (e.g., below 5% E) may also have nutrient-diluting effects (Yan et al., AJCN 2022). The authors need to consider this emerging evidence. The authors refer to Louie et al., Nutr. Rev, 2015. However, it concludes "despite the negative association between dietary added sugar and micronutrient intake, the magnitude of the association was mostly small to moderate, therefore…	Database & WHO Oral Health Country/Area Programmes, 2016. https://capp.mau.se/country-areas/ Full reference list is available on authors request.	
Helen Benson	UNESDA - Soft Drinks Europe	UNESDA, representing Soft Drinks Europe, agree with the authors on: • the general approach that has been taken, which was to defer to the recently published EFSA opinion on dietary sugars, with reference to more recent studies sourced via systematic search of the literature. • noting the difficulty in making food based dietary guidelines (FBDG) when limited scientific studies have been undertaken on many food groups which are either the highest or important contributors to sugars intake in Nordic and Baltic countries. The authors are undoubtedly aware of results of observational studies investigating multiple rather than single food groups which have shown that other sugars-containing food groups (as well as other food groups in general) may be associated with weight gain in children and adults1,2. EFSA considered that the main mechanism by which dietary sugars contribute to health outcomes is via excess energy intake leading to positive energy balance and body weight gain and thereafter increased risk of chronic metabolic disease. Thus, all sources of sugars, or indeed any energy-containing food group, if consumed in excess	• As noted by EFSA, their data on % contribution to added sugar intake in different age groups and countries (Table 3) is not up to date. This is most relevant to the soft drinks sector which has undertaken significant reformulation of soft drinks to contain no or lower levels of sugars. Our sales data suggests that in some Nordic countries >50% soft drink sales are low/no calorie, which is not reflected in EFSA data.1 More recent dietary surveys are available in Denmark, Sweden and Finland showing lower intake of SSBs. We suggest local data sources be used to reflect more recent intakes and composition. • Given the NNR2022 will be widely cited, we request the authors consider : o removing or expanding on comparing the potential difference in the satiating effects of solid sugary foods versus liquids (i.e. sugar-sweetened beverages), where the reference provided is a narrative review of some of the evidence 2 (p8). The EFSA panel also noted potential effects due to form of sugars but that the evidence was equivocal, and adverse effects for sugars from food but not beverage sources on many endpoints may oppose this claim.3 Although results of acute studies generally suggest that liquid preloads are more often associated with lower satiety and/or	Mainly rejected, parts related to EFSA opinion partly adjusted

		resulting in positive energy balance can result in weight gain and increase risk of metabolic disease. We therefore agree with a conclusion referring broadly to intake of sugary foods and drinks but suggest the authors consider referring in particular to excessive intake promoting positive energy balance. The authors might consider noting some important limitations of the EFSA opinion, including that much of the evidence on sugar-sweetened beverages (SSBs) came from observational studies - considered lower quality evidence being subject to higher risk of bias, mainly in the form of residual and unmeasured confounding and incomplete adjustment for energy intake. Adjustment for confounders can never be complete. It is well documented that high consumers of SSBs are more likely to have less healthy lifestyles, dietary patterns and consume more calories in general. and it is considered extremely difficult, if not impossible, to isolate effects of single dietary components from these other dietary and lifestyle factors 3,4. 1. Mozaffarian et al 2011 https://doi.org/10.1056/nejmoa1014296 2. Dong et al 2015 https://doi.org/10.1377/hlthaff.2015.0434 3. Khan and Sievenpiper 2016 https://doi.org/10.1007/s00394-016-1345-3 4. Ioannidis 2018 https://doi.org/10.1001/jama.2018.11025	incomplete energy compensation compared to other preloads, other factors can impact on this effect - inter-meal interval, volume consumed, context, expected satiety and study duration.4,5,6,7 We are only aware of intervention trials lasting weeks (4–8), which show no clear differences in effects on body weight between sugars as liquid vs solid.8 o contextualising or removing the statement that the evidence assessed by EFSA on SSBs was stronger than for other food sources of sugars (p9). We suggest the authors at least note their earlier point that most other sources of sugars could not be assessed by EFSA due to lack of research and heterogeneity of studies and so it is not possible to compare the strength of evidence. And again here it is relevant to note our general point that much of this evidence was from observational studies – widely considered lower quality evidence due to higher risk of bias. 1. Sales and Consumption – UNESDA 2. Pan & Hu 2011 https://doi.org/10.1097/mco.0b013e328346df36 3. EFSA Panel on Nutrition 2022 https://doi.org/10.2903/j.efsa.2022.7074 4. Almiron-Roig et al 2013 https://doi.org/10.1111/nure.12048 5. Appleton et a., 2021 https://doi.org/10.1111/obr.13234 6. Martin et al., 2015 https://doi.org/10.1016/j.appet.2015.06.007 7. McCrickerd et al., 2014 https://doi.org/10.1371/journal.pone.0100406 8. DiMeglio et al., 2000 https://doi.org/10.1038/sj.ijo.0801229 ; Houchins et al., 2012 https://doi.org/10.1038/oby.2011.192 ; Apolzan et al., https://doi.org/10.1371/journal.pone.0251700 ; Te Morenga et al. 2021 https://doi.org/10.3389/fnut.2021.636275	
Marleena Tanhuanpää	Finnish Food and Drink Industries' Federation	In the chapter it is referred to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars. It is not appropriate to rate the effects of		Rejected

		sweets and sugar-containing foods based on EFSA´s report. EFSA evaluated the effects of added and free sugars (and not the effects of food groups like sweets) on health outcomes, because of the challenges in quantifying sugar intakes from individual solid foods or food groups (Final EFSA opinion pages 52-53 "Reasons for not extracting data on added sucrose, added fructose or added sugars for individual solid foods or food group) and because the limited amount of evidence on the effects of different food sources. That is why EFSA's assessment should be deleted from this chapter. According to the authors own literature review, chocolate consumption seems not to effect body weight and sweets do not seem to be associated with incidence of type 2 diabetes mellitus. These perceptions remarks should be mentioned in the conclusion, too. The effect of energy on body weight is independent of energy source. Any detrimental health effects may not be due to sugars per se but rather the calorie content or dietary pattern associated with the consumption of these foods. What it comes to the micronutrient dilution, emerging evidence suggests that very low intakes of sugars may also have nutrient-diluting effects (Yan et al., AJCN 2022). This emerging evidence should be considered in the chapter, too.		
Anna Maria Karlsen	NHO Mat og Drikke/FoodDrinkNorway	The draft refers repeatedly to added sugars in beverages. However, this chapter is supposed to describe the background for setting recommendations for sweets and other sugary foods. We assume that sugar-sweetened beverages (SSB) will be discussed in the upcoming food group chapter 2. In our opinion, all references and discussions regarding SSBs should therefore be transferred to this chapter, and not be part of the chapter on sweets and sugary products. We also	p. 3 Introduction All chocolate, both milk chocolate and darker varieties, are prepared from the same cocoa beans with high amounts of flavonoids. p. 8 It is stated that commercially available milk chocolates have "quite low amounts of flavonoids". This claim should be followed by a scientific reference.	Partly adjusted

		have significant comments regarding the discussions on beverages in this draft. We will however comment on this in the upcoming chapter. One of the main references is the EFSA`s scientific opinion on tolerable upper intake level for dietary sugars. It is important to keep in mind that EFSA`s evaluation has limitations that should be carefully assessed. As an example, EFSA did not separate between sugars in solid foods and in sugars in beverages. The report is therefore not appropriate for use in the evaluation of health outcomes for sweets and sugary foods only. Second, EFSA`s analysis is only valid for added and free sugars in the range of 10-30 %. There is no validated evidence for the risk of metabolic diseases for intakes below 10 % added and free sugars because of high scientific uncertainties. The text should be consistent regarding the correct use, and definitions, of "cocoa" vs. "cacao".	p. 11, Table 1 The numbers in this table refer to the Swedish food agency database. The content of fibre in milk chocolate and chocolate with ≥ 70 % cacao is set to 0 g. However, there is commented in the database that these values are estimated, and not analysed, because of analytical constraints. On the other hand, the values in the Norwegian food database are estimated 3 and 2 g of fibre, respectively. Cocoa does contribute to dietary fibre. Moreover, the values for sugars in Table 1 refer to total sugars, and not added sugars. Parts of the total sugars in products containing milk are naturally occurring, and not added. This should be informed in a footnote and in the discussion.	
L. M. Granskog	concerned citizen	General comments (links to reference articles follow the sentence) No mention is made of what the "sugar" being discussed actually includes. Does it include any fructose-containing sweetener; sucrose, high-fructose corn syrup, maple syrup, honey, agave? There are apparently over 250 names for added sugar used in processed food and beverages (https://hypoglycemia.org/added-sugar-repository/). How are people supposed understand what they're eating? The greatest sources of excessive added sugar in the diet are ultraprocessed foods according to references provided in the detailed comments. SSB (sugar sweetened beverages) are barely discussed in this chapter, even though they too are a significant source of excessive sugar. The chapter on sugar is mostly about chocolate. Cocoa powder happens to be one of the richest sources of magnesium, potassium, and phosphorous I know of. The discussion of sugar	Detailed comments (links to reference articles follow the sentence) Quote from page 1. "This chapter describes the totality of evidence for the role of sweets and other sugary foods for health-related outcomes as a basis for setting and updating food-based dietary guidelines." The chapter is mostly about chocolate. It fails to mention the main source of excessive added sugar in the diet, ultraprocessed foods. Lee et.al. (2022) reviewed data on the American diet from 1800 to 2019. They found that processed and ultra-processed foods have dramatically increased during the last two centuries from less than 5 percent of foods to more than 60 percent. There has been a large increase in consumption of sugar, white and whole wheat flour, rice, poultry, eggs, vegetable oils, dairy products, and fresh vegetables. Polyunsaturated fats from vegetable oils have increased while saturated fats from animal sources have declined. The rise in Non-	Rejected

		is mostly about one of the most nutritious foods it occurs with. The subject of sugar clearly encompasses more than sweets, chocolate and sweet bakery products. One study investigating caloric and noncaloric sweeteners in US consumer packaged foods found that caloric sweeteners were present in 74% of them (https://doi.org/10.1016/j.jand.2012.07.009) If caloric sweeteners are added to most ultraprocessed food, the only way to avoid most of this sugar is to avoid most ultraprocessed food. Articles advising the regulation of sugar (here meaning a whole range of caloric sweeteners) are not discussed. Some examples can be found at the following links (https://doi.org/10.1038/482027a) (https://doi.org/10.3390/nu12113401). The quality evaluation of food should reflect the ability of the food to supply essential nutrients for humans while maintaining energy balance. How did we get to this absurd state of affairs, where beef is considered by "experts" to be a less healthy food than sugar? The dietary recommendations in EAT Lancet and the Food Compass, which apparently allow more sugar than beef are mind boggling. Moderate differences in disease risk based on questionable studies rife with confounding and other issues such as the reliability of food frequency questionnaires do not justify eliminating foods that provide digestible essential nutrients required for survival in the amounts needed. The points brought up here are relevant to the discussion of sugar. Most of the added sugar in the diet is coming apparently from ultraprocessed foods. Cornflakes which can cause unhealthy blood sugar spikes even in healthy people apparently rates as a higher quality food than a cheeseburger, according to nutritional advice from "experts" (https://doi.org/10.1371/journal.pbio.2005143) (https://now.tufts.edu/2021/10/14/ranking-healthfulness-foods-first-worst) Approximately half the population of the US has either diabetes or pre-diabetes	communicable diseases (NCDs) parallels the increased consumption of processed foods, including sugar, refined flour, rice, and vegetable oils, while the consumption of saturated fats from animal sources was inversely correlated with NCDs. (https://doi.org/10.3389/fnut.2021.748847). Martínez Steele E. et.al. (2016) found that approximately 90% of the energy intake from added sugar in the diet was coming from ultra-processed foods, and that decreasing the consumption of ultra-processed foods would be an effective way to decrease excessive added sugar consumption in the US (http://dx.doi.org/10.1136/bmjopen-2015-009892). Meanwhile we now have well known researchers in the field of nutrition trying to tell us that sugar sweetened beverages are more healthy to consume than beef and the basis for this evaluation of foods has apparently been published in Nature Food (https://now.tufts.edu/2021/10/14/ranking-healthfulness-foods-first-worst) (https://www.nature.com/articles/s43016-021-00381-y) A multivariate analysis of fast food transactions found that only soft drink intake is correlated with changes in BMI; not animal fat products (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3949530/pdf/BLT.13.120287.pdf/). The EAT Lancet diet also allows for more kcal from added sugar (120) per day than beef, lamb, pork, chicken, other poultry and eggs combined (111 kcal) (https://doi.org/10.1016/S0140-6736(18)31788-4). Beef has a DIAAS (Digestible Indispensable Amino Acid Score) score of over 1, roasted peanuts have a DIAAS score of 0.434, yet we are expected to believe that a peanut butter and jelly sandwich is more nutritious than a cheeseburger (https://doi.org/10.1017/S1751731116000902) (https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score) (https://now.tufts.edu/2021/10/14/ranking-healthfulness-foods-first-worst) SSB (sugar sweetened beverages) an important source of health problems are barely discussed, even though they are	

		(https://jamanetwork.com/journals/jama/fullarticle/2434682).	an important source of added sugar. They are a major source of added sugar in the diet globally, and are a significant source also in some Nordic countries (https://www.ahajournals.org/doi/10.1161/CIRCULATIONAHA.114.010636) (https://www.nature.com/articles/s41574-021-00627-6) (https://www.mdpi.com/2072-6643/11/2/211).	
Rikke Bekker Henriksen	DI Fødevarer (Dansk Industri)	Thank you for giving us the opportunity to comment on NNR chapter "Sweets and other sugary foods". We have a few general comment regarding the reference to the EFSA's scientific opinion on Tolerable upper intake level for dietary sugars. The EFSA opinion has some limitations, which should be taken into consideration and be assessed in the chapter. A) EFSA did not separate between sugars in solid foods and in sugars in beverages. The report is therefore not appropriate for use in the evaluation of health outcomes for sweets and sugary foods only. B) EFSA`s analysis is only valid for added and free sugars in the range of 10-30 %. There is no validated evidence for the risk of metabolic diseases for intakes below 10 % added and free sugars because of high scientific uncertainties. Therefore, it is not appropriate to rate the effects of sweets and sugar-containing foods based on EFSA´s report, and EFSA's assessment should not be applied in this chapter.		Rejected
Elisabet Rytter	Livsmedelsföretagen	The chapter includes added sugars in beverage although it should be the base for food guidelines for sweets and other sugary foods. In our opinion all discussions and references regarding sugar-sweetened beverages (SSB) should be transferred and included in Food group chapter 2; Beverages, and not be part of this chapter on sweets and sugary products. The EFSA's scientific opinion on Tolerable upper intake level for dietary sugars is a central reference	Our comments regarding SBB is the following: As noted by EFSA, their data on % contribution to added sugar intake in different age groups and countries (Table 3) is not up to date. This is most relevant to the soft drinks sector which has undertaken significant reformulation of soft drinks to contain no or lower levels of sugars. Sales data suggests that in some Nordic countries >50% soft drink sales are low/no calorie, which is not reflected in EFSA data. More recent dietary surveys are available in Denmark, Sweden and Finland showing lower intake of SSBs.	Partly adjusted

		and base for the chapter but the opinion has limitation. EFSA evaluated the health effects of added and free sugars and not the effect of food groups because of: (i) the challenges in quantifying sugar intakes from individual solid foods or food groups (See Final EFSA opinion page 52-53 "Reasons for not extracting data on added sucrose, added fructose or added sugars for individual solid foods or food group) (ii) the limited amount of evidence on the effects of different food sources. Therefore, EFSAs findings should not be applied to sweets and other sugary foods.	We suggest local data sources be used to reflect more recent intakes and composition. Current text "Sugar sweetened beverages contribute with approximately 30% of sugar intake among adolescents and adults" should be updated. The text should be consistent regarding the correct use, and definitions, of "cocoa" vs. "cacao". p. 3 Introduction Current text "This is because dark chocolate is prepared from cacao seeds which contain high amounts of flavonoids, such as epicatechin, catechin, procyanidins, anthocyanins and flavanols" could be misleading. All chocolate, both milk chocolate and darker varieties, are prepared from the same cocoa beans with high amounts of flavonoids. The correct name is cocoa bean, not seed. p. 8 It is stated that commercially available milk chocolates have "quite low amounts of flavonoids". On page 3; Introduction is mentioned that milk chocolate had 70 g/100g. If this is quite low compared to 170 m/100 g in dark chocolate need to be evaluated.	

12. Infant feeding

Name	Organization	General comments to the chapter	Spesific comments to the chapter	Comment from authors
Ellen Ulleberg	Norwegian Dairy Council	We thank the NNR committee for the opportunity to respond to the draft of the chapter on infant feeding.	The overall chapter is well written and balanced, including the section where the authors discuss plant-based diets. Nevertheless, while the text for the most part refers to plant- based drinks as such (drinks, not milk), on page 16 it is written "In many, but not all, plant-based milks and gurts..". We ask that the authors align with The Codex General Standard for the Use of Dairy Terms where it is clearly stated that milk is a term reserved for "normal mammary secretion of milking animals obtained from one or more milkings" (1), and thus the authors should avoid naming drinks/beverages of plant origin, milk. 1. Joint FAO/WHO Codex Alimentarius Commission. Codex Alimentarius. General standard for the use of dairy terms (CXS 206-1999)	This has now been changed throughout. Thanks for pointing it out.
Merete Myrup Christensen	Danish Agriculture & Food Council	See specific comments	Dear NNR committee, Thank you for the opportunity to comment on this draft. From the Danish Agriculture & Food Council, we see several concerns on a general level and want to bring your attention to the following aspects and issues: Specific comments: • Page 11, bottom paragraph: "Infants and young children have small stomachs, and enough space should be ensured for energy- and iron rich foods like whole grain porridge, bread, lentils, beans, nuts and seeds for the infant to meet energy and nutrient needs." Comment:	We have now clarified this and added a reference (ref 20 in the draft used for the public consultation). The text now reads (new text in italics): A summary of existing guidelines from a range of health or government organizations from e.g., the USA, Europe, New Zealand and Australia conclude that well planned vegetarian and vegan diets, including relevant supplementation and fortified foods, are nutritionally adequate and appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, and childhood (National Academies of Sciences, 2020). We have now added "at least" so the text both in the table and the

			The listed iron rich foods do not include any animal products. It is well established that meat is a major source of iron. Official recommendations in Denmark focus on introducing meat and eggs at 6 months to ensure iron in the diet. Have these foods intentionally been left out? References: https://www.sst.dk/da/sundhed-og-livsstil/ernaering/~/media/2986643F11A44FA18595511799032F85.ashx • Page 14, button paragraph: 70). "It is now generally agreed that well planned vegetarian and vegan diets, potentially including relevant supplementation, are nutritionally adequate and appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, and childhood." Comment: Are there any references for this statement? Official recommendations in Denmark advise against a vegan diet for children below 2 years, arguing that it is difficult for children at that age to get the basic nutritional needs fulfilled on a plant-based diet only. References: https://www.sst.dk/-/media/Udgivelser/2020/Mad-til-smaa---fra-maelk-til-familiens-mad.ashx?sc_lang=da&hash=3AD2B92600BE6547225110CE8FE42048 • Page 28, table: "Vitamin D should be given to all children from 1-2 weeks of age until 2 years of age. (10, 21, 22)" Comment: In Denmark it is advised that children take a	footnote reads "Vitamin D until (at least) 2 years of age".

			supplement until 4 years of age and all others during the winter References: https://sst.dk/da/viden/forebyggelse/ernaering/anbefalinger-om-d-vitamin	
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc)	Finnish Vegan Association	No general comments.	Page 2. It's noteworthy that the vitamin D concentration of breast milk depends on maternal vitamin D intake. When maternal vitamin D intake is approximately 50-100 µg/day, breast milk vitamin D concentration results in vitamin D sufficiency in breast-fed infants. References: Basile LA. The effect of high-dose vitamin supplementation on vitamin D serum levels and milk calcium concentration in lactating women and their infants. Breastfeeding Medicine 2006;1:27-35. Available: https://www.liebertpub.com/doi/abs/10.1089/bfm.2006.1.27 March Km et al. Maternal vitamin D3 supplementation at 50 µg/d protects against low serum 25-hydroxyvitamin D in infants at 8 wk of age; a randomized controlled trial of 3 doses of vitamin D beginning in gestation and continued in lactation. American Journal of Clinical Nutrition 2015;102:402-410. Available: https://academic.oup.com/ajcn/article/102/2/402/4564562 Oberhelman SS et al. Vitamin D supplementation to improve the vitamin D status of breast-fed infants: A randomized controlled trial. Mayo Clinic Proceedings 2013;88:1378-1387. Available: https://www.sciencedirect.com/science/article/pii/S0025619613008318 Page 4. Vitamines > vitamins Page 5. It should be emphasized here, that the	According to NNR 2012, the recommended daily intake is 10 µg/day for everyone (including pregnant and lactating women) aged 6 months to 74 years, and the upper level for adults and adolescents aged 11-17 years is set at 100 µg/day. As vitamin D-supplementation for infants has a long tradition in the Nordic countries vitamin D supplements to the infants is judged to be safer than high-dose supplements to the breastfeeding mother. Page 4: corrected. The text now reads: "When the breastfed child of a vegan mother is no longer exclusively breast fed, or the mother's nutritional status is uncertain, the child should receive a supplement containing vitamin B12 and iodine. When the child begins with solid foods, they should also be given DHA in the form of algae oil (vegetarian omega 3). EFSA suggests 100 mg/day as Adequate Intake (AI) for children aged between 6-24 months, and 250 mg from 2 to 18 years (EFSA, 2010)." We removed mentioning vitamin D in the first sentence as vitamin D is thouroughly discussed a few paragraphs earlier. We think it is better to use the wording no longer exclusively breastfed than specifically stating 6 months as the starting point for supplementation.

			vitamin B12 and iodine supplements for vegan baby must start at age 6 months, when a vegan baby is introducing to solid foods, and vitamin D supplementation at the same age as others. It would be useful to mention the dosage of DHA-supplement here. The Finnish Vegan Association recommends a supplement of 200 mg/day of DHA for pregnant and lactating vegans. So far, we haven't had a DHA recommendation for vegan children. Page 8. Plant-based infant formula is not nutritionally equivalent to plant-based milk alternatives (oat-, soy, - almond etc. based) or to homemade mixtures. Of course, plant-based milk alternatives and home-made "milks" are not suitable alternative for breast milk and should not be used during the first year of life, except of small amounts in food. As mentioned in page 16, at present there are no vegan infant formulas available in Nordic countries. Globally, the situation is not like this. Plant-based infant formulas are also available in Europe, and their nutritional content is made according to EU-registration. These formulas are alternative for vegan baby in case in where breast feeding is not option. Page 11 and 15. Seed are mentioned here, but their nutritional role is insignificant in infant nutrition, because due to possible heavy metal traces seed are not recommended (at least in Finland) for infants. The recommended maximum number of seeds from one year is only one tablespoon/d. Page 15. Why a word "potentially"? Some supplements are necessary in vegan diet, not potential. In page 15 it is referred to a study (reference 71) in which were only 6 vegan children, and two of	

			them were siblings. The Finnish Vegan Association has been published a press release of the study: https://vegaaniliitto.fi/pressrelease-nutritional-study-vegan-children/ We emphasized that because small number of vegans conclusions should be drawn with caution. However, neither Vitamin A, nor vitamin D deficiency was not found in vegan children. The method used to measure vitamin A status in this study also raised a critical question. Instead of this small study, we recommend using as a reference larger VeChi Diet study and its conclusions: Weder S et al. Energy, macronutrient intake, and anthropometrics of vegetarian, vegan and omnivorous children (1-3 years) in Germany (VeChi Diet Study). Nutrients 2019;11(4):832. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6521189/#!po=31.0811 Page 15. Plant-based milk alternatives is more exact term than plant-based drinks because drinks may also refer juices.	
Johanna Kaipiainen (M.Sc, RD), Charlotta Hyttinen (M.Sc),	Finnish Vegan Association	No general comments, but our following detailed comments are a continuation of the previous form.	Page 16. "Strict vegan": A word "strict" is unnecessary and a little bit prejudiced because a word "vegan" is unambiguous, meaning a person who do not use any animal products. Plant-based infant formulas are alternative for vegans if breast-feeding or cow-milk-based formulas are not option but getting them another country may need extra efforts. manifold > manyfold It's noteworthy, that many oat-based milk alternatives are nowadays fortified with iodine. Amount of iodine in oat-based milk alternatives varies from 16 to 22.5 µg/100 g. Children under 7 can be easily exceed the tolerable upper limit for	Yes, you´re very right - badly formulated by us. We have now changed this so it reads: "Plant-based infant formulas are at present not available in stores in the Nordic countries, although it may be purchased online. Plant-based milk alternatives such as soy, oat, and almond drinks, and home-made milk alternative mixtures should not be given to infants during the first year, except in small amounts mixed with other foods. We have now removed seeds as an example of good source of iron. Yes of course - sorry. The word "potentially" now removed.Thank you for the comments about the small Finnish study, and for the

			iodine (200-250 µg/g set by EFSA) if they use more than 5 dl iodized oat-based milk alternative and same time the iodine supplement is in use. Page 17. Bioavailability of vitamin B12 from seaweed and fermented vegetables is not questionable. The answer is clear: there is no vitamin B12, but analogues, that are from useless to harmful. It should be emphasized here, that seaweed and fermented food are not source of vitamin B12.	suggestion of another reference. The Finnish study was used as we thought it could be an example showing that planning vegan meals for children can be difficult even when health professionals plan the meals. We had missed your press release and we agree that it wasn´t a very strong study and better replaced. Agree - as the text also mention gurts here, we changed to "plant-based alternatives for milks and gurts". The word "strict" is now removed. We´ll keep manifold. The text reads "the levels of fortification of similar foods can wary manifold ". Used as adjectives the difference between manifold and manyfold is that manifold is "various in kind or quality, diverse", while manyfold is many. The text about fortified plant-based foods in section 6.4 have now been extended and now reads (new text in italics): "Parents therefore need to read the information on packages carefully, so their children do not exceed tolerable upper limits of nutrients (e.g., iodine) through eating a combination of fortified foods with high levels of fortification, especially if they also eat supplements." The text about fortified plant-based foods in section 6.4 have now been extended and now reads (new text in italics): "Parents therefore need to read the information on packages carefully, so their children do not exceed tolerable upper limits of nutrients (e.g., iodine) through eating a combination of fortified foods with high levels of fortification, especially if they also eat supplements.".

				Page 17: This has now been changed according to suggestion.
Katrine Ejlerskov	Dansk Vegetarisk Forening / The Vegetarian Society of Denmark	Overall, I find that the chapter is inclusive in it's mention of children eating a vegan diet, while also emphasizing the importance of informed parents and correct guiding if parents choose this diet for their children.	1. Plant-based infant formulas or milk-like beverages such as soy, oat, and almond drinks, and home-made milk mixtures should not be given to infants during the first year, except in small amounts mixed with other foods (10). Comment: There are soy-based infant formulas on the European marked that are approved. 2. All children ate a large proportion of their daily meals within the Finnish public daycare system where all meals served were planned by nutritionists, i.e. the meals were well planned. Despite this, clear effects on metabolism, as well as vitamin A insufficiency and border-line sufficient D status were seen among the children eating a vegan diet, although there was no difference in growth between the groups. Comment: It would be relevant to have a short elaboration of the 'clear effect on metabolism'. 3. Nutrients that require extra attention are vitamin B12, vitamin D, iron, iodine, selenium, zink, calcium, omega-3 (DHA) and protein (see the respective chapters for more details). For B12 and several of the other mentioned nutrients, supplements or fortified foods are necessary to meet nutritional requirements. Comment: Since the Finnish study found that the children had a vitamin A deficiency, I think this should be mentioned here as a nutrient that require extra attention. 4. For strict vegan families where the infant requires more milk than breastmilk the options are limited. At present there are no vegan infant formulas available in the Nordic countries,	1. You are very right - the text has now been changed and reads: "Plant-based infant formulas are at present not available in stores in the Nordic countries, although it may be purchased online. Plant-based milk alternatives such as soy, oat, and almond drinks, and home-made milk alternative mixtures should not be given to infants during the first year, except in small amounts mixed with other foods. 2. The Finnish study was used as we thought it could be an example showing that planning vegan meals for children can be difficult even when health professionals plan the meals. We had missed a press release by the Finnish Vegan Association (https://vegaaniliitto.fi/pressrelease-nutritional-study-vegan-children/) pointing out a number of weaknesses with the study som we have decided to replace this study. 3. see previous comment. 4. The last sentence starting "The only option..." is now removed.

			although soy formula may be purchased online. The only option when formula is needed may thus be formula based on cow´s (or goat´s) milk. Comment: As you write, soy formula can be purchased online, thus, vegan infant formula IS available (modern parents are able to shop online). This sentence should be reframed. The only option is not formulas based on cow's/goat milk. In Denmark, https://plantebaby.dk/ supply vegan parents with soy-based infant formula.	
Anna-Lena Klapp	ProVeg International	-		
Carina Kronberg-Kippilä	This answer is given as private person (my employer is Danone Oy).	Thank you for this comprehensive chapter on infant feeding. It's highly relevant to discuss both breastfeeding and the importance of First 1000 Days.	* p. 4, 4.2: - Individual needs of the child and how to take them into account could be discussed here as well. - If infant formula is used, please, mention appropriate guidance to families for safe use of it and also the selection of the formula based on the infant's needs. - In the second chapter: Because of low enzymatic activity the synthesis of all LCPUFA from essential fatty acids is not fully happening during the first months of life, also because of some genes there is lower synthesis. This is why DHA and ARA need to be added to infant formula for the support of needs in the brains, nervous system and retina. There has been some discussion about adding ARA after EFSA's recommendation (2016) of adding DHA (content should be 20-50 mg/100 kcal (0,5-1 % of total fatty acids)) to infant formulas but not necessarily ARA. Importance of adding both DHA and ARA to infant formula has been stated by many international expert groups after that: Campoy C, et al. 2021.	Thanks for commenting. In section 4.2 it is mentioned that "When feeding breastmilk is not an option, parents should be given guidance to feed commercial infant formula to their infants." We think that in this recommnedation, it is not possibe to go in very detailed situations (of what kind of formulas should be selected). Essential fatty acid in formulas are discussed in some detail in section 5 (Formula feeeding). Thank you for bringing up the iron in formulas. We have added more information of iron under section 4.2 with the following sentences: By age 6 months, most breastfed infants require an external source of iron and complementary foods should include foods with sufficiently high iron content (e.g., meat, egg, whole grain cereals and bread, lentils, beans, and nuts). Formula-fed infants should receive iron-fortified formula in addition to solid foods (Domellof, 2011 ;Fewtrell, 2017). The statistics from Finland is already

			* p. 5, Iron: - What about the needs of formula-fed infants? Based on Domellöf M 2011 formula-fed infants need iron-fortified formula. Also low-birth weight infants need special attention to iron intake. When infant is introduced to complementary foods then also the quality of the diet and foods rich in iron should be considered. Also a position paper by ESPGHAN (Fewtrell M, et al. 2017) has highlighted this same topic and the need to follow iron intake of infants and use iron-rich or fortified foods or even supplements when the intake is inadequate compared to needs. * p. 7, 1st chapter: - Would it be good to also mention some of the results from the Finnish report here: Ikonen R, et al. (2019): "50 % of babies aged 4 months were exclusively breastfed and 15 % were not breastfed at all. 77 % of 6-mo.-old babies were breastfed. 58 % of babies nearing the age of one were breastfed. Both exclusive breastfeeding and breastfeeding have become more common since 2010. The prevalence of exclusive breastfeeding of 4-mo.-old babies increased by 26 % and the breastfeeding of 11–12-mo.-old babies by 21 %." (Ikonen R, et al. Imeväisikäisten ruokinta Suomessa vuonna 2019 [Infant feeding in Finland 2019]. National Institute for Health and Welfare (THL). Report 11/2020. Helsinki, Finland 2020. (English abstract available)) * p. 7, 5: - Good to mention here what should be done if the infant is over 4 mo. and for some reason breastfeeding is not possible. Solid foods alone is not an option, nor regular cow's milk yet. * p. 8, 1st chapter:	included both in the text (but descriobed with other words) and in Table 2 Beastfeeding statistics. Thanks for commenting. Our wording was unclear and has now been changed. We are not going into details about ingredients of infant formulas. Human milk oligosaccharides (HMO) is mentioned under section 4.2 Content of nutrients and other components in breastmilk , Section 5 Formula feeding - mention?and we used term HMOs for both naturally an manufacrured humna milk oligosaccharides like Salminen et al. do. We have revised the text taking the comments into consideration.

			- The correct term is Human identical Milk Oligosaccharides (HiMOs). Most of the scientific evidence is coming from adding scGOS and lcFOS in infant formula and the effects of adding these and not yet from HiMOs. This is stated in an expert consensus statement by ISAPP (The International Scientific Association for Probiotics and Prebiotics) (Gibson GR, et al. 2017) but also in an article by Salminen et al. 2020. - Could be good to explain in this context as well why these ingredients are added to infant formulae: in order to get more similar effects to breastfed infants (e.g. Fiocchi A, et al. 2021, Salminen S, et al. 2020). * p. 8, 3rd chapter: - In Finland regular cow's milk and breadspreads are fortified with vit D. Infants approaching 1 year of age also use fortified fermented milk products. * p. 9, 6: articles on intro of food & risk of allergy: Obbagy JE, et al. 2019, Larson K, et al. 2017 * p. 10, 2nd chapter: good to raise some successful programs that have supported the acceptance of bitter taste of vegetables, like SAPERE and HabEat. * p.12, 6.2: Taste is also important for the use of the infant formula (e.g. Miraglia Del Giudice et al. 2015, Maslin K et al. 2018) * p. 16, 1st row: injections should be the last option in this list? * p. 21, 7.7: see also GA2LEN and DRACMA guidelines. * p. 22: add WAO guidelines Cuello-Garcia CA, et al. 2016 and Fiocchi A, et al. 2015 - add text on gut microbiota and immunity, eg Hammond AM et al 2021	

Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We have noticed that there are several references in the text to plant-based foods as sustainable choices. Vegetarian and vegan diets are also extensively discussed. As the NNR2022 background papers regarding sustainability aspects are not completed, we find it premature to conclude sustainability at this stage and ask that the chapter be more balanced. This would also include listing animal foods, i.e. meat, poultry, eggs, fish, and milk, as essential components for introducing a diversified diet to infants.	None	Text is revised and the comments taken into consideration
Malén Gudbrandsgard	MatPrat	Dear NNR Committee, we thank you for this opportunity to comment on the draft of the infant feeding. Here are our comments: The authors of the chapter state that the purpose is to describe the evidence related to the role of infant feeding on health outcomes, and we question why the importance of introducing a diversified diet, and what this means, is not more highlighted. Breastmilk is a natural, sustainable and healthy way to feed an infant during the first months of life. At 6 months of age the infant would need complementary foods. When it comes to introducing solid foods, a variation of food from all the food categories is crucial to prevent vitamin A-, vitamin D- and iron deficiency. As the authors state on	no comments.	the text has been revised taking the comments above into consideration.

		page 17 «Deficiencies during the first two years may cause permanent damage». We kindly suggest that the authors to mention on page 17 that animal food, such as meat, meat products, eggs and milk together with the other dietary sources. The main sources of iron in the diets of infants who were not breastfed at 12 months of age in Norway was; industrially produced porridge (37%), infant formula (18%), bread (10%) and dietary supplements (8%). The baby is born with a store of iron in the body, but breast milk contains little iron, so after about 6 months the baby's iron stores are empty. It is therefore important that the first food contributes with sufficient amounts of iron. The authors should also include meat and eggs as examples of iron rich foods on page 11 (1). On page 9 the authors state that «..gradual transition into a diversified diet is recommended». We kindly ask the authors to specify that this involves a varied diet, which can include both plant and animal foods. The chapter has an overall emphasizes a plant-based diets to infants. However, when it comes to introduction of solid foods it is recommended to introduce both animal and plant-based food (2). Complementary foods should be rich		

		in nutrients and given in adequate amounts. At six months, caregivers should introduce foods in small amounts and gradually increase the quantity as the child gets older. The composition of plant-based diets usually results in a high fiber and relatively low energy content. Young children should therefore receive a variety of foods, including meat, poultry, fish or eggs (2). References: 1. Folkehelseinstituttet, 2020 spedkost-3---barn-12-mnd-alder.pdf (fhi.no) 2. World Health Organization, 2011 Child health: Recommended food for the very early years (who.int) 3. Stephenson J, Heslehurst N, Hall J, Schoenaker DAJM, Hutchinson J, Cade JE, Poston L, Barrett G, Crozier SR, Barker M, Kumaran K, Yajnik CS, Baird J, Mishra GD. Before the beginning: nutrition and lifestyle in the preconception period and its importance for future health. Lancet. 2018 May 5;391(10132):1830-1841. doi: 10.1016/S0140-6736(18)30311-8. Epub 2018 Apr 16. Erratum in: Lancet. 2018 May 5;391(10132):1774. PMID: 29673873; PMCID: PMC6075697.		
Karianne Spetaas Henriksen	Animalia	Although several plant-based foods are high in proteins and micronutrients the bioavailability in plant foods is generally lower. A Swedish study found that several	The date for the literature search is missing in the method section of the chapter. We kindly ask the authors to include this.	the text has been revised taking the comments above into consideration.

		plant-based products have a high content of phytic acid. This inhibits the absorption of iron and zinc (1). There is a lack of evidence on the health effects of plant-based diets in infants and young children, and there is not enough research to recommend plant-based diets to these groups (2). As the authors of the chapter state on page 15 «..it is difficult to extrapolate from studies on adults as children need a more nutrient dense diet than adults to ensure normal growth and development". The concept of the first 1000 days emphasizes the importance of different factors during pregnancy and the first two years of life for later health. Several studies show that micronutrient supplementation starting in pregnancy can correct important maternal nutrient deficiencies, but effects on child health outcomes are disappointing (3). It is therefore important that infants eat foods that contain the nutrients they need, and foods that are nutrient dense instead of basing recommendations on supplements. This is an important issue and we kindly suggest that the authors highlight this. We would recommend that references from World health Organization Child health: Recommended food for the very early years (WHO, 2011), and from		

		Unicef: Indicators for assessing infant and young child (Unicef, 2021) be included in this chapter. Finally, the chapter authors randomly include some comments on sustainability in relation to infant feeding. Sustainability is a very complex topic that deserves rigorous science and a systematic and transparent evaluation of the evidence. As the NNR background papers on sustainability are not finalized, we are enquireing how the authors can make statements on what is a sustainable infant diet. Furthermore, NNR states in the chapter disclaimer that any relevant sustainability aspect will be integrated in the main NNR report. References: 1. Mayer Labba, I.-C.; Steinhausen, H.; Almius, L.; et al. Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market. Nutrients 2022, 14, 3903. https://doi.org/10.3390/nu14193903 2. Bärebring et al (draft). Vitamin B12 Systematic review for the NNR 2022_draft. 2022. 3. Stephenson J, Heslehurst N, Hall J, Schoenaker DAJM, et al. Before the beginning: nutrition and lifestyle in the preconception period and its importance for future health. Lancet. 2018 May 5;391(10132):1830-1841. doi: 10.1016/S0140-6736(18)30311-8. Epub 2018 Apr 16. Erratum in:		

		Lancet. 2018 May 5;391(10132):1774. PMID: 29673873; PMCID: PMC6075697.		
Anna Ottenblad	Nutricia c/o Danone Nordics and Baltics	No comments	INFANT FEEDING: * p. 4, §3: Preferably, infant's individual needs should also be addressed here. It would be good to list which details/information should be given to families so that the use of the infant formula is safe and corresponds to infant's needs. * p. 4, §4: Suggestion to also here mention that the synthesis of all LCPUFA including DHA and arachidonic acid (ARA) from essential fatty acids (linolic and alpha-linolenic acids) is not 100% in the first months of life due to low enzymatic activity. There are also some genetic variations that might lead to lower synthesis. Thus, DHA and ARA need to be added to infant formula in order to support the needs for brain, nervous system and retina. The addition of ARA has been controversial after EFSA recommendation in 2016 that infant formulas and follow-on formulas must contain 20-50 mg of DHA/100 kcal (0.5-1 % of total fatty acids, which is higher than in human milk and the majority of infant formulas in the market), and it is not necessary to add ARA. Several international expert groups have thereafter stated the importance of adding both DHA and ARA to infant formula. (Ref: Campoy, et al. Nutr Hosp. 2021;38:1101-1112) * p.5, §1: Suggest to also include discussion about formula-fed infants and infants that are over 6 months of age, with regards to the Domellöf publication (2011): "...estimated daily iron requirements at the age of 6-12 months (0.9-1.3 mg/kg body weight) are higher than during any other period of life... Formula-fed infants should receive iron-fortified formula.	Thank you for these comments . Section "Formula feeding" is now revised and these comments have been taken into consideration.

			Low birth weight infants should receive additional iron supplements from an early age. From 6 months of age, all infants should receive a sufficient intake of iron-rich (complementary) foods, which may be meat products or iron-fortified foods." (Ref: Domellöf M. Ann Nutr Metab 2011;59(1):59-63.) This issue has also been highlighted by ESPGHAN position paper on complementary feeding, by the following: "based on theoretical calculations, the ESPGHAN CoN recently suggested the dietary iron requirement to be 0.9 to 1.3 mg · kg−1 · day−1 from 6 to 12 months (31) consistent with recommendations from other authorities for infants ages 6 to 12 months which range from 6 to 11 mg/day (16). The relatively high estimated dietary requirements may not be achievable in practice without using fortified foods, iron-supplemented formulas, or iron supplements." (Ref: Fewtrell, et al. J Pediatr Gastroenterol Nutr 2017;64:119-132.) * p.7, §3: To the section on formula feeding, there seems to be a lack of information for a situation where the infant is over 4 months of age and no breastfeeding is possible. Solid foods will not be enough alone (if breastfeeding is not possible) and regular cow's milk should not be introduced either. It could be good to add information on what is recommended in such situation/category of infants. * p.8, §1: The most scientific evidence is behind adding short chain galacto-oligosaccharides and long chain fructo-oligosaccharides in the infant formula and of its effects, and not yet behind adding human-identical milk oligosaccharides (HiMOs) according to an expert consensus statement by ISAPP (The International Scientific Association for Probiotics and Prebiotics). (Ref:	

			Gibson GR, et al. Nat Rev Gastroenterol Hepatol. 2017;14(8):491-502.) Please see also Salminen, et al. Nutrients 2020;12(7):1952. The stated examples of added constituents should ideally mirror this scientific evidence basis. Here it would also be good to explain WHY addition of probiotics, prebiotics or other: i.e., in order to get more similar effects to breastfed infants (Ref: Fiocchi A, et al. Nutrients 2021;13(11):3795. Salminen S, et al. Nutrients 2020;12(7):1952.) Also, consider to use the chemical names of the added oligosaccharides as terminology, and/or to distinguish between HMO (from breastmilk) and HiMO (human-identical milk oligosaccharides, added to IF/FO).	
Anna Ottenblad	Nutricia c/o Danone Nordics and Baltics	No comments	continued comments on INFANT FEEDING: * p.9, §2: Consider adding also information about the introduction of foods and risk of allergy. Articles as examples, e.g.: Dai NN, et al. Zhonghua Er Ke Za Zhi 2021;59(7):563-569. Obbagy JE, et al. Am J Clin Nutr 2019;109(Suppl_7):890S-934S. Larson K, et al. MCN Am J Matern Child Nurs. 2017 Mar/Apr;42(2):72-80. * p.12, §1: Taste is also important for the use of the infant formula (e.g. Miraglia Del Giudice, et al. Ital J Pediatr. 2015;41:42. Maslin et al. Pediatr Allergy Immunol. 2018 Dec;29:857-862.) * p.16, §1: Maybe consider injections as the last option in this list of interventions w.r.t B12? * p.21, §3: In addition to the EAACI publication, there is also GA2LEN guideline updated in 2022 available: Muraro A, et al. World Allergy Organization Journal 2022;15:100687. DRACMA guidelines on allergy are updated as well. Here are the three DRACMA articles so far published:	the text has been revised taking the comments above into consideration.

			Fiocchi A, et al. World Allergy Organization Journal 2022;15:100609. Jensen SA, et al. World Allergy Organization Journal 2022;15:100668. Bognanni A, et al. World Allergy Organ J 2022;15(9):100682. An interesting article from a multidisciplinary group of experts: Dias JA, et al. Nutrients 2022;14(19):4016. * p.22, §1: Maybe WAO's guidelines for the prevention of allergies with prebiotics (Cuello-Garcia CA, et al. 2016) and probiotics (Fiocchi A, et al. 2015) could be mentioned here? (Ref: Cuello-Garcia CA, et al. World Allergy Organ J 2016;9:10. Fiocchi A, et al. World Allergy Organ J 2015;8(1):4.) As a suggestion, it could also be good to have some text on gut microbiota and it's role on the developing immune system (Ref: Hammond AM, et al. Semin Perinatol 2021;45:151452.) Maybe relating this topic of gut health and immune system also back to previous section on "the first 1000 days" on page 1? And/or in p. 1 in connection to the sentence part "...the way an infant is fed..." also mention the relationship between nutrition and the health of infant gut microbiome and immune system development during the first 1,000 days, and the influence of overall long-term health?	
Swedish Food Agency	Swedish Food Agency	The fact that this chapter covers not only breastfeeding, but also formula and complementary feeding is a great improvement. This will make the chapter very valuable as a basis for dietary guidelines for infants. In some parts of the chapter it would however be helpful with some conclusions or guidance on how to relate to specific statements and to	Specific statements and smaller studies that would benefit from clarifications: P4: Difference between recommendation from WHO and the Nordic countries on the length of partial breastfeeding. Why is the Nordic recommendation shorter than the WHO recommendation? Is there evidence for keeping or changing the Nordic recommendation?	The text has been revised taking the comments above into account. As we pointed out in the text the different ages and definitions related to statistics collected on infant feeding in different countries make comparison difficult - we have now made that even clearer in the text. p8: agree, and this has now been clarified in the text. P 8-16: the text has

		smaller studies that are described in the chapter.	P9: Efsa states that complementary foods can be introduced before 6 months, but that this is neither necessary nor desirable and that also in high income countries exclusive bf for 6 months provides protection from gastrointestinal infections. Does this mean that we should recommend 6 months exclusive bf also in the Nordic countries? P11: A recent Swedish RCT on complementary feeding with introduction of sour or bitter fruits and vegetables is described in the chapter. This is very interesting, but it is just one study so far. Here it would be very helpful with some guidance on how to relate to the results. P15: Another small study that is mentioned in the chapter is a small Finnish study comparing toddlers eating a vegan, vegetarian or omivore diet. This is another example that would need some clarifications on how to relate to the results. Change in EU regulation on infant formula P8: The regulation on infant formula from 2015 resulted in risk for formula fed infants who got formula with the highest permitted level of vitamin D to attend the UL for infants. Sweden therefore raised this issue on EU level and in February 2020 the highest permitted level of vitamin D was lowered to a level that would not risk a too high intake. Specific advice on supplementation with vitamin D to formula fed infants is therefore not needed anymore. Other comments:	been revised taking the comments above into consideration

			P4 and P?: In Norway there is a multi vitamin-mineral supplement for infants, but on the Swedish market there is no similar product. P6 and forward gives a very detailed description of breastfeeding statistics. This data is collected in very different ways and are therefore difficult to compare. A shortening of this part of the chapter could therefore be beneficial. P8: The reduced protein content of infant formula has already decreased the difference in protein intake between infants fed breast milk and those fed infant formula. The effect might not yet be seen in scientific studies though. P8: Another difference between regular cow's milk and and infant formula is the fatty acid composition. P10: Salt should be avoided for the risk of increased blood pressure. It is also true that infants have immature kidneys, but small amounts of salt does not seem to be a problem due to immature kidneys. https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2018/uppdaterade-underlag-om-rad-om-salt-till-spadbarn-livsmedelsverkets-nr-1-2018.pdf P16. The fact that soy formula may be purchased online could be perceived as an exhortation. P16. According to the EU legislation on organic production fortification is only permitted if there is a national legislation on compulsory fortification. Therefore, organic products on the Swedish market are fortified with vitamin D. In	

			the other Nordic countries they are probably not fortified with vitamin D.	
Christine Henriksen, Janne Anita Kvammen, Rut Anne Thomassen og Ketil Størdal	Universitetet i Oslo og Oslo Universitetssykehus	We believe it is important to update the current guidelines on infant feeding to incorporate new research findings. Several important studies have been published the last years and including these are crucial for an update to be valid. We acknowledge that systematic reviews and meta-analyses weigh more than individual studies. However, this implies a delay in adapting new information. The current version uses a variation of individual studies and reviews, but the selection process for individual studies is questionable. In the introduction, it is stated that "original research were assessed and included as references when needed". We believe this introduces a substantial portion of subjectivity, as detailed below in the next section. Conclusion The authors should present more updated evidence on this topic, because several newer statements and studies have not been included. The benefits of breastmilk are not controversial, but a more balanced information regarding the combination of breastmilk and complementary feeding for infants should be provided. We suggest the following recommendation: "Infants are recommended to introduce complementary foods from the age of 4-6 months. Breastmilk is	1. The guideline should include a link to the search string and when the search was made. The chapter also lacks a description of how the cited articles were selected from the search. Regardless of search strategy, we question why new evidence on prevention of food allergies, and the safety of complementary foods in high-income countries are not cited. As clearly shown in the PreventADALL study and two other large randomized control studies, exposure to allergenic foods from 3 months of age reduced food allergy at 36 months in a general population. An editorial accompanying the publication of PreventADALL in Lancet concluded that these trials have built compelling evidence of such a preventive strategy. In line with recent studies, the European Academy of Allergy and Clinical Immunology (EAACI) has incorporated introduction of allergenic foods in the window of opportunity between 4 and 6 months in their guidelines for allergy prevention. This evidence must be discussed in the chapter since this health outcome is very relevant for the Nordic and Baltic populations. 2. Interpretation of the literature. One might get the impression that the chapter is reporting available studies in a selective manner, leaving out studies that do not support the main conclusion: One example is infections. The chapter says: "There is convincing evidence that breastfeeding has a protective effect against overall infections, acute otitis media, gastrointestinal infections, and respiratory tract infections also in high-income countries". This is correct and non-controversial, but the authors omit commenting	1.-2: the text has been revised taking the comments above into consideration. We have now specified otitis media and added a reference (Frank et al BMC Pediatrics 2019). we have slightly reworded the text and added a reference. We maintain that the WHO-recommendation about exclusive breastfeeding applies to all countries. In our eyes, that some countries have other recommendations does not change that. We have now revised the text about glten introduction and it now reads: the amount of gluten should be kept low during introduction and large quantities avoided onwards throughout infancy.

		recommended during the first year of life, if available and possible. If not, infant formula should be used. In that case, complementary foods should be introduced from 4 months of age".	what is relevant for the recommendations: Does the time of introduction of food have any significant impact on these outcomes? The statement "the immunological protection against infections appears to last for some years after cessation of breastfeeding" is given without references. The issue of confounding in studies is not mentioned, which is known to be a challenge in observational studies, particularly when the exposure (breastfeeding) is closely linked to a healthy lifestyle. The EFSA Scientific Opinion, which is a core reference in NNR2022, states: "When hygiene conditions are satisfactory, there is no evidence that the introduction of CFs<6 months of age compared with thereafter is associated with an increased risk of gastrointestinal infections (low level of confidence in the evidence), lower respiratory tract infections (moderate level of confidence in the evidence) or infections in general (moderate level of confidence in the evidence). The evidence for upper respiratory tract infections is inconsistent and insufficient." At page 2, Exclusive breastfeeding for 6 months is presented as "recommended by the WHO and other authoritive bodies", with no references. At section 4.1 (page 3), Exclusive breastfeeding for 6 months is presented as "a strong recommendation that applies to all countries". The statement is in contrast to a recent survey among the 53 member states of the WHO European region which showed that 82% of national recommendations advise complementary food introduction between 4 and 6 months of age. We believe the wording "…applies to all countries" is not in line with current national guidelines.	

			3. Imprecise citation: EFSA is used as a reference and cited "exclusive breastfeeding is the desirable goal". One has to assume that the most recent update from EFSA in 2019 is the source. However, EFSA clearly states that on relevant health outcomes, the evidence for introduction at 6 months or before is equivocal. The statement is found in the earlier ESPGHAN position paper. On page 19, the chapter authors write that EFSA/ESPGHAN recommended that "the amount of gluten should be kept low, both during the introduction and onwards throughout infancy". The ESPGHAN 8 position paper says: "but consumption of large quantities should be avoided during the first weeks after gluten introduction and later during infancy".	
Ann-Kristin Sundin	LRF	Dear NNR Committee, Thank you for the opportunity to comment on the Infant food draft. Here are the comments from LRF: Generally, we find this a very informative and well written chapter. We have some specific comments to the chapter.	Page 2, 2nd paragraph: It is stated that infant could be fed infant formula if breastfeeding, for the some reason, is discontinued. If breastfeeding is not an option, the infant under the age of 6 months should only receive infant formula if not other sorts of breastmilk is available (a milk bank etc). Just to be clear on this, the "could" may be misunderstood and encourage parents to find other solutions than infant formula, such as home made formulas etc). Therefor, we kindly urge the authors to consider a clearer wording. Page 4, 2nd paragraph: "If the infant is 4 months or older, starting with solids together with continued breastfeeding is an option". Though elaborated in a later chapter, in most countries it is recommended to start complementary feeding at the age of 4-6 months and preferable closer to 6 months (and	Page 2: We have revised text taking the comments into consideration. Page 4-15: Thank you pointing out these issues, text is now revised and the comments taking into consideration. Page 16: this has now been changed

			not later than 6 months). In order to avoid adding to confusion, the text would benefit from being rephrased. Page 5, 3rd paragraph:. The authors clearly state that vegetarian and vegan diets provide insufficient amounts of a vast range of essential nutrients. We urge the authors of other drafts/chapters of NNR to take onboard this statement – vegetarian diets in general and vegan diets in particular pose a challenge to most consumers, and especially consumers in need of nutrient and energy dense foods. Such diets need fortified foods and supplements in order to meet the recommended amounts of several nutrients. Even so, it is important to recognize that fortification and supplementation are not sufficient alternatives to consuming a mixed diet with the naturally nutrient dense sources that come from both animal and plant foods. Here, food matrices must be acknowledged and considered. Page 5, 4th paragraph, last row: The authors use the marketing term of "plant-based foods". We kindly suggest they use "plant foods" instead, which would be considered the more scientific term. The same goes for all drafts/chapters hitherto using this term. Page 15, 1st paragraph: The authors state that "It is now generally agreed that well planned vegetarian and vegan diets, potentially including relevant supplementation, are nutritionally adequate and appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, and childhood" Are there any references for this statement?	

			Especially with regards to infancy where, to our knowledge, there is no consensus in this matter. Further, vegan diets could potentially have a negative impact on the child's optimal growth and development. Page 16, 2nd paragraph: We welcome the recognition of a mixed, balanced diet being nutrient wise complete (save for vitamin D in some cases), and that vegetarian diets may prove difficult for children due to low nutrient density. Page 16, last paragraph, row 3: We strongly advice the authors not to use the term "plant-based milks", but confine to the EU legislation on the matter, where the term "plant-based milks" is incorrect, since "milk" is exclusively allowed for mammal sourced milk, not water-based plant extracts. Page 16, last row: Vitamin D is here incorrectly described as an additive. We kindly suggest the authors to use the term fortification. Page 16, last row: We welcome the statement that "processed foods are not necessarily healthy just because they are plant-based".	

13. Ultraprocessed foods

Name	Organization	General comments	Detailed comments	Comments from authors
Annie Sjöblom	Lfm	The NOVA classification defines Daisy to be in class 1 although pasteurisation as a process. I am erotiker that there is financial benefit to include milk as a class 1 rather than a health benefit. The NOVA classification seems somewhat arbitrary and should be treated more carefully, since the people WHO Madde the classification are based in brazil and are not transparent in how the project was financed.		Out of the scope. Carlos Monteiro who developed NOVA has no ties to the food industry. Dairy products are classified as group 1, 2, 3 or 4 depending on their ingredients and the extent and purpose of processing.
Yan Borné	Lund University	Page 4 "The main literature search was performed on April 12th, 2021. An additional literature search was performed on February 27th, 2022." Which search terms and databases have you used in your systematic review? Page 3 Agreed with "Given that the current topic of ultra-processed foods is a rapidly growing area of research", any plan to update the systematic review before finalizing the chapter?	page 3 "Indeed, ultra-processed foods tend to corelate with nutrient profile indices, such as the Healthy Eating Index,29 the Nutri-Score30 and the Nutrient Rich Food Index.31"----- what do you mean corelate, perhaps correlate?	The search terms are described in the chapter. The search was updated at the timepoints requested by the NNR committee. Typo is corrected to “correlate”
Soile Käkönen	HKScan Finland Oy	Nova-classification seems to be the basis of this chapter and one must ask: based on what? Nordic Nutrition Recommendations (NNR2022) are based on scientific evidence which is lacking here. When does the product become ultra-processed? The paper gives bread or ready meals as a product example in addition to certain processing methods, such as extrusion or using certain additives. When is bread minimally or “acceptably” processed and at what point it become ultra-processed? Are ready meals always ultra-processed despite the nutritional value? Is butter, which is minimally processed, better for you than ultra-processed margarine? And finally: what is “high consumption” of ultra-processed food: 100 g a day, 500 g a week, more/less?	There are several misleading or irrelevant examples in this chapter: - Labelling practices in Chile has little to do with processing, rather than overall nutritional composition of the food. - The omnipresence of food, its convenience or marketing should not be an item in NNR2022, especially when these topics are not restricted only to ultra-processed foods. - In the chapter it is stated that “ultra-processed food intake is associated with increased exposure to endocrine-disrupting chemicals and phthalates used in industrial plastic packaging”. First, ultra-processed foods are not	The concept of ultra-processed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. Concerning additives, several studies in animal models and in humans have suggested deleterious health effects for some of the roughly 330 additives currently approved for use in Europe, for instance through gut microbiome dysbiosis, inflammation and DNA damage.

		Highlighting additives relating to ultra-processing is surprising. For decades authorities have explained to consumers that additives are safe to use and there is no correlation between additives and healthy diet. Again, is cream with no additives better for your health than vegetable fat-based milk product which contain several additives? EFSA have evaluated all additives safe to use and this evaluation is ongoing; for instance, aspartame is concluded to be safe to use at least four separate investigations. The chapter lists artificial sweeteners, emulsifiers, phosphate salts and modified starches as indicators for ultra-processed foods. Are other additives less processed and thus more acceptable? And who informs industry, consumers, and other parties this classification? As long as there is no conclusive studies to show that additives are harmful for health there shouldn't be any implications to suggest that. The term ultra-processed in confusing and gives no additional value to NNR2022. It requires massive communication and consumer education. There are already "rarely consumed foods, i.e., sattumat" in the national recommendations, which present in an understandable way that such foods shouldn't be consumed regularly. The authors note that the studies included in this chapter have limitations, e.g., there is lack of dietary assessment methods and nutrient databases. In addition to the fact that there are no common classification criteria for different processing methods, one has to ask why is this chapter included in the NNR2022?	packed differently than other, less-processed foods. Second, there is legislation that gives criteria for material used in food industry and thus guarantees the safe use. - There are several processing methods mentioned in the chapter and it should be noted that for example industrial partial oil hydrogenation in not used in Europe in margarine production and extrusion-processes is also used manufacturing high-fiber snacks, pasta and other foods with good nutritional values. - The authors wish that by categorizing ultra-processed foods, consumers can make healthier choices and give as an example choosing chicken breast instead of nuggets. There are different kinds of nuggets and in Northern countries, which NNR2022 is targeting, the nuggets are mainly made from chicken breast meat. - The authors suggest that there should be brand-specific data to better distinguish between foods and processing levels -does this mean that there in going to be not only food-based, but brand-based recommendations in the future, and if so, who is keeping up with the different, changing brands?! The chapter seems to forget that processing has several positive effects. For example - it secures product safety thus causing less food-born illnesses and preventing food-waste. - several processing methods such as	The chapter does not disregard or negate the benefits of food processing (i.e., pasteurization, freezing, canning). The chapter evaluates the health effects of ultra-processed foods, not processed foods in general. There is no evidence that industrially processed foods are inherently bad for health. We have added text to clarify this.

			sous vide- or micvac-cooking prevail vitamins better than conventional cooking methods. - industrial-scale processing is optimized to prevent energy losses or food-waste. - several foodservice-operators rely on processed foods. - industrial processing ensures efficient material and raw-material use, thus helping with food scarcity and circular economy -e.g., you can't raise animals with just having fillets, you must have an address to other parts as well.	
susanne knittel	Danone AB	The chapter aims to describe the totality of the available evidence regarding ultra-processed foods in relation to health-related outcomes. When the "ultra-processed foods" concept is increasingly used in Public Health research, we want to remind that the concept is highly controversial among scientists. This controversy was displayed during the last ASN conference with a debate between Pr. Astrup and Pr. Monteiro (ref 27 of the chapter) but was also visible in discussions among scientists during all recent conferences on public health. Beyond the controversy, we would like to emphasize that the classification of food as "ultra-processed" is currently relying (quasi-)exclusively on the NOVA classification. This classification system uses definitions that are not measurable metrics, they encompass several dimensions including ingredient lists and processes but also packaging and marketing considerations. Studies explored the understanding of the term "ultra-processed food" by experts but also by consumers. On the consumers side, 8 years after the concept was embedded in the "Food Guide for the Brazilian Population", a study1 "concluded that		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods, which is defined by NOVA. A comprehensive evaluation of the NOVA system per se is beyond the scope of this chapter. Nevertheless, we acknowledge the ongoing scientific debate concerning the NOVA classification.

		the term UPF is still confusing for most Brazilians”. This study highlights the dissonance induced by the gap between “ultra-processed foods” wording and its definition, that could result in consumers misunderstanding of associated recommendations. Regarding experts understanding, the outcomes paper2 of an online dialogue with professionals from various fields, titled ““Even we are confused”: A Thematic Analysis of Professionals’ Perceptions of Processed Foods and Challenges for Communication,” identified both the need for definitions and “the challenge of communicating uncertainties” among key topics on “ultra-processed foods.” Another study went in depth in the definitions issue: it showed that when a list of foods is given to several food and nutrition experts for them to be sorted according to the NOVA classification, the overall consistency among evaluators is low, even when ingredient information is available 3 . This study questions the ability to accurately sort foods according to the NOVA classification, which has implications on the relevance of input data in many studies. The limits of the NOVA classification are acknowledged by the scientific community including by prominent researchers publishing papers using NOVA. Several of them started projects to better understand mechanisms, a needed step to refine the existing classification that might misclassify many foods regarding their actual health impact. Because of the lack of scientific consensus on the concept, the lack of robustness of existing classifications and the possible misunderstanding by consumers, we recommend not include the “ultra-processed food” chapter in the NNR2022 until a scientific consensus is reached.		

		1Foods | Consumers' Understanding of Ultra-Processed Foods (mdpi.com) 2 Frontiers | "Even We Are Confused": A Thematic Analysis of Professionals' Perceptions of Processed Foods and Challenges for Communication (frontiersin.org) 3 EJCN | Ultra-processed foods: how functional is the NOVA system? (nature.com)		
Kristin Hollung	Nofima	Focus on processing as part of foods' healthiness is relatively new, and research is still not approaching this in a consistent way. Processing may reduce or enhance foods' nutritional content, healthiness, or unhealthiness, and should be treated as a separate factor. Processing may lead to nutrients becoming more accessible for digestion, or reduce nutrient content, or include ingredients that are beneficial or not to consumers. We miss a final consideration that is not characterizing all processed foods as unhealthy. In addition, future need for food security to a growing population requires processing for full utilization of raw materials. In some instances, UPF may be a solution for certain groups to uphold a healthy diet and for providing sufficient nutrients. For future studies, clarifying the UPF classification, further considering nutritional aspects healthy/unhealthy in addition to the suggested diversifying of processing types, should be investigated.	The NNR 2022 chapter 6 is biased by citing almost all literature in favor of the NOVA classification system, while the critiques are mis-interpreted (e.g. Gibney et al. 2017, Am J Clin Nutr) or not cited at all (e.g. Gibney M., 2022, Am J Clin Nutr;116:9–10.; Teo PS et al. 2022 Am J Clin Nutr;116(1):244–54 and Blewiss-Sande et al. 2019 Nutrients, 11(6), 1344). According to the NOVA classification, the different food categories are separated mainly by presence or absence of food additives and does not consider the type or level of processing (Monteiro et al 2019, Public Health Nutr 22(5): 936-41). Excluding nutritional content and solely depending on processing characteristics of foods in dietary advice may lead to undernutrition as many consumers are unaware of dietary requirements and/or their own diet's nutrient composition (Ares, G. et al. 2016. Appetite, 105, 611–617). Consequently, consumers may not choose foods based on acquiring essential nutrients, but only on the level of processing, which in itself does not guarantee a good nutrient composition (Estell M.L., et al. 2022. Eur J Nutr	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. The chapter does not suggest ignoring the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement existing food- and nutrient-based recommendations, not to replace them.

			61(2):935-945). In addition to sugar, salt and fats, texture has been proposed as an important sensory characteristic that may lead to excessive food and energy intake, being in some cases more important than the degree of processing by determining eating rate. (Teo PS et al. Am J Clin Nutr 2022;116(1):244–54). Foods classified as ultra-processed can vary in both texture and energy density, and including them in one category, simply because of their additive content, is not helpful to those charged with formulating dietary advice to minimize NCDs (Gibney M., Am J Clin Nutr 2022;116:9–10). In addition, processing level and nutritional value do not have a linear relationship and these concepts need to be dissociated (Sadler, C. R. et al., TIFS. 2021;112:149-162). Thus, a holistic approach, taking processing, nutrient content, and food structure/textural aspects into account and therefore a diversification of the UPF classification is necessary. In the Mechanisms chapter on Page 9: The chapter addresses intrinsic and extrinsic characteristics of UPF. Intrinsic characteristics of UPF include the processing itself and the consequences of this for the product. Extrinsic characterization of UPF (lines 23-25) includes other characteristics linked to, for example, marketing, which has nothing to do with the technical characteristics of the product itself and these characteristics should be	

			presented separately. By not differentiating between these in the same argumentation, it is difficult to provide targeted advice. Both parts are important but are measured in different ways and give different insights into the problem.	
Xin Huang, Markus Nurmi, Anne Pihlanto, Sari Mäkinen, Eija Järvenpää, Minna Kahala, Hanna-Maija Karikallio, Anu Kaukovirta	Natural Resource Institute Finland	Our opinion is that NOVA and SIGA classifications are biased and not valid for diet recommendation, because they are based on the correlation of processes and disease prevalence rather than well-established ingredient/component and health relation. The need for new types of processed foods and food ingredients is evident for transition to sustainable, healthy diets in an effective way. We need science based data on the effects of updated processes and ingredients on health, to be able to develop variety of new products, which are nutritious, healthy and safe. However, this RDI work can not be based on NOVA and SIGA classification. • NOVA and SIGA classification are poorly science based and biased. According to NOVA classification of Group 4 Ultra processed foods are made of many food ingredients and several process techniques. For example, soft drinks, ice cream, chocolate, salty snack foods, biscuits, cakes etc. are considered as ultraprocessed foods because of the ingredient formulation and steps of food processes. Many food products under this definition are in high in sugar, fat or salt, and normally consumed for pleasure and took a small part of a diet. The high intake of salt, sugar or fat can be related to higher risk of obesity, type 2 diabetes, and other cardiovascular diseases, however, the relation of processing step alone is not established. On the contrary, the Group 1 unprocessed or minimally processed foods include seeds, fruits, roots, animal	• Page 2, Extrusion process is one industrial process which cannot be conducted at home for consumers at the moment and defined as one type of ultraprocesses in NOVA classification. The extrusion process creates new food texture, but no evidence on the generation negative compounds solely was reported. • Page 2, NOVA recommendation was based on the evidences mostly from cohort studies of USA and south America. Its relevance to Nordic diet and Mediterranean diet was not too high. • Page 5, Based on the NOVA category, 41% in Finnish diet is consisted of ultra-processed foods. The recommendation of limiting or avoiding ultra-processed foods in a diet would largely reduce the choices for public. The inclination of consuming more unprocessed or minimally processed foods do not fit to the fast urban life and modern efficient agrifood system. • Page 9, NOVA classification also blames food additives used in ultraprocessed foods. However, the safety of food additives have been established by EFSA and worldwide entities and their safety threshold is well recognized. NOVA hypothesized that	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. No studies in the literature review used the SIGA classification. The chapter does not suggest ignoring the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Regarding extrusion: Accumulating evidence support that the food structure (in particular the presence of an intact or highly degraded food matrix) may influence the health effects of a food due to changes to e.g., absorption kinetics, glycemic potential and effects on the gut microbiome. Several of the included cohort studies were conducted in European and Mediterranean populations (e.g., NutriNet Sante cohort, Seguimento the Navarra cohort).

		muscle meat, eggs, which are commonly rich in protein or fiber, which are beneficial for a health diet. • Examples of biased classifications. Soft drink is made with added sugar and carbonation techniques. One may relate the type 2 diabetes with high sugar intake, but the process itself does not affect. NOVA and SIGA classification define simple sugar as minimally processed ingredient and considered as health for consumption. Another example is yoghurt, plain yoghurt is classified as unprocessed or minimally process foods, but flavored yoghurt would be ultraprocessed food, although the so-called process is merely one ingredient(s) addition. • The processes involved under definition of 'NOVA Group 3 processes foods and Group 4 ultra-processed foods' are not clarified and classified. According to their food products types, these processes mostly involve same processes like heating, baking, roasting, fermentation, refrigeration, chilling, freezing etc. What is then defined as 'ultra', and how many steps of processes or level of processing in food production is defined as 'ultra'? • SIGA classification of ultraprocessed foods are divided into C1, C2 and C3 groups. But it is very vague without definition of the number and types of additives, and types of numbers of processed involved. • The FoodEx2 classification from EFSA is better established system for food and process classifications. It describes individual food items aggregated into food groups and categories in a hierarchical parent-child relationship by Standard Sample Description (SSD2) data model. • Some processes are intended to remove components/ingredients which have adverse effect	food additives may have negative effect on gut microbiota, however without any support of scientific evidences and studies. • Page 10, Migration of the packaging material was listed as negative impact from ultraprocessed foods. The raw material shall face the same packaging issue and the processes alone are not related. • Page 10, During heating process, some negative effect compounds are formed, i.e. acrylamide, furan. The reaction would be generated from industrial process and home preparation. More biomarkers shall be established to evaluate to the level of process and compare the home preparation and industrial processes. • Page 11, NOVA referred to one study (Hall et al., 2019), where two diets with and without 'ultraprocessed foods' were compared and the ultraprocessed food group had gain more body weight. Although the energy intake was reported to be balanced between the two diets, the ultraprocessed food diet in fact had higher energy density, which might be the main reason for the gain rather than the processes.	Concerning additives, several studies in animal models and in humans have suggested deleterious health effects for some of the roughly 330 additives currently approved for use in Europe, for instance through gut microbiome dysbiosis, inflammation and DNA damage. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023)

		on certain consumers. For example, skimmed milk, zero energy beverages, were meant for lowering energy intake, lactose-free milk was meant for consumer who have lactose intolerance. • Home cooking is considered as a good way of food preparation due to the less processing steps. Despite the same processes are used in food industry, the home recipes are not always healthier, or even could be less in nutrition value. The quality of home cooking varies largely among public and cannot be monitored and controlled.		
Department of Food Technology, Engineering and Nutrition, Lund University, Sweden	Department of Food Technology, Engineering and Nutrition, Lund University, Sweden	This is a comment on the 'ultra-processed foods' category chapter, collectively signed and sent from the Department of Food Technology, Engineering and Nutrition, Lund University Sweden. Whereas the draft contributes with a comprehensive overview of the studies and claims made in the novel research area on so-called 'ultra-processed food' from a nutritional epidemiological perspective, it lacks a connection to the more well-established research on food processing/technology/engineering in general and the relatively extensive mechanistic research on the relationship between processing and nutritional effects in particular. This gives rise to some unfortunate misunderstandings (e.g., confusion of the NOVA class 'ultra-processed' with extent of processing, see Detailed comments), that can have severely adverse effects if used in dietary recommendations (i.e., recommending against foods that today's NNR advises consumers to eat more of). In our view, the chapter draft also misses some of the main and truly interesting discussion points that would be needed as a background for making recommendations (e.g., risk of conflicting recommendations and a broader methodological discussion, see below).	*Processing vs the NOVA category 'ultra-processed'* An underlying issue is the use of the word 'processing' in NOVA studies (and in the draft chapter). The draft uses NOVA to define what constitutes 'ultra-processed' food. This is problematic. The established definition of 'processing' is to subject a food to technical transformation (e.g., mashing, cutting, heating etc.). Most foods are processed, but to varying extents. A highly processed food would be one having experienced more intense temperatures (e.g., 'thermal load'), pressures or mechanical forces (e.g., shear forces). Plain (unsweetened) yoghurt and retorted chickpeas are examples of highly processed foods (using the established definition). 'Ultra' (meaning 'beyond' or 'extremely') would imply a food that is processed to an extreme amount or beyond the extent of alternatives (e.g., a roast burned to a crisp). NOVA disregards the established term and classifies foods as 'ultra-processed' if containing many	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Epidemiologic studies support that that are lower in ultra-processed foods are generally more aligned with existing food-based dietary guidelines. We have revised the wording on page 12 (last paragraph) to "choose non-ultra-processed foods" instead of "foods of lower processing level" All mass-produced breads are not ultra-processed in the Nordic countries. There are several examples of industrially produced whole grain breads that are processed, not ultra-processed. Similarly, all ready-meals are not ultra-processed. The advice

		The draft chapter lacks a full discussion on what would be the consequences of including recommendations of limiting 'ultra-processed' food consumption, i.e., how would one handles cases where recommending eating less 'ultra-processed' conflicts with other recommendations, for example of increasing whole grain or reducing saturated fat (e.g., remember that all mass-produced packaged bread are 'ultra-processed' according to NOVA, including whole grain unsweetened rye bread labelled with 'Nyckelhålet'). It is difficult to overstate the revolutionary consequences in terms of dietary recommendations to include a recommendation to limit 'ultra-processed' foods in them. Recommending against 'ultra-processed' would imply recommending against all functional foods, virtually all designed pre- and probiotic foods, all plant-based replacement products (many of which have their well-founded research supporting their beneficial health effects). It would also imply recommending against all ready-made meals, regardless of their nutrient and/or energy density. This would be something fundamentally different than traditional dietary recommendations and their emphasis either on nutrients or food categories such as 'fruit and vegetables'. Making such a revolutionary change to NNR would require a scientific overview that is not only limited to a narrow, novel emerging research field but discussing it from a broader food science perspective. Making recommendations that advise limiting the intake of all plant-based beverages, meat analogues and functional foods would need some supporting studies on what would be the mechanism of their harmfulness. This broader discussion and analysis is missing in the draft chapter.	ingredients, sophisticated processes and packages (what in an established food science nomenclature would be referred to as a 'highly formulated food'). NOVA also chooses to bring in factors such as producer profitability, ownership structure and marketing strategies in their description of what constitutes an 'ultra-processed food' (what in an established nomenclature could be referred to as aspects of a 'highly commodified food'). Moreover, NOVA also collects foods that are neither highly processed nor highly formulated in the 'ultra-processed' class, apparently mainly based on these foods being known to have adverse health-effects if overconsumed (e.g., pastries, cakes, pizza). The consequence is that NOVA classifies many foods that are (in an objective sense) highly processed as 'minimally processed' (e.g., milk powder) and vice versa. Interestingly enough, even advocates of NOVA-based research typically acknowledge this as a challenge, and solves it by claiming that 'ultra-processed' is a distinct term, not necessarily associated with the more well-established term 'processing'. The draft chapter, however, is unclear on this and discusses NOVA as a measure of processing extent (for example p. 2). The single most problematic use is on p. 12 (last paragraph) where it is stated that "[…] recommendations to limit ultra-processed foods, and choose foods of lower processing level, […] may enhance and support several existing FBDGs…"	would be for consumers to choose non-ultra-processed versions when selecting a mass-produced bread or a ready-meal.

		Another point-of-improvement, is that the chapter reports what the NOVA-studies do and claim, but lacks a broader problematizing discussion of the approach. From a methodological perspective, the NOVA-based studies claim that one can use an extremely broad class of foods ('ultra-processed'), containing everything form soda, beer and pizza to a packaged whole grain rye bread and an oat based beverage, to draw sound conclusions on health effects of that entire group, without requiring any studies of the mechanisms involved (as is usually deemed necessary). This is controversial, from a broader scientific viewpoint. Research on so-called 'ultra-processed' foods is novel and controversial, making claims of overthrowing much of the established food science. 4000 signs are not enough to fully describe or discuss these issues. As having a national responsibility in research on the link between processing and food quality, the Department would gladly contribute to further constructive discuss...	(emphasis added). This implies that a food's position on the NOVA-scale is a measure of its processing level, which is not the case in any objective sense. Recommending foods "of lower processing level" would imply consumption of milk over plain yoghurt, or raw over sautéed spinach – which is something very different from what the NOVA studies support. *Missing discussion on conflicting recommendations* Last paragraph on p. 12 also suggests that adding a recommendation against ultra-processed food would act in support of current recommendations. This is simplifying things too much in our view, potentially leading to bias and confusion. Yes, both a NOVA-based recommendation and traditional one advise oatmeal before sweetened breakfast cereal, but there are also many cases where a recommendation against NOVA classified 'ultra-processed' food goes against other/current recommendations. How should a consumer act when faced with contradictory recommendations? If looking to 'ultra-processing' section, a consumer would be recommended to choose a sweet home-baked wheat loaf over an unsweetened whole grain store-bought rye bread (packaged mass-produced bread is 'ultra-processed' according to NOVA) and recommended eating a home-cooked stack of pancakes with	

			home-made jam over a lean, vegan ready-made meal based on vegetables, and lentils (ready-made meals are 'ultra-processed' according to NOVA). However, if looking at recommendations on w...	
Heli Åby	Atria Finland Ltd	The definition of ultraprocessed food is biased, it doesn't state nutrirional properties. Home cooking is considered as a good way of food preparation due to the less processing, though same processes are used in food industry. Home recipes are not always healthier - salt and saturated fat intake can be much higher when not weighed. Processing has not only negative aspects, for example vegetable proteins need processing to be in edible form , for example lactose free milk. Also processing can improve nutritional qualities of foods like adding vitamin D to milk to improve vitamin D intake. Usually ultraprocessing is connected with industrially produced food, but many processes are the same at home but in smaller scale and same negative compounds are formed, for example heating process vs. barbeque If there will be an ultraprocessed chapter in the NNR, it will probably restrict the use of ready made food components or ready made foods in public food service. Nowadays there is continuous lack of resources in food service kitchens. NOVA classification blames food additives in UPF though they are classified safe to use by EFSA. Additives are used only when necessary to improve food safety, texture or taste untill best before -date		The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. All ready-made meals are not ultra-processed.

		Considering the time management of consumer today, added blame of using ready made foods is not necessary. If the UPF foods will be used in future nutrition recommendations, consumers may be even more confused and afraid of ready made foods. We don't support adding UPF chapter in the NNR		
Turid Rustad	NTNU	Begrepet Ultraprosessert mat er problematisk og dekker en stor gruppe med mat/produkter med svært varierende næringsinnhold og dermed effekt på helsen. Begrepet bør derfor forklares tydeligere og det bør problematiseres rundt den store variasjonen i næringsinnhold og helseeffekt av matvarene i denne gruppen. For eksempel kommer rå melk veldig godt ut og yoghurt med smakstilsetning kommer dårlig ut. Produkter som er utviklet for å inneholde lavt fettinnhold og lavt sukkerinnhold kommer også dårlig ut siden slike produkter må bearbeides/prosesseres mere for å få tilfredsstillende smak, konsistens og holdbarhet. En ser ikke på næringstettheten og produkter som f.eks inneholder proteinhydrolysater (laget fra sidestrømmer) kommer dårlig ut. Sendes inn på vegne av NTNU Food Forum		The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. We have added text to clarify this.
Nesli Sözer (Prof in sustainable food production) and Jenni Lappi (Senior scientist in Nutrition)	VTT Technical Research Centre of Finland	There is no official, unambiguous definition of ultra-processed foods. The definition used in the chapter is according to NOVA classification (Monteiro et al. 2019) which is questionable (Petrus et al. 2021). NNR should not justify nutrition recommendations that depend on a vague and misleading definition of a food group. Instead, the chapter could highlight that the current NOVA classification is vague and confusing in terms of defining level and quality of processing. It is impossible for a consumer, or for a health	In the beginning of Abstract, ultra-processed foods are defined based on the vague NOVA classification. The term should already be challenged and preferably referred to 'so-called ultra-processed foods'. For example: "Nutritionally low-quality so-called ultra-processed foods, which are often defined by a questionable NOVA classification claiming the manufacturing to involve several stages and various	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. The current evidence strongly supports that the association between ultra-processed foods and health outcomes is independent of nutrient intakes and dietary patterns. That

		professional, to differentiate a product based on steps of different kind of industrial processes. In fact, the definition of ultra-processed foods is based on the number of additives used, and the formulation of ingredients (ie food composition) rather than processing (Monteiro & Monteiro 2022). Also, the authors of NOVA-classification suggest checking the ingredient list, and not to consider the level of processing of a food (Monteiro et al. 2019). It seems that other than fat and carbohydrate quality, amount of sodium, and dietary pattern-related factors underlie the health effects related to the consumption of certain foods (the so-called ultra-processed foods). Synergetic effects of food additives and physical structure of a food may have essential role, but evidence is incomplete for providing recommendations based on these assumptions that are not necessarily depended on processing per se. The authors successfully summarize the main results by noting that there is a limitation across all existing observational studies in the dietary assessment method specifically designed to assess ultra-processed food intake, leading to very possible misclassification of several foods. Based on NOVA classification, the brand name of a product should be available for researchers when determining if the food is composed of a mixture of 'cosmetic' additives and flavors, or if it has been packaged. For example, generic food frequency questionnaires do not differentiate whether an eaten bread had been unpackaged (i.e. processed food) or a mass-produced packaged bread (i.e. ultra-processed food), and brand name is not reported. It is a challenging problem if	processing techniques and ingredients, are increasingly consumed worldwide." Pg 3, end of 1st paragrph: The authors name reformulations and plant-based alternatives as ultra-processed foods. However, plant-based alternatives have not been included in the epidemiological or RCT studies referred. Currently, little is known about health effects of nutritionally balanced plant-based alternatives to meat and dairy. The NNR2022 cannot implicate plant-based alternatives to be among unhealthy foods without evidence. Pg 9, 1st pargrph in 'Mechanisms': The first sentence should be revised in highlighting that processing also alters a food's health potential by removing harmful components such as phytate, tannin, enzyme inhibitors, and lectins, which are called anti-nutritional factors (ANFs) (Orlien et al. 2021, Sá et al. 2019). Reducing ANFs by processing increases bioaccessibility of protein from plant-based ingredients (Sá et al. 2019). Extrusion processing shown to reduce phytic acid and tannin in lentils (Rahul & Annapure 2016), and in turn improve bioavailability of hemi-iron and zinc. Thus, a suggested mechanism due to processing cannot be simplified to result from removal of beneficial nutrients and bioactive compounds as effects of removals depend on the process and the component removed. Pg 9, 3rd paragrph in 'Mechanisms': Processing can indeed alter the physical structure of the food matrix with	said, we do not suggest completely ignoring the nutrient composition of foods, or the existing food-based guidelines. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. We have removed the example of plant-based alternatives in order to not single out any specific food. We have revised the first sentence of the first paragraph in the mechanisms section.

		recommending food product choices based on the degree of processing because information about the steps of processing is not available even if the brand name was known. Of note is also that the studies referred do not include processed plant-based foods alternative to meat and dairy. Meat and dairy analogues and alternatives are important food categories for introducing carnivore consumers to a plant-based diet. Now, if NNR2022 straightforward suggests not to use this kind of processed foods, which are now understood to go under the definition of 'ultra-processed foods', there most probably will be a drawback in consumers attitudes to the dietary shift essential for sustainability and the planetary boundaries. We suggest removing the chapter of ultra-processed foods from the food-based NNR 2022 due to limited evidence of processing per se increasing risk of detrimental health outcomes. Another option would be to use consistently the term 'so-called ultra-processed foods' and highlight that evidence is limited to create recommendations based on various level of processing or processing techniques. As the authors also mention, "diets high in ultra-processed foods tend to be nutritiously unbalanced", the evidence until today justifies recommending nutritionally balanced foods from various processed and unprocessed food groups. There is no additional benefit to recommend limiting highly processed foods with the examples provided at the end of the chapter. The same limitations can be made by just recommending foods with low content of sugar and saturated fat, and high content of fiber and whole grains. To summarize, if highly processed foods are suggested to be avoided, this should be based on	consequent implications. NOVA classification always assumes that the so-called ultra-processing will change the food matrix similarly to the same direction by making the structure less complex, with less fiber, which then leads to fast absorption kinetics of nutrients. However, extracted plant-based protein concentrates (especially those produced by dry fractionation technologies) contain unbroken cells and good amount of fiber. Processing induced protein digestibility effects have been mainly researched in the ingredient level and scientific knowledge on processing effects on food matrix and protein digestibility is scarce (Lappi et al., 2022) Therefore, the effects of processing on food structure cannot be generalized. Pg 10, 2nd paragrph is incomplete and should be removed from misleading : The following sentence is too simplifying: "extensive heat treatment and extruding during processing may lead to the formation of contaminants". Extruding is not always "extensive" as the moisture content (dry or wet extrusion) and the extrusion parameters (heat, time, shear) can be modified and the most suitable parameters can be chosen to prevent formation of contaminants. Processing is heavily regulated in EU and therefore industrially manufactured retail foods are not allowed to contain more than 2 g of trans-fatty acids per 100 g of fat ((EU) 2019/649). Page 11, last paragrph: It should really	

		facts that are currently recognizable by consumers such ...	be highlighted that more studies are needed to identify 'optimal' vs. detrimental types of processing as the NOVA classification does not help with this. There are several industrial processing options with several different parameters and ingredient combinations. Evidence today do not allow to give food recommendations based on the level of processing. Refs: Monteiro et al 2019. doi.org/10.1017/S1368980018003762 Monteiro & Monteiro 2022. doi.org/10.1021/acsfoodscitech.2c00087 Petrus et al. 2021 doi.org/10.1016/j.tifs.2021.08.010 Orlien et al. 2021 doi.org/10.1080/10408398.2021.1980763 Sá et al. 2019. doi:10.1080/10408398.2019.1688249 Baugreet et al. 2019 doi.org/10.1016/j.ifset.2019.04.005 Lappi et...	
Ch.Trägårdh (1), Ch. Skjöldebrandt (2), G.Trägårdh (1), E.Tornberg (1), P. Dejmek (1)	(1) former professor of food engineering, Lund University (2) former adjoint professor of food engineering, Lund University	We are aghast at the fact that a reputable institution is about to give a cachet of approval to the completely nonsensical concept of overprocessed foods. There is no known scientific hypothesis that could explain the purported inverse relationship between nutritional benefits of a food and the number of processing steps. The studies claiming this choose foods of questionable nutritional quality arbitrarily and classify them as "overprocessed" and thus the outcome is given. Essentially all foods are processed. Most processes		The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits.

		are beneficial and some may be deleterious. Processes change the food components as to form, state and composition. The number of process steps is of no nutritional significance whatsoever, it is the changes that matter. Even the "simple" process of heating foods, used by hominins as early as a million years ago, may cause invaluable positive changes such as improved digestibility and killing of pathogens, and sometimes negative changes such as the formation of carcinogenic compounds. Separation of components, vilified in the Nova classification is at the very heart of the production of olive oil e.g.. Potable water in city mains has gone through at least five processes, typically using three additives. There are approximately ten processing steps in the production of natural yoghurt, not including the production of the starter culture which would double the number of processing steps. The production of potato chips is incomparably simpler. The whole concept of overprocessing is based on insufficient knowledge of food technology and its use makes a mockery of the significant part of the nutrition science community that understands the difference between causation and confounded correlation.		Ultra-processed foods are not defined by the number of processes involved in their production.
Ellen Kathrine Ulleberg	Opplysningskontoret for Meieriprodukter	NOVA Most research on health effects related to the degree of processing of food is based on the NOVA classification system. Group 4 of this system, the so-called ultra-processed food (UPF), is too broad and lacks consistency as it includes both nutrient rich food such as most flavored yoghurts and industrially produced wholegrain bread as well as nutrient poor calorie dense food such as snacks, desserts, candy and sugary sodas. The classification is misleading as it judges all food categorized as	Introduction The hypotheses used to describe why UPFs are related to diseases are too uncertain and poorly substantiated for it to weaken the trust in nutritious foods with less fat, sugar and salt that, due to a too broad classification system, are among the UPFs. The text questions whether reformulation to produce products with a more desired nutrient profile is	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. The chapter does not suggest ignoring the nutrient composition of foods, or the existing food-based guidelines. We advised the NNR-committee to include recommendations regarding UPF to

		UPF as equally unhealthy. At least this is how it is often communicated to the public, and it is also the impression we are left with after reading this chapter. NOVA is based on physical processing and the use of certain additives, and the purpose of processing. It does not consider the nutrient composition of foods, and the mere addition of aroma or an emulsifier will automatically define it as UPF and thereby unhealthy. This is unfortunate as research support that some of the UPFs are healthy and thus can't at the same time be harmful due to a classification system: Yoghurt contains nutrients regardless of whether it has been added flavor or sweeteners, and wholemeal bread is a source of fiber and nutrients, whether it be industrially produced or homemade. Dairy products and wholemeal bread are part of dietary guidelines of many countries and are important foods in a healthy diet. Likewise, cooking dishes at home based on minimally processed food is not synonymous with it being healthy. Although there could potentially be problems related to both processing techniques and certain additives, nuances are lost by using NOVA to define if foods are healthy or not. Both consumers and researchers have trouble identifying which products are UPF(1). This can potentially cause bias in the scientific literature. As described in a scientific background document for the Belgian FBDG(2) UPFs are diverse and thus "the degree of processing should be considered as a criterium but not the only criterium e.g. for developing food based dietary guidelines". Consumers will make their own definition of what identifies UPFs. By communicating that	enough to make them healthy. In Norway the food industry cooperates with the health authorities to create healthier products partially through reformulation. Most reformulation of dairy products, such as reducing the fat content in cheese or stepwise removal of added sugar in flavored yoghurt, does not demand using additives. In other products such reformulation can shift the foods from "processed" to "ultra-processed" in NOVA due to additives used to attain the desired texture and flavor. Reformulation is a public health measure supported by WHO and FAO as a complimentary strategy to improve national diets1). By using solely NOVA to indicate if a product is healthy these products are deemed less healthy. Thus, it is thus strange that NNR should state that reduced calorie/low-fat products are only "perceived as healthy". Dietary intake The chapter lacks a description of which type of UPFs are most commonly eaten and if there are varieties between countries. The text should mention that approx. half of the purchased UPFs in Norway consists of nutrient-poor, energy-dense food2). Mechanisms All the suggested mechanisms are hypotheses to explain the effects of UPFs as a group on the risk of disease. While each mechanism may be valid for certain UPFs, they are not all valid for every single product in this group.	complement the other recommendations, not to replace them. We agree that it is high consumption of ultra-processed foods that is problematic, not occasional intake of individual foods. This is stated in the chapter. We have removed the recommendations regarding specific food substitutions in order to not single out any individual foods.

		reformulations and health claims are signs of food to avoid it is likely that people will lose confidence in measures to reduce fat, sugar and salt, and be suspicious of common processing methods. Health It seems hasty to state that all food classifies as UPFs have been linked to obesity, cardiovascular disease, hypertension, type 2 diabetes, cancer, depression, and all-cause mortality with the very limited number of studies and the too wide classification system. Higher consumption of UPFs often equals higher consumption of nutrient-poor but calorie-rich food(3). This is the same food that is linked to obesity(4) and as stated, increased weight and obesity has gained the strongest evidence in relation to UPFs. The conclusion should be altered to clarify that the undesired health effects are only found when a large part of the diet is UPF, not for any single UPF. Thus, the authors should not point out single foods to be avoided. The study by Hall et al. is a good example of how junk food and snacks lead to overconsumption as this was largely what was served in the ultra-processed diet. While the study is a good start to explore how people eat more of these foods it should not be used as proof that every single UPF will make people overeat. There is a need for studies comparing diets where the same type of food would either be industrially produced or homemade, or studies on diets that are more comparable to what we eat in the Nordic countries. References 1. Braesco V et al (2022) Eur J Clin Nutr. 2022 Sep;76(9):1245-1253 2. Flemish Institute of Healthy Living (2020)	Not all UPFs are nutrient poor with elevated levels of salt and added sugar, and fat. Flavored milk and yoghurt are as nutrient rich as unflavored variants. There is no evidence to suggest that the intake of these dairy products is less satiating nor that it displaces a more nutrient-rich variant. Processing might change the physical structure of food and thus increase the eating rate and bioavailability of nutrients. Research has also suggested that processing techniques often used for UPFs also can add texture to a product and reduce a food's energy density combined with reformulation3). This can slow the eating rate and thus the energy intake. Hundreds of additives are approved for use in food. Recent research has indicated that some of these additives may cause unfavorable alterations to the gut microflora. It is important to adjust safety approvals accordingly when new research has established a relationship between the additive and an unfavorable outcome. However, this should not imply that all other additives belonging to the same group or other groups be judged in the same way. If NNR should conclude that all products added flavors, sweeteners or emulsifiers are harmful, that means that we can no longer trust in risk assessments by expert panels such as EFSA. Food of all processing degrees can be found in plastic packages and the same	

		Implications of food processing: the role of ultra-processed foods in a healthy and sustainable diet. gezondleven.be 3. Gupta S et al (2019). Front Nutr.6:70 4. GBD, Lancet. 2020;396(10258):1223–49	cups are used for both natural and flavored yoghurts. The authors should find out what the status is on the Nordic packaging market before arguing that packaging materials can cause health problems. This should be addressed in the text. Dietary Guidelines Unsweetened yogurt is mentioned as a better choice to flavored yogurt, but there are also good choices amongst the flavored yoghurts. None of the studies mentioned have compared the intake of flavored vs plain yoghurt directly, and studies on yoghurt as a group (the majority being flavored yoghurt) have linked the consumption to a reduced risk of type 2 diabetes4) regardless of whether the yoghurt is flavored or not. The authors should discuss such findings. 1. Gibney MJ (2018) Curr Dev Nutr. 2018 Sep 14;3(2):nzy077 2. Solberg SL et al (2016) Public Health Nutr. 19(11):1990-2001 3. Forde CG et al (2020) Curr Dev Nutr. 4(3):nzaa0...	
Terkel Due	Nestlé Nordic, Arne Jacobsens Alle 7, DK-2300 København S	1. All processes are not the same, some may reduce the nutritional quality of food, others may not impact it or even improve it. Referring to food processes in general terminology is highly misleading. 2. The chapter doesn't mention any of the many major benefits of food processing, e.g. regarding environment, shelf life, reducing food waste, innovation/food tech, food safety, taste,	Page 9, 10 & 11 Comments on the RCT studie Hall, 2019 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7946062/): The energy density of "non-beverage" (i.e. solid) meals + snacks was about 85% higher in the ultra-processed diet	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate

		affordability, convenience and health. No scientific expert on the food processing involved in writing the chapter. 3. The chapter fails to provide an objective view of the definition and the impact on health of Ultra-processed food by excluding negative criticism. The authors refer to some critical articles (ref 27 and 28) without presenting their key arguments. 4. The term Ultra-processed food is alarming, undefined and questioned, it should therefore not be used as the headline of the chapter. 5. Remove "plant-based alternatives" from the chapter. The chapter states: "Nevertheless, some ultra-processed foods, for example reformulations and plant-based alternatives, are identified as 'healthy' based on nutrient profiling. As a result, it is currently debated if nutrient reformulation is sufficient or not to address the issues surrounding ultra-processed foods." To question nutrient profiling and reformulations without any scientific backup is highly questionable and contradictory to other chapters in NNR. Plant-based products, or any other category, should not be made suspicious purely based on speculations. 6. Considering the lack of scientific backup and the weak NOVA definition its questionable whether Ultra-processed food deserves a chapter of its own. Other areas, like whole grain or plant based, have a more solid scientific foundation and a greater potential to improve public health or environmental impact. The chapter is leading to a negative perception of consumers in processed foods and drinks and therefore may have a negative impact on efforts to improve public health. 7. It is the final composition/nutrient profile of a product that matters when assessing its role in a healthy diet, not the level of processing.	compared to the unprocessed diet (2.147 vs. 1.151 kcal/g). Thus, to eat the same number of calories, the ultra-processed group had to eat almost twice the amount of food. The energy density was then adjusted for by adding beverages, however, as the authors state, beverages doesn't satiate the same way as solids and can therefore not compensate for differences in energy density of solid foods. This has been thoroughly researched by Barbara Rolls (Rolls, 2009), as referred to in the article. The authors states: "…the ~85% higher energy density of the non-beverage foods in the ultra-processed versus unprocessed diets (Table 1) likely contributed to the observed excess energy intake (Rolls, 2009)." The major difference in energy density between the diets is a much more likely cause of the outcome, rather than the processing level of the foods. This, and additional criticism is pointed out by A. Astrup (https://academic.oup.com/ajcn/advance-article/doi/10.1093/ajcn/nqac123/6602408)	that many types of food processing are necessary and may confer many benefits. We have removed the example of plant-based alternatives in order to not single out any specific food. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

Guro Waage	Nortura SA	Nortura do agree that increased intake of minimal processed food probably would be beneficial, and that some of the factors addressed in the chapter may be important for improving public health. But we do have some concerns about this chapter, and the definition of ultra-processed food. In the introduction the authors state that While an official definition of ultra-processed foods is lacking, the vast majority of research defines ultra-processed food according to the NOVA framework. The statement is correct, but we do question why the published criticism and challenges with NOVA (1,2,3) is not referred to at all, nor discussed in the chapter. Neither are the potential use of other frameworks related to ultra-processing, or the term ultra-processed itself. This gives the impression that the NNR-committee accept NOVA as valid, without further discussion. NOVAs definition of ultra-processed food is wide-ranging, and includes a variety of different products, with different ingredients, nutrient profile, and degree of processing. The huge differences between the products classified as ultra-processed, should be discussed. Also, the chapter focus mainly on food with poor nutritional value, and not the fact that products with high nutritional quality, also are defined as ultra-processed according to NOVA. Most animal-based products marked with “Keyhole”, a symbol for healthier choice, owned by the authorities in the Nordic countries, is by NOVA defined as ultra-processed. To achieve the requirement set to use the Keyhole, the meat products must contain lower amounts of salt, sugar, and fat than comparable products.	It is written under data gaps for future research that Further research is also warranted to clarify the biological mechanisms through which ultra-processed foods may influence health outcomes and the proportional harm associated with the nutritional composition, food additives, physical structure, and other properties of ultra-processed foods. We would like to emphasize the need to investigate the aforementioned factors as soon as possible. To get answers to the biological mechanisms will help manufacturers make changes that might be beneficial for public health. 1) Raul Amaral Rego (2022) Ultra-processed: The Search of positioning from the food industry regulatory authorities. Frontiers in Nutrition. dio: 10.3389/fnut.2022.906561 2) Sadler CR., Grassyb K., Hart M., et al (2021) Processed food classification: Conceptualization and challenges. Food Science & Technology. doi.org/10.1016/j.tifs.2021.02.059 3) Astrup, A., Monteiro, C.A. (2022). Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? American Journal of Clinical Nutrition. doi: 10.1093/ajcn/nqac123 4) Lovdata: Forskrift om tilsetningsstoffer til næringsmidler. Forskrift om tilsetningsstoffer til næringsmidler - Lovdata 5) Varela-Tomasco P-, Skipnes D., Bårvåg	The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods (which is a term defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. Likewise, a comprehensive evaluation of the NOVA system per se is beyond the scope of this chapter. Nevertheless, we acknowledge the ongoing scientific debate concerning the NOVA classification.

		Fat/saturated fat is a natural part of the animal, and processing are therefore often needed to meet the requirement. Also, the consistency and flavor from the fat must be replaced with other ingredients to meet the consumers demand. The keyhole-products are also produced to meet the requirements set for the industry through the agreement of intent for a healthier diet (Intensjonsavtalen), with the health authorities. The contradiction between ultra-processed food and the current strategy from the authorities, particularly related to saturated fat, needs to be discussed and assessed before the category ultra-processed food are implemented in the food based dietary guidelines. This contradiction puts manufacturers in a verry difficult position. Furthermore, the use of additives is strictly regulated through the Regulations for use of additives in food products (4). Any substance added to a product with a technical purpose, must be listed in the list over approved additives given by the legislation. This makes it challenging to replace certain additives in the products with other, “more natural”, ingredients and accommodate NOVAs rigorous criticism of additives, without compromising the regulation. Another aspect not mentioned in the chapter is the fact that not all processing (also methods defined in category 4, NOVA) is bad, and that there are continuous changes in processing technology, and new technology are often both more sustainable and gentler on raw materials (5). Considering sustainability, processing allows us to utilize the resources we have, to make use of the whole animal, and reduces food waste, which means more food for a growing population.	Grini I.S., et al (2022) Verd å vite om ultraprosessert mat, NOFIMA. www://nofima.no/fakta/verdt-a-vite-om-ultraprosessert-mat/	

		The Nova classification system is made in Brazil and based on the Brazilian diet and how they farm and do processing. Products highlighted in the NOVA-classification, and used as examples through the chapter, probably contain different ingredients, and are produced in different ways, in different parts of the world. None of the studies referred to in the chapter are done in the Nordic countries. We therefore request an analysis of NOVA in a Nordic context. See sources under detailed comments..		
Marleena Tanhuanpää	Finnish Food and Drink Industries' Federation	Part 1. The concept of "ultraprocessing", created by a nutritional epidemiologist, is from several points of view inappropriate, vague and misleading (Petrus et al 2021). Criticized in many scientific papers (Botelho et al 2018, Petrus et al 2021, MORE REFS), it demonstrates the gap and need of communication between food and nutrition scientists. The NOVA classification, made without and scientific background or reference regarding food processing, attempted to divide foods in four classes with respect to level of processing. Nutritional quality of a product, however, is associated with formulation/recipe and not with the level of processing, with few exceptions (Botelho et al 2018, others). No scientifically substantiated or legally/generally accepted definition for the concept of ultra-processed foods exists (AESAN 2020). In spite of this, even the NNR22 committee now considers using the term to categorize foods to be avoided. We oppose this. Food processing comprises alterations in a food occurring between the point of origin (i.e., the	Page1 Abstract: The definition of ultraprocessed food should not be accepted, it does not state anything about nutritional properties: "ready-to-eat/heat formulations whose manufacture involves several stages and various processing steps and ingredients". Page 2 Introduction para 2: "While an official definition of ultra-processed foods in lacking": Yes, this is why it should not be studied for health relevance of foods – everyone can make their own classification and this concepts should not be "used as a novel dimension of diet quality" (page 3 para 1). Page 9 Mechanisms first para: Only negative aspects of processing are listed, neglecting the many ways in which processing may improve nutritional properties. Second para: Convenience, availability, affordability… and	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include

		production of raw foods or food ingredients) and the point of destination (i.e., the consumption of a final food product) (Capozzi et al 2021). Ensuring food safety and product quality and palatability have historically been important drivers for both home and industrial processing of food ingredients. From the perspective of food science and technology, degree of processing and nutritional value do not have a linear relationship and these concepts need to be dissociated (Sadler et al., 2021). The NOVA classification conceptually differs from processing level concepts in food science, and states that food processing is directly related to nutritional impact of food (Botelho et al 2018). This is unfortunate as, in contrast, NOVA classification rather considers the number and quality of ingredients contained in industrially processed foods (Petrus et al 2021, other refs). Even if the nutritional quality of food is largely determined by the choice of ingredients, processing may be used to design nutritional properties, especially bioavailability of nutrients and non-nutrients such as plant phytochemicals. This is not considered in the NNF report at all. Adjusting the glycemic response of starchy foods is one example herein (REFS). Some raw materials, such as grains and pulses, cannot be eaten without processing. Food structure, important for sensory characteristics and food digestion, is an important target of modern food engineering (Aguilera 2006). Fractionation methods may be used to remove nutritionally unfavourable compounds from plant raw materials. Bioprocesses, such as fermentation, have proven useful in improving nutritional quality of foods, or assisting in pretreatment of healthy plant ingredients to improve their palatability.	marketing: how are these related to processing of food? Third para: Processing can alter the physical structure of food.. sure it does it, and often in a positive way. “UPF are generally low in DF” -not true – adding emulsifiers, thermal processing etc may actually assist in formulating palatable high DF-foods. Last para: why are additives and industrial ingredients criticized here, making EFSA and food safety assessment in general under suspicion? Food additives have undergone extensive toxicological assessments by EFSA and other entities worldwide, which ensures the safety and healthiness of those. Page 10, para 2: the contaminants mentioned here are better controlled in industrial processing than home processing. Para 3: plastic packaging: why is this mentioned only in connection with so-called UPFs, also fresh vegetables, salads etc are packed. Page 10 Summary: “Carefully conducted studies” – we find this missleqading, when there is no generally accepted definition of UPF, which is the basis of any study?! Page 11 para 3: A shared limitation across all observational studies is the lack of dietary assessment methods… indeed, and it is indeed impossible to link the observations to any degree of processing, rather the type of	recommendations regarding UPF to complement the other recommendations, not to replace them. Concerning additives, several studies in animal models and in humans have suggested deleterious health effects for some of the roughly 330 additives currently approved for use in Europe, for instance through gut microbiome dysbiosis, inflammation, and DNA damage. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023)

		"Ultra" generally means very extreme or radical, and it may add either a good or bad connotation. Ultra-good or ultra-exciting are positive terms; ultra-bad or ultra-boring are negative (Petrus et al 2021). It is sad that ultraprocessing is taken as a term to describe foods to be avoided, casting a shadow and perhaps leading to consumer concerns about processed foods in general. The consumers already have in earlier nutrition recommendations been advised to restrict the intake of added sugar, salt, and saturated fat. If the vague concept of UPF foods will be used in future recommendations, consumers may be further confused and afraid of any industrially prepared food. How could they distinguish the UPF category to be avoided, if even scientists have not been able to define it? Is the aim really to advise consumers to go for home cooking? The list of references are submitted in part 2.	ingredients used, ie nutritional profile. Page 11 data gaps, last para on page: Indeed nutritional composition, safety of food additives, role of food physical structure are all important food characteristics to study, but not limited to so called UPF. "How ultra-processing changes whole foods" – this sentence has no meaning. Processing is a prerequisite for development of more sustainable foods and diets, and to increase the use of plant raw materials – here we need more studies, how to achieve this. Shift page 11-12: ..examine potential benefits of dietary advice focusing on processing level in addition to nutrient based recommendation: We disagree, as the examples of differentiating between processed and ultraprocessed foods is by definition the presence of additives or ingredients used to tailor the sensory quality of food (like adding jam or pectin to jogurt, or adding flavour of sweetener to muesli). Some healthy foods are considered unpalatable, and additional processing and/or structurizing agents may actually have beneficial effect on their intake. Page 12 Integration, para 1, last 3 lines: We disagree that adding the concept of UPF limitation in consumer advice would have benefits over avoiding salt, sugar and fat. Instead, there is clearly need to integrate food scientists and	

			technologists in the dialogue about classifications of food processing. Behavioral sciences should also be integrated in the process to study and develop end-user communication means with respect to food choice. The current plans regarding introducing the concept of UPF, with no scientific consensus about what they really are, will create confusion and blur messages about healthy food choices	
Terhi Virtanen	Finnish Food and Drink Industries' Federation	Part 2. List of references to the comments of Finnish Food and Drink Industries' Federation	Part 2. List of references to the comments of Finnish Food and Drink Industries' Federation AESAN (2020). Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on the Impact of Consumption of Ultra-processed Foods on the Health of Consumers. Ministerio de Consumo (Spain), AESAN 2020/3. Translation available: https://zenodo.org/record/3935602#.Yk_wIijP3yR Aguilera, J.M. (2006) Food product engineering: building the right structures. J Sci Food Agric 86:1147–1155 . Botelho, R., Araújo, W., & Pineli, L. (2018). Food formulation and not processing level: Conceptual divergences between public health and food science and technology sectors. Critical Reviews in Food Science and Nutrition, 58(4), 639–650	

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			Trends in Food Science & Technology, 112, 149–162. https://doi.org/10.1016/j.tifs.2021.02.059 Tian, J., Ogawa, Y., Shi, J., Chen, S., Zhang, H., Liu, D. and Ye, X. (2018) The microstructure of starchy food modulates its digestibility. Crit. Rev. Food Sci. Nutr. 59.https://doi.org/10.1080/10408398.2018.1484341	
Rita Nilsen McStay	Orkla Foods Norway		Firstly, we would like to thank for the opportunity to give input to the proposed chapter on ultra-processed food (UPF). Our comments are directed towards the last paragraph on page 2 “Examples of ultra-processed foods include soft drinks, salty snack foods, fast foods and candy. Many foods that are marketed and perceived as healthy, such as reduced-calorie/low-fat products, are in fact ultra-processed. Foods such as industrially-produced breads, breakfast cereals, and flavored yogurts are classified as processed or ultra-processed foods depending on their ingredients (e.g., content of food additives)” and the last paragraph on page 12 "As a result, recommendations to limit ultra-processed foods, and choose foods of lower processing level, when possible, may enhance and support several of the existing FBDGs and help individuals select more healthful foods that align with the overall NNR2022 guidelines within each food category”.	The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

			The concluding remarks on page 12 builds on research that includes a large group of different foods. The research does not consider single food items, does not distinguish on different ingredients or the matrix of ingredients, nor research containing Nordic foods or diets. Through the NOVA classification it is not possible to assess whether specific additives are driving the associations found, or differences in the levels of nutrients, or whether different processing techniques could be the determining or mediating factors. Hence, the food group defined as UPF is wide and the risk of confounding factors is high and, as of today, causality cannot be drawn on what specific factors determine the association seen between an increased intake of UPF and health effects. On page 2 it is stated "The purpose of the NOVA is to classify foods according to processing level and the classification does not consider the nutrient composition of foods", implying a disregarding of the work from EFSA which are based on solid scientific documentation. Using the NOVA classification, certain foods considered healthy in a Norwegian diet will be categorized as UPF. If the statements on page 2 and the conclusion on page 12 are kept as is, several food items that are recommended in the dietary guidelines today, will be suggested to be limited in consumption.	

			We want to emphasize these points through the example of oily fish and fish spreads. These are food items the authorities and dietary recommendations recommend the population to increase their intake of. However, several of these will be affected by the NOVA classification: 1. Products that both have the Keyhole and are recommended in today's dietary recommendations like Makrell i tomat på tube, Peppermakrell i rapsolje (with Keyhole), Makrell i tomat i porsjonspakker, Makrell i tomat finhakket (with Keyhole) and Makrellfilet Grovhakket i salsa (with Keyhole) are all UPF according to the NOVA classification. 2. In Norway, only around 20 per cent of women and 25 per cent of men eat the recommended intake of fatty fish and fish consumption has decreased in recent years. Fatty fish is a good source of nutrients such as protein, vitamin B12, iodine and selenium. Fatty fish, such as mackerel, is the main source of marine omega-3 fatty acids in the Nordic diet. Fatty fish is also a source of vitamin D. There are several approved health and nutritional claims for each of these nutrients, but it is especially vitamin D and DHA/EPA that are important considering the Nordic diet. Vitamin D, for example, is a vitamin that many people in the Nordic countries have difficulties getting enough of, both because of sun conditions, but also	

			because the intake of fatty fish is too low. 3. Using NOVA and disregarding the nutrient profile will make several products made to make it easier for consumers to eat fatty fish, be promoted as products to avoid. We like to argue that this will be confusing and most likely make many people remove these from their diet.	
Kirsti Greiff	SINTEF Ocean	The definition of ultra-processed food does not distinguish between healthy and unhealthy food. The nutrition recommendations already contain recommendations to reduce the intake of saturated fat, sodium and sugar, and a new definition as "ultra-processed foods" will confuse the consumer.	The Ultra-processed foods are defined in the abstract as ready-to-eat/heat formulation, is this the same classification as used later in the chapter? The authors refer to the Novo-classification. The Novo-classification is debated, it is no scientific consensus on the definition, and it is too early to set recommendations related to "Ultraprocessed foods" based on this classification. There are many counterarguments to the use the Novo-classification and one disadvantage is that the classification does not distinguish between healthy and unhealthy food, and there are still debates whether it is the processing or the ingredients that is negative for the health. New technology for food production is continuously developed for a gentler processing and there are a lot of ongoing research and developing with the aim to produce more healthier processed food.	The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing is necessary and may confer many benefits.

Kirsti Wettre Brønner	TINE SA/Nutrition	Numerous association studies have linked diets high in 'ultra-processed' foods with higher risk of obesity and with other cardiometabolic health risks. The biological pathways are not yet fully understood, and suggested mechanisms are hypothetical. We argue that one and each of these hypotheses should be approached individually and explored scientifically in realistic conditions (formulations, doses and combinations that are used commercially). The use of term 'ultra-processed', and especially the approach to use intention behind the addition of ingredients to classify a food as unhealthy, will at its best delay a more scientific approach to how foods, components in foods and additives affects health. When research suggests that a food or an ingredient may cause a pro-inflammatory status and metabolic dysregulation due to encroachment of microbiota, this is of serious public health concern. It is naïve to suggest that only components or processes used to make products more appealing to consumers potentially could affect microbiota. Thus, the approach should be to generate more data on microbiota effect of all additives, so that this can serve as scientific input to EFSAs risk assessments as basis to guide further regulations (eg, maintenance or reduction of authorized concentrations of some substances, or their prohibition altogether). Neither the impact of food components on microbiota, nor potential migration of contaminants from packaging, are concerns that would be exclusive to foods in NOVA class 4. Plain yoghurt and flavored yoghurt are packed in the same packaging, and so is the case with milk versus flavored milk. The approach to explore and evaluate such mechanisms should be broad and	Mechanisms - page 9. Findings suggest that texture of food may impact eating rate, and that texture combined with high energy density may at least partly explain the higher intake of energy from UPF that was observed in the Hall study (1). The impact of texture and true processing techniques (such as milling and extrusion) on eating rate and satiety should be discussed as a possible mechanism for the results found. 1) Teo et al. Am J Clin Nutr. 2022. Texture-based differences in eating rate influence energy intake for minimally processed and ultra-processed meals Integration - page 12. Although there is no one agreed definition of ultra-processed foods, a general trait often used to describe them is the lack of whole food ingredients. Both plain yoghurt and flavored yoghurt has a high content of milk, and the natural content of important milk minerals such as calcium and iodine is equally high. What separates a yoghurt that is considered ultra-processed from other yoghurts could be the mere presence of aroma. Although evidence from RCTs is scarce, there is increasing evidence from prospective cohort studies indicating that yogurt (including flavored yoghurt) is strongly associated with a lower T2D risk (1). Also, evidence suggest that yogurt consumption may improve gut health and reduce chronic inflammation	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. We have added a discussion regarding the potential role of food texture and eating rates in explaining the results of Hall et al., and referenced Teo et al. 2022. We have removed the examples of food substitutions in order to not single out any individual food.

		open, and not restricted to 'components with unfamiliar names', or other traits and cues that aim to classify ultra-processed foods in a seemingly random way. One should be careful not to raise doubt about "sweeteners" or "emulsifiers" in general. Both sweeteners and emulsifiers are diverse groups of compounds. Studies support that aspartame, sucralose, acesulfame K and steviosid impact microbiota differently (1). So is the case with emulsifiers (2). Reformulation is supported by WHO and FAO as a complimentary strategy to improve national diets. In light of the important role that both sweeteners and emulsifiers play in obtaining public health priorities to reduce the intake of added sugars and saturated fats, one should be careful not to raise doubt about the safety of these additives if not intended and scientifically substantiated. Heating, fermentation, drying, pasteurization and filtration are examples of commonly used processing techniques that ensure safety, distribution throughout the country, and that contributes to avoidance of spoilage. The preterm "ultra" is often used to specify the degree of processing, without any relation to health. Consumer mood is for real food, and there seems to be a health halo around products that are perceived as all "natural", "fresh" and "clean". Choosing "real foods" and avoiding ultra-processed foods are to sides of the same coin. However, there is no one agreed definition of UPFs, and for the average consumer it will be almost impossible to correctly identify what constitutes ultra-processed foods, jf NOVA. As a commercial supplier we already experience consumers have their own	by enhancing innate and adaptive immune responses, intestinal barrier function, lipid profiles, and by regulating appetite (2). Moreover, eating flavored yoghurt labelled with the Keyhole® could secure intake of iodine and calcium in line with existing Norwegian FBDGs. Choosing plain, unsweetened yoghurt instead of flavored, sweet yoghurt should not be used to exemplify how the recommendation to limit ultra-processed foods would support existing FBDGs. 1) Guo J et al. Adv Nutr. 2019 The Impact of Dairy Products in the Development of Type 2 Diabetes: Where Does the Evidence Stand in 2019? 2) Pei et al. Crit Rev Food Sci Nutr. 2017 Evidence for the effects of yogurt on gut health and obesity	

		ideas about what ultra-processed is and what it is not. We are worried that an un-precise use of the term “ultra-processing” unintentionally will raise doubt on the safety of commonly used processing techniques, such as pasteurization of milk. 1) Naimi et al. Microbiota. 2022. Direct impact of commonly used dietary emulsifiers on human gut microbiota 2) Suez et al. Cell 2022. Personalized microbiome-driven effects of nonnutritive sweeteners on human glucose tolerance		
Anders Högberg	Orkla Foods Sverige	GENERAL COMMENTS Firstly, we would like to thank for the opportunity to give input to the proposed chapter on ultra-processed food (UPF). On a general basis we would like to express our concern with the term Ultra Processed Foods (UPF) as it may hamper the improvement and development of present and new Healthier and Sustainable Food Products if not very well defined and scientifically evaluated. On a more detailed basis we would like to stress the following: • Lack of robustness on the definition of UPF and the proposed health effect mechanisms are speculative and uncritically described • Food products within the Ultra Processed Category can be healthy, e.g Keyhole labelled products included in the national dietary guidelines • NOVA classification dismisses decades of nutrition research showing the relationship between nutrients, dietary patterns and health We think that the above aspects are not sufficiently included in the proposed chapter on ultra-processed food.	DETAILED COMMENTS The NOVA classification is too broad on the definitions (Weaver C.M. et al., 2014, Gibney M.J. et al., 2017, Gibney M.J. et al., 2019, Braesco V. et al., 2019, Vergeer L. et al. 2019, Thielecke F. et all., 2020, de Araujo T.P. et al., 2022) and there is a lack of measurable cut-offs when categorizing food products according to the classification, making the arbitrary component high (Weaver C.M. et al., 2014, Gibney M.J. et al., 2017). As a consequence, and demonstrated by Braesco V. et al. (2022), nutrition and food science researchers, medical doctors, and dietitians showed inconsistency and difficulties classifying 231 food products. In addition, the proposed mechanisms for health effects of UPF are not very well founded and critically described (excluding nutrient composition and dietary patterns that is very well described in decades of NNR publications). Hence, we would like to	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

		REFERENCES USED INCLUDED IN DETAILED COMMENTS Braesco V., Corrieu G., Feillet P., Giacchetti I., Pascal G., Risse J., Serpelloni M., This H., Trystram G. (2019). Aliments dits "ultra-transformés et santé: que faut-il en penser? Publication of the Academie d'Agriculture de France. Braesco V. et al. (2022). Ultra-processed foods: how functional is the NOVA system? Eur J Clin Nutr 76(9):1245-1253. Thielecke, F., Lecerf, J-M., Nugent, A. P. (2020). Processing in the food chain: do cereals have to be processed to add value to the human diet?. Nutrition Research Reviews, (), 1–43. de Araújo, T.P., de Moraes, M.M., Afonso, C., Santos, C., Rodrigues, S.S.P. (2022). Food Processing: Comparison of Different Food Classification Systems. Nutrients, 14, 729. Estell M.L., Barrett E.M., Kissock K.R., Grafenauer S.J., Jones J.M., Beck E.J. (2022). Fortification of grain foods and NOVA: the potential for altered nutrient intakes while avoiding ultra-processed foods. European Journal of Nutrition 61(2):935-945. Gibney, M. J., Forde, C. G., Mullally, D., & Gibney, E. R. (2017). Ultra-processed foods in human health: a critical appraisal. The American Journal of Clinical Nutrition. Gibney, M. J. (2019). Ultra-processed foods: definitions and policy issues. Current Developments in Nutrition, Volume 3, Issue 2. Livsmedelsverket, (2022)	argue that the term UPF should be used with caution in a NNR context and especially if we want to enhance circularity within the food system, where processing will be essential. Orkla Foods Sweden is committed to inspire people to adopt a healthier lifestyle for example by using publicly endorsed health labelling like the Keyhole, Finnish heart label, Danish Whole Grain Partnership or the Norwegian "Bread scale". The first Keyhole-labelled Orkla product was launched in Sweden during the 1990's and the number of products has increased every year since then. In total, Orkla had 263 Keyhole-labelled products in 2021 whereof 77 in Sweden, a 15 % increase compared with the year before and with an annual sale of more than 350 million SEK in Sweden alone. Even though difficult to assess because of the vague definition, we believe that all, or at least a very large majority of these Keyhole labelled products, will be classified as Ultra-processed according to the NOVA scale. We think that this shows that UPF can have a wide variety of nutritional qualities where we can find products such as whole-grain packaged bread products, unsweetened whole-grain breakfast cereals, less energy dense dairy products, ready meals with high content of vegetables all developed in accordance with agreements with, recommendations from national authorities (Livsmedelsverket, 2022). This suggests	

		https://www.livsmedelsverket.se/livsmedel-och-innehall/text-pa-forpackning-markning/nyckelhalet. Poti, J. M., Braga, B., & Qin, B. (2017). Ultra-processed Food Intake and Obesity: What Really Matters for Health—Processing or Nutrient Content? Current Obesity Reports, 6(4), 420–431. Sadler, C. R., Grassby, T., Hart, K., Raats, M., Sokolović, M., & Timotijevic, L. (2021). Processed food classification: Conceptualisation and challenges. Trends in Food Science & Technology, 112, 149–162. Thielecke, F., Lecerf, J-M., Nugent, A. P. (2020). Processing in the food chain: do cereals have to be processed to add value to the human diet?. Nutrition Research Reviews, (), 1–43. Vergeer L., Veira P., Bernstein J.T., Weippert M., L'Abbé M.R. (2019). The Calorie and Nutrient Density of More- Versus Less-Processed Packaged Food and Beverage Products in the Canadian Food Supply. Nutrients 11(11):2782. Weaver, C. M., Dwyer, J., Fulgoni, V. L., King, J. C., Leveille, G. A., MacDonald, R. S., Ordovas J., Schnakenberg, D. (2014). Processed foods: contributions to nutrition. The American Journal of Clinical Nutrition, 99(6), 1525–1542.	that processing itself may not be a causal determinant of the nutritional quality of foods (Poti, J. M., et al., 2017) and that from the perspective of food science and technology, processing and nutritional value do not have a linear relationship and these concepts need to be dissociated (Sadler, C. R. et al., 2021). In addition, it has been shown statistically significant differences in all nutrients, including whole grain, dietary fibre and food components of interest when UPF were excluded from the diet, risking a non-beneficial intake level (Thielecke F. et all., 2020, Estell M. et al., 2022). In summary, we think that the NOVA classification dismisses decades of nutrition research showing the relationship between nutrients, dietary patterns and health, which overrules the overall scientific approach accepted worldwide and that have been the state-of-the-art approach in work with NNR. Orkla's companies are reducing salt, sugar and saturated fat in a growing number of foods and we also see an increased number of products labelled with the Keyhole as warranted by national health governments. Indeed, these products in most cases are more or less processed but they have one goal in common and that is to contribute to consumers more sustainable and healthier dietary habits. Thus, we urge the authors to assess a more balanced view in the chapter about UPF.	

Susanne Bryngelsson	RISE Research Institutes of Sweden	Dear NNR2022 committee, Thank you for the opportunity to comment on the chapter “Ultra-processed foods”. Please, find below the comments from RISE Research Institutes of Sweden. Our comments are submitted in three separate parts, due to the upper word limits per submission. This is the first part. Food processing cause chemical and structural changes of food raw material, which may contribute to impaired or improved nutritional quality and health effect of the final food. Critical evaluations of potential nutritional and health consequences of various food technologies are important, to secure that foods are safe, healthy and sustainable. Therefore, an evidence-based discussion on the relationships between food processing and nutritional and health performance of foods is warranted and welcomed. However, to be useful it must be based on scientifically sound definitions and stringent assessments of the scientific evidence. Unfortunately, we do not find the NNR2022 chapter on ultra-processed foods to meet this, in its present form. We are concerned that the chapter on “Ultra-processed foods” in its present form will lead to confusions and unforeseen consequences and may even hinder innovations required to solve the urgent challenges of the food system. There are critical needs of food science and technology to solve the Global Sustainability Goals (Lillford and Hermansson, 2021). Food technology will be crucial for the possibilities to feed the growing population with healthy foods, while reducing greenhouse gas emissions and saving the non-renewable resources of the planet.		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the health effects of food processing in general is out of scope and not discussed. We do not negate that some types of food processing are necessary and may confer many benefits.

		We believe that a more general “Food processing”-chapter that objectively summarizes the present state of knowledge regarding nutritional and health effects of selected well-defined food processing techniques would be more useful. That would provide useful information for risk managers when formulating food based dietary guidelines and would align with the tradition of the highly reputable NNR to be far-sighted and of high scientific standard. In that context, ultra-processed foods according to the NOVA classification could be objectively discussed, together with other suggested models how to classify foods based on the degree of their processing.		
Marte Gjeitung Byfuglien	Mills As	Mills AS wants to submit the following seven comments to the public consultation of the NNR2022 chapter 17 Ultra-processed foods: Definition of ultra-processed foods An official definition of ultra-processed foods is lacking (1). Today ultra-processed foods present a broad concept that needs to be defined. It may also be important to define the degree of processing. NOVA is not an approved definition either. The authors of this chapter also mentioned that ultra-processed foods do not have a definition themselves in the introduction, page 2. However, they still advocate ultra-processed foods and NOVA further in the chapter as if they were approved. This creates ambiguity about what underlies the hypotheses and the conclusions. Ultra-processed foods challenge some of today’s food-based dietary guidelines and sustainability. For several years the food industry has reformulated recipes initiated from the health authorities, which mean products with lower content of saturated fat, sugar, and salt, but also	Ultra-processed foods, public health, and communication We need to contribute documented dietary advice to the public because of the challenges with noncommunicable chronic diseases worldwide. In this chapter there is an absence of focus on how people perceive ultra-processed foods. Both professionals and consumers have a different understanding of ultra-processed foods (1,2). The term ultra-processed food is confusing, and there is a need to define the term before the Food-Based Dietary Guidelines is given. Ref. 1. Consumers’ Understanding of Ultra-Processed Foods. Sarmiento-Santos, J. et al. Foods 2022; 11: 1359. 2. “Even We Are Confused”: A Thematic Analysis of Professionals' Perceptions of Processed Foods and Challenges for Communication. Sadler, C.R., Grassby,	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the health effects of food processing in general is out of scope and not discussed. We do not negate that some types of food processing are necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We

		additives in some products. Even though sustainability is not a part of this chapter it is worth mentioning that processing foods might have a possible impact on several factors regarding to sustainability. Processed foods might contribute to improved food security, reduced food waste and increased shelf life. Ref. 1. “Even We Are Confused”: A Thematic Analysis of Professionals' Perceptions of Processed Foods and Challenges for Communication. Sadler, C.R., Grassby, T., Hart, K., Raats, M., Sokolović, M and Timotijevic, L. Front Nutr. 2022; 9: 826162. Published online 2022 Feb 23. doi: 10.3389/fnut.2022.826162 Ultra-processed foods do not consider products with different nutritional qualities Within the ultra-processed foods group and NOVA, we find products with different nutritional values. This suggests that processing itself may not be a causal determinant of the nutritional quality of foods. NOVA does not consider the relationship between a product’s nutritional value and the degree of processing. The level of processing of food and drink does not determine the nutritional content of the final product. According to NOVA, butter for instance, is classified as a culinary ingredient and no distinction is made on the healthiness of the product based on e.g., saturated fat content. Margarines, which are recommended products in the Norwegian Dietary Guidelines, are according to NOVA ultra-processed products. This approach is quite confusing because it does not help the consumer to choose a healthier product because it does not address the nutritional value of the nutrients themselves.	T., Hart, K., Raats, M., Sokolović, M and Timotijevic, L. Front Nutr. 2022; 9: 826162. Published online 2022 Feb 23. doi: 10.3389/fnut.2022.826162 The available scientific evidence Different types of scientific studies are necessary to make an overall assessment of the association between food intake and the risk of non-communicable chronic diseases (1). Most of the studies referred to in this chapter are prospective studies. The authors of this chapter write themselves in the abstract; The current evidence is primarily observational and relies on self-reported dietary data and may therefore be subject to measurement error and confounding. It is therefore possible to question the overall quality of this chapter for inclusion in the NNR2022. Ref. 1. Christensen et al. The Nordic Nutrition Recommendations 2022 – Principles and methodologies. Food Nutr Res. 2020; 64: 4402. Concrete dietary advice in the conclusion In the conclusion of this chapter dietary advice are given. This is remarkable as there are lots of other chapters that will contribute to dietary advice for more specific food groups. Conflict of interest	advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023)

			The central goal of the conflict-of-interest policies is to protect the integrity of professional judgment and to preserve public trust. We do notice that one of the peer reviewers does have commercial interests, and we find this comparable to what is written in articles on methodology related to NNR (1). We also find that the chapter lacks involvement of people with expertise in food technology. With the absence of such expertise, significant perspectives and understanding of the processing of foods are not satisfactorily addressed Ref. 1. Christensen et al. The Nordic Nutrition Recommendations 2022 – Principles and methodologies. Food Nutr Res. 2020; 64: 4402. Mechanisms We do have some comments on the paragraph “Mechanisms”. First, food additives pose difficulty as food additives may be legally permitted in foods. Second, emulsifiers are necessary for processing some types of foods, and they may also be of natural origin such as egg and lecithin. Third, trans-fatty acids were replaced in Norwegian food processing two decades ago and are no longer a notable threat to human health (1). Fourth, acrylamide is formed by heating foods to above 120 degrees. It is formed regardless of whether the food	

			is ultra-processed or not. There is a substantial difference in how much acrylamide is formed depending on which varieties of the raw materials are used, and how they are pretreated. Finally, contamination of packaged food occurs to a greater or lesser extent regardless of processing. We do not use Bisphenol A in our packaging. Ref. 1. Ultra-processed foods in human health: a critical appraisal. Gibney, et al. Am J Clin Nutr. 2017; 106: 717-24.	
Torill Emblem Nysted	Animalia	On a general basis, classifying food and food items is not without challenges. However, the term "processed food" has been used for a long time. It is included in the current dietary guidelines on meat, but without any prior discussion or considerations. Therefore, when one chapter is dedicated to «ultra-processed food» , it is surprising that the definition or classification is not discussed at all. The authors use NOVA as basis, without any discussion around definitions, strengths and/or weaknesses. Nor do they mention why NOVA is chosen and whether there are other classification systems 1. NOVA does not take nutritional values into account, which is problematic as well. Ultra-processed food is the 4th category of the NOVA system, and many of our daily food products fall into that group. This is problematic because they may differ a lot. It is also problematic that the chapter does not discuss the nutritional importance this big group of food has in the Nordic countries today. The chapter also focuses mainly on food with poor nutritional value, and not the fact that there are many products with high nutritional		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is a term defined only by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealty" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to

		quality. We raise concern about the use of the term «ultra-processed» food being normalised as something that is only negative and not good for your health, without being properly defined. Without a clear and accepted definition, research evidence will be hard to interpret, and may cause bias. The studies referred to in the chapter are not done in the Nordic countries. We want to point out that some processed foods in Norway may differ from the same type of food in other parts of the world, partly due to the work done in relation to «Intensjonsavtalen», a partnership agreement between the food industry and the health authorites. In accordance with the partnership, the industry has worked for years to reformulate and produce new products with lower fat, sugar and salt to obtain the “healthy foods”-label, «Nøkkelhullmerke». To obtain this label, many foods needs some processing. The introduction of the NOVA-system can therefore be in contradiction to this partnership. The chapter lacks a description of which type of ultra-processed foods are most commonly eaten and if there are varieties between the countries. The text mentions that 59% of the purchased food items in Norway is UPF but it should also mention that approx. half of this consists of nutrient-poor, energy-dense food2. From a sustainability point of view, processed foods are important for feeding more people and for utilizing all food resources, e.g. use of the whole animal in sausages etc. Such positive aspects of food processing are not mentioned in the chapter, which is problematic. The authors’ «interest of conflict» is missing in this chapter as for the other chapters published for public consultations, and should be included.		complement the other recommendations, not to replace them. We have added a statement of author conflict of interest (none to declare).

		1. De Araujo et al, 2022; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8877594/pdf/nutrients-14-00729.pdf 2. Solberg SL et al (2016) Public Health Nutr. 19(11):1990-2001.		
Lauren Woodley	Nomad Foods	Full response in PDF submitted via email (to personvernombud@helsedir.no) on 30th November 2022	Full response in PDF submitted via email (to personvernombud@helsedir.no) on 30th November 2022	We have not seen this e-mail.
Aina Marie Lien	NorgesGruppen	1 The manuscript (ms) is well written, but it is written with the intention that ultraprocessed foods have a negative effect on people's health. It should be remembered that not all types of processing are negative. 2 The main purpose of this ms should be to give an overview of the different food processes usen in the Nordic countries and how they may affect the health. The title should, therefore, be changed to something like "Food processing and effects on health" 3 Care should be taken not to blame the food industry, retailers and/or marketing of food in general for the health situation in the population. They produce and sell the food people want. If science shows that processes and/or additives is bad for the health, the producers will stop using these elements immediately. No one wants to produce food which is bad for their customers . Every part of the food chain is cooperating with the health departments to keep the population as healthy as possible. Healthy choices are of great importance when developing new and better food alternatives to the customers. 4 The NOVA-classification is not valid for Nordic diets. A more appropriate classification should be defined for Nordic foods, taking in consideration		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. As requested by the NNR committee, the manuscript is written with the intent of reviewing the available empirical evidence regarding ultra-processed foods and chronic diseases. The evidence supports that ultra-processed foods are associated with mortality and multiple health outcomes. The manuscript is based on a systematic literature review, not on our opinions.

		normal use of different food groups in the Nordic countries.		
Siv Skeie	Norwegian University of Life Sciences (NMBU), Faculty of Chemistry, Biotechnology and Food Science	This comment is from the Food Science group at the Faculty of Chemistry, Biotechnology and Food Science, NMBU In our understanding the definition of Ultra Processed foods (UPF) is not really linked to processing but rather to content of sugar, fat, salt and additives. This is also stated in the introduction "Many of these foods are characterized by high densities of salt, added sugar and fats, and when consumed in high amounts, can undermine diet quality" therefore it is surprising that UPF is about to get such an importance with regards to nutrition recommendations. Processing of foods has been used since ancient times and even products termed as processed or ultra-processed foods in the NOVA classification (which has been set as a standard by many) i.e., pastry, dried meat and fish, and cheese (and even distilled alcoholic beverages) has been produced by man since long before the industrial revolution. The consumption of such products is suggested to be limited or discouraged. The principle of processing today is much the same, the main difference is the volumes used during production and that the production processes are more efficient. However, we do agree that products listed under the group of processed or UPF foods may not be healthy due to formulation with high fat and sugar contents as well as the use of many additives. However, to state that the use of heating, cooking, and packaging in modified atmosphere as you do with pre-prepared meat, fish and vegetables results in a food product that is unhealthy falls on its own unreasonableness. Another example is yoghurt, where a plain yogurt without added flavor and sugar is considered	Additives is a large group of different chemical compounds including artificial sweeteners, emulsifiers, thickeners, preservatives, colors etc. Some are of natural origin and present in plant based raw materials (such as benzoic acid in cloudberries and alginate in seaweed) whereas others are artificial; this is a huge and diverse group of compounds and each of them needs to be evaluated also when it comes to gut microbiota, immune responses, and metabolism. We must remember that these compounds are very important for the product's sensory properties, texture and shelf life, and it would be very difficult to ensure that the food reach the consumer without these compounds. When that is said we agree that the healthiness of the added compounds needs to be evaluated in all aspects. The report mentions industrial partial hydrogenation of oils that leads to the formation of trans fatty acids, we must emphasize that partially hydrogenated fats was replaced by fully hydrogenated fats the last decades and are no longer used in food products available in the Nordic countries. Therefore, the classification needs to be adapted to normal processing practices in the Nordic countries if it is taken into consideration. Therefore, we strongly oppose using the	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

		unprocessed or minimally processed, whereas the flavored yoghurt is considered UPF. These two yoghurts have undergone the same level of processing, with concentration, heating, fermentation, and packaging. The only difference is that after fermentation the flavored yogurt is added sugar. It might be that it is the production of sugar as such that classify this product under the UPF label, but it is no processing difference on the yoghurt. If the consumer starts with plain yoghurt and ads jam by himself, the outcome should be the same. In some countries flavored yoghurts may be added thickeners, but that is mainly not done in the Nordic countries. We do agree that highly formulated foods using highly modified ingredients and additives and products produced by novel processing technologies which cause large chemical alterations in the product during processing might be characterized as ultra-processed foods. We do agree on the statement of those that question the usefulness of focusing on processing level beyond the conventional classification system, since “ultra-processed diets” are detrimental to health simply because they are of poor nutritional quality. But many products classified as UPF are nutritious products with a good nutritious profile necessary for a balanced diet in a society where the food needs to be conserved to reach the consumer. In addition, processing of food is important to feed a growing global population, and the use of ingredients and/or additives assist in shelf-life stability of foods in countries where the cold chains are inconsistent. Many processed foods have longer shelf- life than fresh and unprocessed food, meaning that they can be transported and stored for longer periods, reducing food waste. Therefore,	current processing-based food ranking system such as the NOVA system as a way to encourage healthy diets. Dietary guidance, national policies or international standards that rank the healthfulness of foods must be built upon robust scientific evidence demonstrating they will lead to positive health outcomes with no significant negative effects. NOVA and other policies that seek to discourage consumption of foods based only on the level of processing fail to meet these essential requirements.	

		processing reduces food waste and food losses for sustainability. To conclude processing have positive contributions to the food chain by formulation and additives that contributes to ensure the safety, nutritional adequacy, quality, preservation, and extended shelf-life of food. (see more elaboration under detailed comments).		
Rikard Landberg (Chalmers tekniska högskola), Roger Andersson (SLU), Björn Bergenståhl (LTH), Robert Jan Brummer (OrU), Fredrik Bäckhed (GU), Tommy Cederholm (UU), Magnus Domellöf (UmU), Anne-Marie Hermansson (Chalmers), Krsiter Holmberg (Chalmers), Maud Langton	Samtliga är professorer vid svenska lärosäten och medlemmar i Svenska Nationalkommittén för nutrition och livsmedelsvetenskap	We acknowledge the importance to outline the current knowledge and identify knowledge gaps related to food additives, eating patterns, nutrient profiles, and the role of food processing for health. The consumer interest is large, and concerns regarding additives and processes shall be taken seriously. However, the information provided must be tuned in relation to current available evidence and methods, and it needs to be packed in an appropriate format. We have fundamental concerns regarding the current chapter and we think it is questionable that NNR includes the chapter in the present form for several reasons: - The concept of "ultra-processed foods" (UPFs) represents one food processing class in the NOVA classification system, and it is controversial and under intense scientific debate. This is not well reflected in the present chapter. More emphasis should be put on explaining the classification, its limitations, and strengths so the reader clearly understands the limitations of the concept and the consequences of using it. - The concept UPF is very wide and unspecific and currently a composite exposure that includes foods that may have undergone fundamentally different processes and have a large variation in ingredients (such as additives) and nutrient profiles. With such an exposure, it is very difficult to study specific mechanisms that relate intake of the group (UPF) to health outcomes.	We have identified several statements in the text which we find important to consider revising: Page 9: "Second, processing can alter the physical structure of the food matrix, with potential implications for nutrient bio-accessibility, absorption kinetics and the gut microbiome. The large share of acellular nutrients in ultra-processed foods and consequent high nutrient availability in the small intestine may promote an inflammatory gut microbiota." Such a remarkable statement would require to be backed up with references. Page 9: "Ultra-processed foods ……. .Low-fiber diets may also shift the gut microbial metabolism toward the utilization of proteins and host mucins, resulting in degradation of the intestinal mucus layer and increased susceptibility to chronic inflammatory diseases." The reasoning is based on studies in rodents and there are no direct findings in human or animals that provide any evidence that this may happen at intake levels typically consumed. The statement is highly speculative and cannot be simply translated to humans. Please tune this message.	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. We have clarified this in the text. We have added text regarding the scientific debate and controversy surrounding Nova and the UPF concept. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other

(SLU), Marie Löf (KI), Jan Nilsson (Lunds Universitet), Marju Orho-Melander (LU), Ann-Sofie Sandberg (Chalmers), Mats Stading (Chalmers/RISE), Alicja Wolk (KI), Anna Winkvist (GU)		- Some foods that are defined as UPF are at the same time labelled with Keyhole and recommended according to national dietary guidelines, for example some whole grain breads, veggie burgers, soy mince and canned beans in tomato sauce. This creates contradiction in the recommendations that risk both to undermine the dietary guidelines as well as the scientific rigor on which the NNR is founded. - Mechanisms discussed for the health effects of UPF are highly speculative and uncritical; some can be traced back to single rodent studies and although they are theoretically interesting, they cannot be put in relation to health effects in humans. The unbalanced discussion about mechanisms undermines the credibility of the work conducted by NNR. - There is currently no precise way of classifying foods according the UPF definition, which makes the exposure arbitrary, and the risk of misclassification is large. Food political concerns are playing a major role in the classification of foods as UPF or processed. - The currently ongoing transition from meat-based foods towards more extensive use of plant-based protein-based analogues is largely mediated by foods that fall into the UPF category. This may counteract the transition towards more sustainable foods. In summary, the chapter introduces an unspecific concept that is controversial without a detailed discussion about its benefits and limitations. It is questionable whether the concept UPF adds anything beyond existing measures of diet quality since it is merely a proxy that includes both diet (nutrient) quality aspects, additives and processes. It is of outermost importance that NNR is based on	Page 10: "Third, additives and other ingredients of exclusive industrial use in ultra-processed foods may influence biological systems and health outcomes. For example, animal studies indicate that artificial sweeteners and emulsifiers may disrupt gut microbiota integrity and promote a pro-inflammatory status and metabolic dysregulation. ……. Although food additives must be evaluated for safety, they are not tested for effects on gut microbiota, immune responses and metabolism prior to approval. " This is correct, but again, results are derived from animal studies with very high (unrealistic doses) of the additives. The most common emulgators used in the Nordic countries are esters that are hydrolyzed already in the small intestine during lipolysis and never reach the large intestine and the gut microbiota. However, most scientific investigations (including the ones referred to in the chapter have used polysorbat, which is more resistant but is rarely used in foods on the Nordic market. Moreover, only a few studies have been conducted in humans with realistic doses, but with no effects on gut microbiota composition demonstrated or other negative health effects. Page 10: "Using the Risk of Bias for Nutrition Observational Studies (RoB-NObs) Tool…….. Low risk of bias indicates that studies are comparable to a RCT." It is very good that the RoB-NObs has been used as a systematic approach to	recommendations, not to replace them. Appropriate references are cited for the statement "Second, processing can alter the physical structure.." on page 9. We have clarified that the statement regarding low-fiber diets on page 9 is based on rodent studies. We have added a statement regarding the benefits of added dietary fiber for type 2 diabetics based on RCTs in humans. We have added text and references for RCTs in humans demonstrating negative effects of realistic doses of artificial sweeteners and emulsifiers on the gut microbiome and glucose metabolism. We have also clarified the specific emulsifiers used in these studies. Regarding Page 10: "Using the Risk of Bias for Nutrition Observational Studies (RoB-NObs) Tool.." we are using the verbatim language from the RoB-Nobs. To avoid confusion, we have edited the sentence to "The RoB-NObs tool states that a low risk of bias indicates that the study is comparable to a well-performed randomized trial in the relevant domain.» We have deleted the sentence «Filling the knowledge gaps outlined in the

		solid scientific data and avoids speculations based on model studies and poorly defined exposures to maintain trust and credibility among the public and the research community. As researchers, we consider UPFs as an unspecific and non-scientifically defined concept that will make it difficult to study mechanisms and unravel causality. Instead, we suggest using existing and more well defined and studied measures of diet quality and make efforts to come up with better ways of measuring food processing per see to allow a scientific evaluation of its potential implications for human health. This could be reflected in a narrative chapter that introduces and discuss the concept of UPF and food processing and their benefits and limitations in a balanced way as well as identifies scientific gaps in our understanding of the role of different processing and additives for health.	identify risk of biases. However, we suggest the last sentence is deleted since an observational study can never be comparable to an RCT on an equal basis. Page 12: "Some scholars, however, have criticized the NOVA framework as ambiguous and questioned its usefulness for informing dietary guidelines beyond conventional nutrient-based classification systems. Filling the knowledge gaps outlined in the above section will be crucial to resolve this issue with certainty". Since outlined knowledge gaps have nothing to do with the ambiguity of the NOVA framework, we suggest reformulation of the statement. Page 12: "While the exact underlying mechanisms linking ultra-processed foods to chronic diseases are not yet fully elucidated, several factors beyond nutritional composition, such as food additives and physical structure may play a role." Because the broad concept as UPFs is used to measure the exposure, including many fundamentally different processes, ingredients, and nutrient profiles, it is difficult to understand how underlying mechanisms can even be studied or understood. To understand mechanisms, specific exposures and factors needs to be isolated, disentangled and studied in relation to outcomes in RCTs or in observational studies. The text implies that some of the mechanisms are	above section will be crucial to resolve this issue with certainty". Page 9 and 12: We have revised the wording regarding mechanisms to "have not yet been determined» and «are not yet elucidated», respectively. We acknowledge that UPF is a heterogeneous food group and that investigation of specific exposures is necessary to elucidate mechanisms of action.

			understood (“not yet fully understood”), which is hardly the case. Please modify the text to better reflect the difficulties in studies...	
Christiane Hoffmann	Kjøtt- og fjørfebransjens Landsforbund	The summary of the NNR article on Ultra-processed foods describes one of the main problems of this study, namely that the current literature is only suggesting an association between UPF and certain diseases and that the study number is very limited. We question therefore the relevance of this chapter and its scientific addition to the nutritional recommendations. The article fails to describe why and how the NOVA model was chosen in the first place, as it is used to define throughout the article what ultra-processed food is comprised of. The NOVA classification in itself has many pitfalls, and the definitions of the different groups are not robust and therefore products are no treated equal throughout the publications. We question the absence of critical voices and articles towards the NOVA model as the right tool for the task set. The article fails to describe how processing is defined and why processing on an industrial site is different from processing that is done by the consumer at home. Among the expert we would have liked for someone with the expertise of food processing and food technology to have been included. The mechanisms described in the article are mainly hypotheses and we therefore question the validity of the work and relevance for the NNR. The Norwegian independent meat and poultry association would especially like to emphasize that we trust the European Food Safety Authority and we support their work and assessments. Questioning the validity and safety of certain additives should therefore be left to the European		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods. The concept of ultra-processed foods is exclusively defined by NOVA and the included studies all used the NOVA definition. Our mission was not to evaluate food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

		authorities and not be undermined. The criticism of ultra-processed food in the article is manly linked to the nutritional composition of certain products inside this NOVA category. It is pointing out trans fats, salt, sugar, and caloric content as well as social economical as the main problem among these products, not the processing amount. We agree that the industry carries a responsibility to create nutritious food that is convenient for the consumer. As processing is a useful tool to achieve food safety, sustainability, and innovation we strongly believe that it is a vital part in today's food system.		
Sandrine Lauret	European Alliance for Plant-based Foods (EAPF)	The NNR2022 project is carrying out a series of public consultation towards informing and providing all necessary scientific background for the 6th edition of the Nordic Nutritional Recommendations regarding dietary guidelines and reference values. The European Alliance for Plant-based Foods (EAPF) welcomes the opportunity to provide input for consideration by the NNR2022 Committee on the draft chapter on ultra-processed foods (UPF). Overall, EAPF deems it premature to include a chapter on UPF when the international health community misses a consistent, solid definition of the term and is based on highly controversial classification systems and scientific ground. Stronger body of evidence is needed to better understand the impact of various methods of processing on health. EAPF also regrets the association of plant-based food with UPF made in the draft chapter (p. 3). Here below some of the key concerns and scientific studies to take into account regarding food	Additional scientific studies to consider: 1) No common, harmonised definition of "ultra-processed": - Sadler et al. "Processed food classification: conceptualisation and challenges". Elsevier Trends in Food Science & Technology. June 2021; 112:149-162. - Gibney M. "Ultra-processed foods: definitions and policy issues". Current Developments in Nutrition. 2019; 3(2), nzy077. 2) Problematic NOVA definition: Petrus et al. "The NOVA classification: A critical perspective in food science". Trends in Food Science & Technology, October 2021; 116:603-608. 3) No correlation between processing and low nutritional value: - Tobias and Hall. "Eliminate or reformulate ultra-processed foods?	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods. The concept of ultra-processed foods is exclusively defined by NOVA and the included studies all used the NOVA definition. Our mission was not to evaluate food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile.

		processing: - No common, harmonised definition of “ultra-processed”. Emerging classification systems (e.g. NOVA) provide diverse, vague explanations of ultra-processed foods, based on subjective and variable criteria (e.g. contraposition between home-made, artisanal and industrial products; identification of a number of ingredients). Scientific research is fragmented on the topic, not allowing a solid interpretation (and categorisation) of ultra-processed foods. Classifying foods as “healthy” or “unhealthy” based on their level of processing also disregards the benefits of processing towards building healthy, resilient, and more sustainable food systems. This lack of definition is visible from the draft chapter itself, which considers “highly processed” and “ultra-processed” foods as the same (p. 2), while attempting a broad definition of UPF on p. 1: “Ultra-processed foods, defined as ready-to-eat/heat formulations whose manufacture involves several stages and various processing techniques and ingredients, mostly of exclusive industrial use, are increasingly consumed worldwide.” There is no consensus in the global health community on the factors that determine the level of processing. - The NOVA definition is problematic since it mixes disparate factors such as number of ingredients, focuses on certain specific ingredients, processing as such as well as several criteria that are irrelevant in this context, e.g. if the producer is a transnational corporation. All in all, NOVA Group 4 (UPF) is too broad, anti-food-industry, and ill-appropriate to guide public health guidelines and recommendations. - No correlation between processing and low	Biological mechanisms matter”. Cell Metab. 2021;33(12):2314-2315; - Gustafson et al. “Making Healthy, Sustainable Diets Accessible and Achievable: A New Framework for Assessing the Nutrition, Environmental, and Equity Impacts of Packaged Foods:. Curr Dev Nutr. 2022;6(10):nzac136; - Hallinan et al. “Some ultra-processed foods are needed for nutrient adequate diets: linear programming analyses of the Seattle obesity study”. Nutrients 2021;13(11):3838. 4) Weak body of evidence, mainly based on epidemiological studies: Astrup A, Monteiro CA. "Does the concept of 'ultra-processed foods' help inform dietary guidelines, beyond conventional classification systems?" NO. Am J Clin Nutr. 2022 Jun 7:nqac123).	That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Foods fortified with essential vitamins and minerals are not necessarily ultra-processed and fortification does not make a food ultra-processed. While we agree that randomized controlled trials are the golden standard to prove cause and effect, such studies are not always ethical, practical, or feasible in nutrition research. Other dietary recommendations, such as decreasing the intake of red and processed meat, are largely based on epidemiological evidence.

		nutritional value. Common legitimate concerns relate to the low quality of some (groups of) food products. However, we should refrain from leading people to think that more processing means poor nutrition (i.e. high in fat, salt and sugars). Tools such as the NOVA system create a misguided association between those two aspects, while it does not evaluate the nutritional value of the foods. In many instances, processing is used to enhance the quality and benefits of food (e.g. for the elderly and frail). Fortification is a key example: adding calcium, vitamins or iodine to food is processing, and yet brings essential nutrients to individuals. Some studies even suggest that reducing food intake based on degrees of processing could lead to detrimental effects on nutritional health and food security. - Evidence relating to UPF and negative health outcomes are mainly epidemiological, i.e. based on correlations rather than proven causality. Their conclusions are thus not scientifically substantiated. A shift to more plant-based diets is crucial to tackle challenges linked to climate change and public health, while feeding a growing population. Dietary guidelines and recommendations should reflect this transformation as they try to shape healthier, more sustainable eating habits.		
Gitte Hestehave	DI Fødevarer / Danish federation of Food&Drink Industry	DI Fødevarer comments part 2: Systematic Reviews, referred to in this chapter, are highly debatable. One of the references (ref. 9) Micha R. et al. is not about processing or UPF according to the NOVA model, so the authors cannot make deep conclusions from that. In the study by S. Meneguelli T et al (ref. 35), states that there are disparities found in the studies, and the	Detailed comments from DI Fødevarer, part 2: Mechanisms: • Page 9 - first argument: The conclusions of Hall study (ref. 42) have been questioned/criticized by e.g. A. Astrup (ref. 27), which is not mentioned or reflected in this chapter (see also	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope

		difference in food classification makes the comparisons between studies difficult. In the study by Santos FSD et al (ref. 36) the authors states "Due to the heterogeneity in the operationalization of the exposure and outcome variables, it was impossible to perform a quantitative synthesis (meta-analysis). This fact introduces a limitation in summarizing these results." Furthermore, about the references of the meta-analysis, (ref. 3, 33-41) those are observational studies. Prospective studies are designed to observe what happens in populations. Very high risk of uncontrolled bias. It is not possible to build a causality effect. It is lower grade evidence only association. The scientifical evidence that the authors want to claim, is not as strong and evident as they want to say. Only the negative impacts of processed foods are discussed. There is a lack of balanced and objective assessment, where also positive impacts, the necessity and benefits of food processing are considered According to Knorr, D. and M.A. Augustin, emerging non-thermal processing technologies enable achievement of microbial and chemical safety, whilst improving nutritional quality, physical and sensory properties of food products. Food processing is an essential tool in feeding the increasing world population [2]. NNR should be based on sound scientific evidence of nutritional value. Processing enhancing food safety and quality (removing potential toxic substances and anti-nutrients, eliminating pathogens, or preventing their growth, controlling spoilage microorganisms). It might also improve the bioavailability (milling grains increase bioavailability for minerals for example) and increase shelf-life of.	above comments to page 6). Secondly in the examples of minimally processed foods, "milk" should be added (ref. 1 + 95). · Page 9 – second argument: "Ultra-processed foods are generally low in dietary fiber ……..". This claim is simply not correct. For instance, industrial produced Danish ryebread is included in Nova class. group UPF – as well as other wholegrain bread types, müsli, cereals, plant-based food etc. All these food types are high in fibers. · Page 10 – third argument: "Although food additives must be evaluated for safety, they are not tested for effects on gut microbiota, immune responses and metabolism prior to approval". The use of food additives in the EU/EEA is carefully regulated. The additives have undergone extensive toxicological assessments by EFSA, and other entities worldwide, which ensure their safety and healthiness (Gibney M.J. et al., 2022). EFSA is constantly monitoring and reviewing new scientific data (EFSA). · Page 10 – forth argument: First of all, the reference to creation of trans-fatty acids during processing is not relevant and should be removed. Trans fatty acid creation has not been an issue for many years in DK and Nordic countries. Secondly, the formation of acrylamide is produced at any level of processing, not making a distinction between homemade or industrial goods, including UPFs. In general, the contaminants mentioned in this paragraph are often	and not discussed. We do not negate that food processing is necessary and may confer many benefits. We agree that randomized controlled trials are the golden standard to prove cause and effect. However, such studies are not always ethical, practical, or feasible in nutrition research, especially in relation to chronic disease outcomes that develops over decades such as CVD, and cancer. Other dietary recommendations, such as decreasing the intake of red and processed meat, are largely based on epidemiological evidence. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023) The study by Mertens et al. is an ecological study and was therefore not included in the systematic literature review (see inclusion criteria). Ecological studies have a high risk of bias as such studies (a) do not provide data on intake and disease risk at the individual level, (b) are cross-sectional, and (c) do not allow for adjustment for confounding factors.

		Processing helps to produce foods more sustainably and it reduces food waste. It is also possible to enhance nutritional quality of food (enrichment and fortification). Fortification of food supply began in the early 20th century to combat a variety of nutritional deficiencies and conditions. This type of food processing has prevented many diseases and conditions such as goitre (iodized salt), neural tube defects (folic acid in flour) and rickets (vitamin D in milk). If consumers and policymakers are led to believe that processing of food is negative by using negative terms like UPF, it might have unfortunate consequences, which have not been assessed in the paper (e.g. hamper investments in future sustainable foods systems). Several of the food groups, mentioned in this chapter as UPF, are already described and evaluated in detail in other chapters, as described at page 6, line 1-6, ex. beverages, meat, cereals, yoghurts etc. No need for this chapter to evaluate these foods again. We wonder why no experts in food processing/manufacturing have been involved in the writing or review of this chapter. As a result, significant perspectives and understanding of the processing of foods are completely missing in this draft. The description of the NNR organization states, that the chapters will be peer reviewed by scientific experts. This chapter has been peer reviewed by Marit Kolby, who do not have a candidate / PhD degree. We question whether a person without a PhD can be appointed as scientific expert.	better controlled in industrial processing than at-home processing (Van Boekel, M., et al. 2010). • Page 10 – final argument: Reference to increased exposure to endocrine-disrupting chemicals and phthalates from plastic packaging of ultra-processed foods is not relevant. Packaging materials (food contact materials) are carefully regulated in EU, and packaging materials are highly important to prevent food waste. Less processed foods like fresh salads, fruits, vegetables, fish, meat, seeds, kernels etc. are also packed in plastic packaging, so the reference to an increased exposure of chemicals based on the level of processing is not correct and should be removed. • Page 10 - The conclusion: “In summary, ultra-processed foods may contribute to metabolic disturbances and inflammatory processes, which are present in obesity, cardiometabolic diseases, cancer, and depression” is too weak. None of the 5 arguments are scientifically correct. Data gaps: · Page 11: “Nevertheless, the reviewed studies were conducted in multiple different countries and populations, including various European countries, which increases the generalizability of the results”. The Mertens paper (ref. 87) showed that within Europe there was no association between prevalence of overweight and UPF consumption.	

		References: [2] Knorr, D. and M.A. Augustin, Food processing needs, advantages and misconceptions. Trends in Food Science and Technology, 2021. 108: p. 103-110.	· Page 11: “Given that there are national differences in food supplies, health status and culinary traditions, more studies in Nordic and Baltic populations are warranted”. This fact creates a lack of evidence for the health outcome for the Nordic population. Scientific data for health outcome from Nordic/Baltic countries must be provided before introducing recommendation regarding processed foods.	
Rikke Bekker Henriksen	DI Fødevarer (Danish Federation of Food&Drink Industry)	Comments from DI Fødevarer will be split in 2 parts due to the limited number of characters. Part 1: We would like to express our concerns regarding this chapter “Ultra Processed Food” in its current form, since we find it of scientifically weak quality and biased in its argumentations. We therefore recommend that this chapter should be excluded (or re-written) in the NNR 2022 with following general arguments: The whole chapter is based on the NOVA model and classification, and the authors claim that this model has gained acceptance among health researchers. There is no global scientific consensus around this concept. The definitions of what constitutes an ‘ultra-processed food’, and their perceived impact in people’s health is overly simplified, lacks robustness, and is highly subjective and misleading. This chapter aims to describe the totality of the available evidence regarding ultra-processed foods in relation to health-related outcomes as a basis for setting Food-Based Dietary Guidelines (FBDGs) for the Nordic Nutrition Recommendations 2022	Detailed comments part 1: Abstract • Page 1: “Ultra-processed foods, defined as ready-to-eat/heat formulations whose manufacture involves several stages and various processing techniques and ingredients, mostly of exclusive industrial use”. There is no scientific consensus around this concept, this should not be accepted and rephrased. • Page 1: “Diets high in ultra-processed foods tend to be nutritiously unbalanced and are hence less likely to adhere to the overall NNR2022”. This statement is an interpretation by the authors and is not scientifically proven. Introduction • Page 2: NOVA classification is introduced in this chapter, but there is a lack of objective discussion of the NOVA classification, which has been widely criticized in several scientific articles (see general comments). • Page 3: “Nevertheless, some ultra-	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA). We conducted a systematic literature review of prospective cohort studies, systematic reviews end meta-analyses on this topic. As stated in the inclusion/exclusion criteria we did not include narrative reviews, commentaries or opinion pieces, which is why the mentioned references were not included. The term UPF is defined by the Nova framework. We would like to remind you that there is no legal or official definition of a “healthy diet” or “healthy food”. There is considerable epidemiological evidence that higher consumption of ultra-processed foods is associated with greater intakes of added sugar and saturated fat and lower intakes of

		(NNR2022). But the chapter excludes important papers like the reviews from Gibney, Julie M. Jones, Ciaran Forde, Vincenzo Fogliano etc. Therefore, it is not the totality of the available literature, which is reviewed. There are missing publications that question the NOVA classification as a model. The authors do, though, refer to some critical articles (ref. 27 + 28), but without presenting key arguments from these articles. A very important constraint is, that it is difficult to consistently classify products into the NOVA groups, as demonstrated by authors Braesco et al. [1] A healthy diet is determined by a combination of the food's nutritional composition, the amount and frequency of consumption, and overall dietary habits. The present approach to nutritional epidemiology and the development of food-based dietary guidelines has little or nothing to benefit from the use of the NOVA classification. [1-6] In addition to above, there is no official or legal definition for the UPF term, and its description does not meet the criteria established for the terms "processing" and "processed foods" by Regulation (EC) No 852/2004 on the hygiene of foodstuffs [7]. This fact should also be assessed in the chapter. References: [1] Braesco, V., et al., Ultra-processed foods: how functional is the NOVA system? European Journal of Clinical Nutrition, 2022. Ultra-processed foods: how functional is the NOVA system? - PMC (nih.gov) [2] Knorr, D. and M.A. Augustin, Food processing needs, advantages and misconceptions. Trends in Food Science and Technology, 2021. 108: p. 103-	processed foods, for example reformulations and plant-based alternatives, are identified as 'healthy' based on nutrient profiling. As a result, it is currently debated if nutrient reformulation is sufficient or not to address the issues surrounding ultra-processed foods". To question nutrient profiling and reformulations without any scientific backup is highly questionable and contradictory to other chapters in NNR. Should be removed. Methods • Page 6 (top): "Details regarding the consumption of specific ultra-processed foods and foods that may be ultra-processed depending on their ingredients can be found in other chapters….". These other chapters cover most processed foods, which are already described thoroughly elsewhere. Therefore, this paper is not relevant. • "One American RCT (42)…… The findings support that a diet high in ultra-processed food increases energy intake and promotes weight gain in the short-term." This conclusion must be further discussed! The energy density of consumed foods did significantly differ between the two diets and the eating rate was also higher for the (so-called) UPF diet.	fiber and several essential micronutrients. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them.

		110. [3] Gibney, M.J., Ultra-Processed Foods: Definitions and Policy Issues. Curr Dev Nutr, 2019. 3(2): p. nzy077. [4] Gibney, M.J., Ultraprocessed Foods and Their Application to Nutrition Policy. Nutrition Today, 2020. 55(1): p. 16-21. [5] Jones, J.M., Food processing: criteria for dietary guidance and public health? Proc Nutr Soc, 2019. 78(1): p. 4-18. [6] Petrus, R.R., et al., The NOVA classification system: A critical perspective in food science. Trends in Food Science & Technology, 2021. 116: p. 603-608. [7] Regulation (EC) No 852/2004 on the hygiene of foodstuffs, art. 2 "Definitions".		
Per Frank	Nestlé	1. Food processing is essential for the transition to a more healthy and sustainable food system, and is part of everyday life. The chapter fails to address this by not mentioning any of the many major benefits of food processing, e.g. regarding environment, food waste, innovation/food tech, safety, taste, fortification, affordability, availability, convenience and health. 2. There is no conclusive scientific evidence that processing food causes negative health impacts. In addition, all UPF's are not equal, as concluded in this publication (Taneri et al. 2022) and should not be treated as a group. By generalizing, guidelines in a complex topic becomes misleading. 3. There is an ongoing debate in the scientific community about the UPF classification and its flaws, as described in this publication (Monteiro et al. 2022). This, including any negative criticism of the UPF classification, is not reflected in the chapter.	Page 3, Para 1, last three lines. "Nevertheless, some ultra-processed foods, for example reformulations and plant-based alternatives, are identified as 'healthy' based on nutrient profiling. As a result, it is currently debated if nutrient reformulation is sufficient or not to address the issues surrounding ultra-processed foods." - The chapter appears to imply that the results obtained from the various studies assessing UPFs are more robust than scientific results obtained for the creation and validation of tools such as nutrient profiling. It is quite surprising given that the authors acknowledge that the scientific topic is recent. The statement undermines the Nordic dietary guidelines and other chapters of the NNR.	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. We have clarified this in the chapter. We have also expanded on the ongoing scientific debate and controversy concerning Nova and the UPF concept. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy"

		4. The definition of UPF is unclear, this results in: a. Difficult application, including in research setting (Mozaffarian et al. 2022). In addition, we would want to highlight that the results obtained from observational studies not aimed at assessing intake of UPF should be interpreted with a lot of caution. b. Nutrition professionals' confusion (Braesco et al. 2022). c. Consumer confusion. The purpose of dietary guidelines is to make it easier for individuals to make the right decisions. UPF may lead to more confusion by introducing conflicting messages, e.g. on whole grain, plant-based and low sugar. 5. Considering the lack of scientific backup and the weak NOVA definition its questionable whether Ultra-processed food deserves a chapter of its own. Other areas, like whole grain or plant based, have a more solid scientific foundation and a greater potential to improve public health or environmental impact. There should be consistency in what is assessed in the recommendations. We understand the assessment of this topic considering the growing scientific literature, but we believe assessment of the evidence should be more robust. References Taneri et al. Association Between Ultra-Processed Food Intake and All-Cause Mortality: A Systematic Review and Meta-Analysis. American Journal of Epidemiology, Volume 191, Issue 7, July 2022, Pages 1323–1335. Monteiro et al. Does the concept of "ultra-processed foods" help inform dietary guidelines,	- Plant-based alternatives should not be made suspicious and should therefore be removed from the chapter.	solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. We have removed the mentioning of plan-based alternative in order to not single out any individual type of ultra-processed food.

		beyond conventional classification systems? YES. The American Journal of Clinical Nutrition, nqac122, https://doi.org/10.1093/ajcn/nqac122 Dariush Mozaffarian, Meghan O'Hearn, Naglaa H. El-Abbadi, Jeffrey B. Blumberg & Renata Micha. Reply to: Food Compass novelty and NOVA category assignments. Nature Food volume 3, pages584–585 (2022). Véronique Braesco, Isabelle Souchon, Patrick Sauvant, Typhaine Haurogné, Matthieu Maillot, Catherine Féart & Nicole Darmon. Ultra-processed foods: how functional is the NOVA system? European Journal of Clinical Nutrition volume 76, pages1245–1253 (2022).		
Mats Stading	RISE Research Institutes of Sweden	This is the second part of comments from RISE Research Institutes of Sweden, on the NNR2022 chapter "Ultra-processed foods". Our main concern regarding the present chapter is that there is no scientific consensus on how to define "ultra-processed foods" (UPF), and that the suggested definition according to the NOVA classification is not scientifically stringent. Several papers in the scientific literature have raised critical aspects of the concept (e.g. Visioli et al 2022; Astrup and Monteira et al 2022; Gibney and Ford 2022; Castro-Barquero and Estruch, 2022; Capozzi et al 2022; Rodrigues Petrus et al, 2021), whereof only one (the paper by Astrup and Monteira 2022) is briefly referenced in the present chapter. Some data gaps are discussed, but the present chapter lack a critical analysis of the NOVA classification per se. Here we highlight some critical aspects regarding the NOVA classification, while referring to the		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA). A comprehensive analysis of the Nova framework per se is out of scope. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other

		above-mentioned references for a more extensive list: • The NOVA classification neglects the relationships between energy and nutrients and health, which conflicts with the classic, evidence-based evaluation of foods based on energy content, nutritional composition and portion sizes, that for decades have been agreed on as the scientific foundation of food based dietary guidelines worldwide, incl NNR. • The NOVA classification clusters several processing techniques (e.g. extrusion, molding, sterilization). This approach neglects the complexity of food processing and makes it impossible to understand which, if any, factors might potentially be responsible for the negative health consequences being attributed to UPF. It is well known that different processing techniques affect the chemical and structural properties of food raw materials differently. As stated by Rodriques Petrus et al 2021: "Knowledge of food engineering and/or science must be taken into consideration if food processing is the key for food classification." • The premise of the NOVA classification is that "ultra-processing" (e.g. extrusion) of foods will always make foods less healthy. However, food processing may also improve nutritional quality of foods. For example, extrusion of proteins may improve protein digestibility and reduce antinutrients (Cotacallapa-Sucapuca et al 2021) and pulsed electric field treatments may preserve or increase content or function of bioactive compounds (Dziadek et al 2019; Zhang et al 2015). In addition, food processing may have crucial and beneficial effects in terms of e.g. food safety (killing pathogens), shelf life of the product, taste and convenience (van Boekel et al 2010).		recommendations, not to replace them. Concerning contaminants formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023) Concerning additives, several studies in animal models and in humans have suggested deleterious health effects for some of the roughly 330 additives currently approved for use in Europe, for instance through gut microbiome dysbiosis, inflammation, and DNA damage.

		• The NOVA classification implies that similar kind of food, e.g. meat-balls, prepared at home are by definition healthier than the same kind of food prepared industrially, independently of the product's final nutritional profile. To the best of our knowledge, there is no scientific evidence to support this. On the contrary, industrial processes have better control over the formation of substances of health concerns, such as acrylamide and heterocyclic amines, during food processing (van Boekel et al 2010). • The NOVA classification implies that the use of additives is of health concerns. In a Nordic context, this is speculative since all additives approved for food use within EU are evaluated for their safety by European Food Safety Authority (EFSA). The usefulness of NOVA classification is questioned also in a background paper to NNR2022: "For example, using the NOVA definition might lead to the assumption that processing is generally a negative aspect of food production, and all ready meals are nutritionally inadequate (which is not the case)" (cited from "Overview of food consumption and environmental sustainability considerations in the Nordic and Baltic region", line 2741-2742).		
Evelina Höglund	RISE Research Institutes of Sweden	This is the third part of comments from RISE Research Institutes of Sweden, on the NNR2022 chapter "Ultra-processed foods". Due to the subjective definition of UPF it is difficult to classify foods according to this definition. A wide range of foods are given as examples, in the scientific literature. Many of the foods suggested to be classified as UPF would obviously be classified as unhealthy (e.g. snacks, cookies, sweets) also based on traditional nutritional assessments (e.g. high in sugars, salt, saturated fat, and low in vitamins and		The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature.

		minerals). However, also foods that constitute important sources of nutrients in a modern diet will be classified as UPF, e.g. baby foods and keyhole labelled wholegrain bread, whole grain cereals, ready to eat meals (also those of fish, vegetables and legumes) and flavored low fat dairy products. How the concept of UPF can be practically implemented, is difficult to understand and the potential consequences if consumers are recommended to reduce their intake of UPF needs to be carefully considered, as has also been highlighted by others; ".. the drastic reduction or elimination of the availability of all categories of UPFs without simultaneous consideration of all efforts to replace them with better, affordable, and practical alternatives is not a winning strategy." (cited from Capozzi et al 2022).		
Tanya Footman	Unilever	In our view the chapter is not a balanced review of the science, so we value the opportunity to provide comments. The reported associations between UPF consumption and health effects are based on studies applying the NOVA classification, which has not been validated and has been criticized for being subjective and not allowing for robust and functional food assignments. The chapter would better reflect the scientific debate if these were sufficiently addressed. • Braesco, Eu J Clin Nutr, 2022 concluded that consistency in assigning foods to NOVA groups was low • Khandpur, J Nutr Sci, 2021 showed that there is no single gold standard for applying the NOVA categorization and mentions that the approach is not validated yet. • Sadler, Trends Food Sci & Tech, 2021 found there is no consensus on what factors determine the level of processing, with most classification systems not including quantitative measures but, instead,	We acknowledge that there are research gaps in the area of UPFs and health, however the authors have omitted some papers in their assessment and in some cases have not accurately reflected the science in a balanced review. Missing papers: o Gibney MJ Nature Food 2022 o Braesco V. EJCN 2022 76: 1245- o Sadler CR, Front Nutr. 2022 o Amorim A Front Nutr Jan & Sept 2022 o Petrus RR Trend Food Sci & Tech 2021 o Castro-Barquero S Eur Heart 2022 o Forde & Decker Annual Rev Nutr 2022 o Visioli Nutr Res Rev 2022 o Drewnowski A Curr Develop Nutr 2022 Obesity (Page 6) • Mertens (Ref 87 NNR UPF chapter) looked at the associations between UPF consumption and BMI in Europe and	The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. We have clarified this in the text. A comprehensive analysis of the Nova framework per se is also out of scope. We conducted a systematic literature review of prospective cohort studies, systematic reviews end meta-analyses concerning ultra-processed foods and health outcomes. As stated in the inclusion/exclusion criteria we did not include narrative reviews, commentaries or opinion pieces,

		imply correlation between “processing” and nutrition. • More Recently Astrup, AJCN, 2022, found that the concept of UPFs does not help inform dietary guidelines, beyond conventional classification systems. It should be noted that a diet free of all UPF is not necessarily nutritionally adequate (Petrus, Trends Food Sci & Tech, 2021; Knorr, Trends Food Sci & Tech, 2021). Also, the scientific evidence that intake of UPFs impacts health in a negative way is mostly based on observational data comparing “healthy” diets to “unhealthy” diets and not on the level of processing. It remains unclear whether associations between UPFs and negative health outcomes can be attributed to processing itself or to the nutrient content of UPFs (Poti, Curr Obes Rep, 2017). Hence, more mechanistic insights are needed. Processing ensures food is safe, affordable, palatable, and convenient. It can also help reduce food waste and extend shelf life. These benefits are not acknowledged in this chapter. Food insecurity is a concern, with Eurostat reporting in 2021 that 95.4 million people in the EU were at risk of poverty or social exclusion (equivalent to 21.7 % of the EU population). Food processing allows for increased accessibility of foods, innovations in processing can also improve the nutrient density of foods (e.g., low sodium, sugar products) and other attributes like sustainability (e.g., plant-based meat alternatives). Recommendations regarding consumption of UPFs would not assist consumers in comparing products and making the better choice between two processed foods, for example, a new low-sodium version of an original product. An underlying premise of the Dietary Guidelines is	concluded that there was no association between intakes of UPF and BMI. • Text ‘The findings……weight gain in the short-term’. The energy density and eating rate of consumed UPF foods did significantly differ between the two diets. This element should be considered further. CVD (Page 7) • Juul and Zhong (Ref 47 and 67 NNR UPF chapter) both reported that not all UPF food groups were associated with CVD risk, further supporting that UPF consist of a very heterogenous group of products and not all are adverse for health. Type II Diabetes (Page 7) • Text – ‘Higher intake…type 2 diabetes’. Lifelines cohort, researchers looked at UPF consumption patterns and showed that only one of four patterns were associated with T2DM risk. (Duan MJ BMC Med 2022;20:7) Mechanism (Page 9) • Text – ‘Processing……of the food matrix’. Home cooking is also food processing and may have the same effects, including the formation of acrylamides. There is greater control of this during industrial food processing. Forde & Decker Ann Rev Nutr 2022 • Teo PS AJCN 2022 116:1 Suggest that food texture accounted for observed differences in the amount of food consumed across minimally processed and UPFs • Hall et al (Ref 42 NNR 2002 UPF chapter) does show that eating rate and	which is why the mentioned references were not included in the literature review. However, we have added text regarding the ongoing scientific debate and controversy concerning Nova and the UPF concept in the introduction. Regarding the findings of Hall et al.: We have added a discussion regarding the potential role of differing eating rates and energy density. Fortification does not make a food ultra-processed and not all fortified products are ultra-processed. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered “healthy” or “unhealthy” solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Concerning contaminants formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine

		that nutritional needs should be met primarily from foods and beverages, specifically those that are nutrient dense. The science behind recommendations for individual nutrients to limit is well established. While some studies associate processed food with decreased nutrient density, other classifications find nutrient-dense foods at all levels of processing. Avoidance of foods deemed as ultra-processed, such as wholegrain/enriched bread and cereals, may not address obesity and could decrease intakes of e.g. calcium and dietary fibre (Jones, Proceedings of Nut Soc, 2018). In the Nordics, products are fortified e.g. milk, fat spreads, salt and flour and this form of 'ultra-processing' is beneficial to the consumer and can improve public health nutrition. In the 2009 article that introduced the term 'ultra-processed foods', the authors claimed that the issue was not food, nor nutrients, but food processing (Monteiro, Pub Health Nutr, 2009). Shifting scientific hypothesis to focus on food processing rather than emphasizing nutrient density of the foods is a sharp contrast to national dietary advice in the Nordic and Baltic countries.	energy density differed. Satiety and palatability did not differ. This should be considered • Text - "animal studies….metabolic dysregulation." These animal studies do not translate into human studies. (Trinh P Front Public Health. 2018;6:235). Please also refer to existing human studies showing no negative effect of low energy sweeteners on the gut - Thomson P BJN 2019;122(8):856-62; Serrano J Microbiome. 2021;9(1):11; Frankenfeld CL AnnEpidemiology 2015;25(10):736-42.e4) or beneficial effects of polyols Gostner A BJN 2006;95(1):40-50; Ouwehand AC BJN 2009;101(3):367-75.; Björklund M Age. 2012;34(4):987-99; Beards E BJN 2010;104(5):701-8. • Text – 'Industrial partial oil…disease and diabetes'. In the Nordics consumption of industrial TFA is below the WHO recommendation of 1En%. As the majority of dietary TFA comes from ruminant TFA, in the Nordics it is misleading to criticise processed foods as a public health issue in relation to trans fat. Data gap for future research (Page 11) • Text – 'reviewed studies… the generalizability of the results'. The Mertens paper (ref 87 NNR 2002 UPF chapter) showed that within Europe there was no association between prevalence of overweight and UPF consumption. Integration (Page 12) • Text - 'Diets high in ultra-processed….	biomarkers of problematic compounds, including acrylamide (see e.g., Menichetti et al. Nature Communications 2023) The study by Mertens et al. is an ecological study and was therefore not included in the systematic literature review (see inclusion criteria). Ecological studies have a high risk of bias as such studies (a) do not provide data on intake and disease risk at the individual level, (b) are cross-sectional, and (c) do not allow for adjustment for confounding factors. We have added text and references regarding RCTs in humans concerning artificial sweeteners and emulsifiers.

			food category.'- General statement and there is large heterogeneity between foods classified as UPF. Important to note that minimally processed foods or home-cooked meals are not by definition healthy based on how and where they were prepared. The practical impact of avoiding certain foods should also be further considered in the guidance.	
Nina Peacock	Kellogg Europe	As a Global food company, Kellogg has been nourishing families for more than 115 years. We are proud to be one of the original wellbeing companies, providing a wide breadth of plant-based foods. We're aware of our responsibility to help people make healthier choices, demonstrated by the recent launch of our Wellbeing Manifesto - our plan to improve our foods so that they are better for people, the community and the planet. We are also committed to transparency around ingredients, nutrition and how are foods are made. With that in mind, we welcome the opportunity to feedback on the NNR2022 Ultra-Processed Foods Chapter and grateful for consideration of our inputs. Decades of scientific research have shown that breakfast cereals make a positive contribution to healthy diets, providing millions of people with safe, nutritious, grain-based breakfasts. Breakfast cereal consumption is associated with diets that are higher in vitamins, minerals and fibre, and lower in fat [1] and are often enjoyed with other nutritious foods like fresh fruit and dairy [2]. As such, they are implicated in a wide range of health benefits. Contrary to health outcomes presented in the	Re last sentence on Pg 12 par 2: As a leading global food company, Kellogg and our people are addressing the interconnected issues of health, food security and climate across our value chain to ensure we're providing foods that deliver holistic wellbeing for people and our planet, in an accessible way. • Simply implying that consumption of specific breakfast cereals leads to increased risk of all-cause mortality due to an indicated classification as ultra-processed is hugely inaccurate, whilst, in fact, the opposite may be the case. Aune et al. (2016), for example, reports that total breakfast cereals (and wholegrain breakfast cereals) are inversely associated with all-cause mortality [1]. • A substantial body of evidence supports a role for breakfast cereal consumption in body weight management. For example, a systematic review concluded that children and	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. We have clarified this in the text. We have also removed any mentioning of breakfast cereals in order to not single out any individual type of ultra-processed food.

		Chapter, evidence indicates that regular breakfast cereal consumption is associated with a lower BMI and a reduced risk of being overweight or obese in children and adults [1,3]. Specific characteristics of breakfast cereals may play a role in supporting cardiometabolic health, with high fibre / whole grain breakfast cereals been linked to a reduced risk of type 2 diabetes [1,4] as well as potentially better lipid profiles from regular consumption of breakfast cereals that are sources of soluble fibre (oat-, barley- or psyllium-based breakfast cereals) [1]. Evidence also points to total breakfast cereals been inversely associated with all-cause mortality [5]. The simple reality is, that some degree of processing is required in order for us to bring these benefits to our consumers. Like so many natural products, cooking (also known as thermal processing) is essential to transform raw grains into safe, nutritious, palatable, convenient, and cost-effective foods. The simple cooking processes which breakfast cereals undergo also play an important role in supporting consumers achieve healthy and sustainable diets, by: • Offering a diverse range of plant-based food choices • Helping consumers meet dietary recommendations for example in relation to dietary fibre; • Working to preserve the food and extend its shelf life, which in turn helps to minimise food waste. Furthermore, over the past number of decades, Kellogg has made significant food improvements – helping our consumers reduce their salt and sugar intakes as well as increase their fibre consumption. Such improvements, whilst maintaining the taste	adolescents who consume breakfast cereals regularly are slimmer and are less likely to be overweight or obese than those who consume breakfast cereals infrequently or not at all [2]. Similarly, Williams (2014) also indicated that regular consumption of breakfast cereals is associated with a lower BMI and a reduced risk of being overweight or obese in adults and children [3]. This benefit seems unlikely to be attributable to whole v refined grain [4], nor driven by cereals with lower added sugar content [5]. • High fibre/ whole grain breakfast cereals have been linked to a reduced risk of type 2 diabetes [3,6], as well as potentially better lipid profiles from regular consumption of breakfast cereals that are sources of soluble fibre (oat-, barley- or psyllium-based breakfast cereals) [3]. • Breakfast cereals do not displace nutritious foods. They are a contributor to dietary fibre [7]. Regarding Kellogg's cereals, 93% of our European portfolio is a source of fibre (≥3g/100g) and 47% high in fibre (≥6g/100g). Breakfast cereals are also a key driver of dairy consumption [8], serving as a vehicle to further optimize the nutritional profile of the diet, as well as being associated with intakes of other positive food groups i.e. fruit and whole grains [9]. • Breakfast cereals are not hypercaloric.	

		and eating experience expected from our consumers, have been – and will continue to be - underpinned by innovations and breakthroughs in food manufacturing and processing. References 1. Williams PG (2014) The benefits of breakfast cereal consumption: a systematic review of the evidence base. Advances in Nutrition 5, 636S–73S. 2. Michels N et al. (2016) Ready-to-eat cereals improve nutrient, milk and fruit intake at breakfast in European adolescents. European Journal of Nutrition 55, 771–79. 3. de la Hunty A et al. (2013) Does regular breakfast cereal consumption help children and adolescents stay slimmer? A systematic review and meta-analysis. Obesity Facts 6, 70–85. 4. Hu Y et al. (2020) Intake of whole grain foods and risk of type 2 diabetes: results from three prospective cohort studies. British Medical Journal 370: m2206. 5. Aune D et al. (2016) Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. British Medical Journal 353: i2716.	By way of demonstration, a multigrain flake cereal (Special K) provides only 118kcal (500kJ) per 30g serving, while a chocolate flavour toasted rice cereal (Coco Pops) provides only 116kcal (491kJ) per 30g serving (125ml semi skimmed milk providing around an additional 58 kcal/ 241 kJ). Relative to other breakfast choices, such as 2 slices of rye bread with 14g butter (241 kcal/ 1,010 kJ) [10], hypercaloric simply isn't an accurate description for breakfast cereal. • Breakfast cereals represent a valuable source of fibre, with evidence supporting a role of intact cereal fibres in promoting gut microbiota diversity and abundance [11]. • On one hand, the contribution of breakfast cereals as a food group to health and wellbeing is clearly evident in the scientific literature, while on the other, the scientific rigour supporting their limited consumption due to processing classifications is very much lacking. Public nutrition policy should be grounded in robust science and we, therefore, encourage the NRR2022 team to carefully consider the evidence presented herein. References 1. Aune et al. (2016) British Medical Journal 353: i2716 2. de la Hunty et al. (2013) Obesity Facts 6, 70–85	

			3. Williams (2014) Advances in Nutrition 5, 636S–73S 4. Bazzano et al. (2005) Obesity Research 13, 1952-60 5. Miller et al. (2012) ICAN: Infant, Child, & Adolescent Nutrition 5, 43-50 6. Hu et al. (2020) British Medical Journal 370: m2206 7. Stephen et al. (2017) Nutrition Research Reviews 30, 149–90 8. Michels et al. (2016) European Journal of Nutrition 55, 771–9 9. Smith et al. (2022) Frontiers in Nutrition 9: 816548 10. Ceereal (2015) Breakfasts in Europe. An overview of typical breakfasts in Europe and their nutritional values....	
Emma Holtz	RISE Research Institutes of Sweden	This is the fourth part of comments from RISE Research Institutes of Sweden, on the NNR2022 chapter “Ultra-processed foods”. UPF has been linked to a number of health outcomes in a number of epidemiological studies. However, there is strong consensus that epidemiological studies cannot be used to prove causality, which is also discussed in the NNR2020 method paper: “Well-designed and well-implemented RCTs can demonstrate causality, while observational studies, in the absence of huge effect sizes, do not.” (cited from Juel Christensen et al 2020). Furthermore, most food frequency questionaries do not provide detailed data on how foods are processed, meaning that classification of foods may depend on personal judgements and may differ between studies. A recent study concludes that the overall consistency among evaluators was low, even when ingredient information was available (Braesco et al 2022). The		The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. We agree that randomized controlled trials are the golden standard to prove cause and effect, however such studies are not always ethical, practical, or feasible in nutrition research. Other dietary recommendations, such as decreasing the intake of red and processed meat, are largely based on epidemiological evidence.

		authors suggest that the current NOVA criteria do not allow for robust and functional food assignments. For other chapters of NNR2022 (e.g. the chapter on egg) an evidence-based approach is applied, grading the evidence according to the NNR2022 methods and principles described by Juel Christensen et al 2020. It is not clear to us why similar approach is not applied to the chapter on UPF. One randomized clinical trial on UPF is often referenced (Hall et al 2019). This is a short-time study (two weeks). The key finding is that the UPF-based diet caused an increased energy intake and weight gain compared with unprocessed foods. Several researchers have commented that this short-term study does not provide evidence that a UPF-based diet causes long-term weight gain and obesity (e.g. Astrup et al, 2022; Visioli et al 2022). The observed short-term effect can be explained by differences in energy density and qualitative aspects of macronutrients. The possibility that the UPF included in Hall et al (2022) contribute to a higher energy intake rate (energy per minute) is interesting. Recent research also links the disruption of the food matrix, caused by food processing, to overconsumption and higher calorie intake (Fardet et al 2022). However, considering the wide range of available food processing techniques and foods classified as UPF it needs to be further assessed whether this is a characteristic of UPF in general, and whether eventual matrix effects on metabolic responses are related to nutritional compositions of foods or not		

		(discussed by e.g. Gibney and Forde et al 2022; Teo et al 2022).		
Karin Östergren	RISE Research Institutes of Sweden	This is the fifth and last part of comments from RISE Research Institutes of Sweden, on the NNR202 chapter “Ultra-processed foods”, listing the references used in our previously submitted comments. References • Astrup A, et al. Does the concept of “ultra-processed foods” help inform dietary guidelines, beyond conventional classification systems? No. Am J Clin Nutr 2022;00:1–7. • Braesco V, et al. Ultra-processed foods: how functional is the NOVA system? Eur J Clin Nutr 2022;76:1245-1253. • Capozzi F. Food innovation in the frame of circular economy by designing ultra-processed foods optimized for the sustainable nutrition. Front Nutr 2022; 9 • Castro-Barquero S, Estruch R. Ultra-processed food consumption and disease: the jury is still out. Eur Heart J 2021;43:225-227. • Cotacallapa-Sucapuca M, et al. Extrusion Process as an Alternative to Improve Pulses Products Consumption. A Review. Foods 2021;10:1096. • Dziadek K, et al. Effect of pulsed electric field treatment on shelf life and nutritional value of apple juice. J Food Sci Technol 2019;56:1184. • Gibney MJ and Forde CG. Nutrition research challenges for processed food and health. Nature Food 2022;3:104-109. • Hall et al. Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metabolism 2019;30:67–77 • Juel Christensen J, et al. The Nordic Nutrition Recommendations 2022 – principles and		No response required.

		methodologies. Food Nutr Res 2020, 64: 4402. • Lillford P and Hermansson AM, Global missions and the critical needs of food science and technology. Trends Food Sci & Techn 2020;111:800-811. • Rodrigues Petrus R, et al. The NOVA classification system: A critical perspective in food science. Trends in Food Science & Technology 2021; 116:603-8. • Teo PS, et al. Taste of Modern Diets: The Impact of Food Processing on Nutrient Sensing and Dietary Energy Intake. J Nutr 2022;152:200-210. • Van Boekel, et al. A review on the beneficial aspects of food processing. Mol Nutr Food Res 2010;54:1215-47. • Visioli F, et al. The ultra-processed food hypothesis: a product processed well beyond the ingredients in the package. Nutr Res Rev 2022;1-1. • Zhang ZH, et al. Effects of Pulsed Electric Fields (PEF) on Vitamin C and Its Antioxidant Properties. Int J Mol Sci 2015;16.		
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	Our comments will be sent in 4 parts. This is part 1 of 4. *** The Norwegian food industry has for several years collaborated with the Norwegian health authorities to increase the proportion of the population who has a balanced diet in accordance with the dietary guidelines and reduce premature mortality from NCDs. To offer healthier foods, the partnership is working with different priority areas where the optimization of nutritional quality through reformulations is essential. The keys to successful innovations and reformulations are the use of new technologies and new ingredients. Therefore, new research and scientific publications are followed	1. NOVA/DEFINITION The title of the chapter, and the term itself, are closely related to the NOVA classification framework. The authors correctly refer to that an official definition of "ultra-processed foods" is lacking (p. 2). Despite this, the authors consequently refer to scientific studies based on NOVA as a basis for this chapter. We ask why the authors have not in more detail elaborated on the critique in the studies criticizing NOVA and discussed the limitations in the interpretation of this framework, or even presented their key arguments. The NOVA classification has very broad definitions, and the risk of	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods, which is defined by NOVA, not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. A comprehensive analysis of the NOVA framework is out of scope. However, we have added text to clarify the critique against NOVA.

		closely. Consequently, we must express our concern regarding the term "ultra-processed foods" (UPF), and the weak scientific quality of the discussions and conclusions presented in the draft NNR chapter. The low quality of this draft chapter, and limited evidence in this field, suggests that UPF concepts should not be included in the NNR2022 and the FBDG. The level of processing of food and drink does not determine the nutritional content of the final product. Moreover, classifying, and legislating food based on the level of processing is not a scientifically-sound approach to food policy and would lead to negative outcomes for the food systems. Lastly, there is a high risk of misleading the consumers if they are introduced to the term in FBDG. We will elaborate on this in our comments.	misclassification is high (Gibney M.J. et al., 2017, Visoli F. et al., 2022, Braesco V. et al., 2022, Petrus, R.R. et al., 2021). The findings in the studies that use NOVA should also spur reflection on the reliability of conclusions from epidemiological studies. Additionally, the definition of UPF in this chapter, i.e. "ready-to-eat/heat formulations whose manufacture involves several stages and various processing steps and ingredients"(p. 1) is in fact not even aligned with the NOVA definition. Lastly, there is also no legal definition of the term, and its description does not meet the criteria established for the terms "processing" and "processed products" by Regulation (EC) No 825/2004 on the hygiene of foodstuffs. 2. PROCESSING/EXPERTS The authors and the peer reviewers are exclusively nutrition experts. The nature of this topic, the processing of foods, calls for involving experts in processing. As a result, significant perspectives and understanding of the processing of foods are completely missing in this draft. Only possible mechanisms, or hypotheses, for negative health outcomes are discussed. Processing of foods is undoubtedly essential for the transition to healthy and sustainable food systems, both in social and environmental terms. Positive aspects of the processing of foods must	We would like to remind you that there is no legal definition of “healthy food/diet” either, yet it is used extensively in the NNR2023. We are using the verbatim definition of UPF from Monteiro et al. 2019, doi:10.1017/S1368980018003762

			be acknowledged, such as increased shelf life, food safety, innovation, health, palatability, affordability, and convenience.	
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We will send our comments in 5 parts. This is part 2 of 5.	3. LIMITED EVIDENCE The NNR constitutes the scientific basis for national nutrient recommendations and food-based dietary guidelines in the Nordic and Baltic countries. However, many of the studies that are referred to in the paragraph on health outcomes are, in our opinion, of limited relevance. The nutritional composition of the available foods and the dietary patterns in other parts of the world, as well as in southern Europe, is significantly different from the Nordic and Baltic countries. The possible findings and conclusions are therefore not applicable in a Nordic context. There might also be differences in major health challenges and socioeconomic status between countries. The chapter refers to a few consumption estimates of UPFs in the Nordic and Baltic countries (p. 5), but as long as the definition of UPF lacks robustness, these estimates are of limited value. According to the NNR instructions to authors, the tools used to quality-check all major publications which are directly relevant for setting FDBGs should be stated. Thus, the totality of evidence should be reviewed, and the uncertainties should be described. We ask for information on the overall	The tools and procedures used to quality check all of the included studies are stated in the methods.

			strength of evidence for each of the health outcomes. We refer to the chapters Meat and Eggs where this is interpreted in an informative way. The authors do state that there is limited evidence for several health outcomes. Nevertheless, possible mechanisms for health outcomes are thoroughly discussed in the chapter. Moreover, they refer to strong evidence supporting that a diet high in UPF increases energy intake and promotes weight gain. One of the studies referred to in the chapter (ref. 42, table 3, and p. 9) is the study by Hall et al. (Hall K.D. et al., 2019). In this study, the participants' UPF diet is taken to the extreme. It does not contain any healthy processed foods in line with the dietary guidelines, such as foods high in whole grains, vegetables, and fat-reduced dairy. The finding in the study is not surprising, as the participants ate a large proportion of foods with high fat and sugar content, and thereby high in energy. The major difference in energy density between the diets in the Hall study is a much more likely cause of the outcome, rather than the processing level of the foods. This, and additional criticism, is pointed out by Astrup (Astrup A., Monteiro C.A, 2022). These limitations should be emphasized and included in the NNR working process. We will also point out the fact that the author themselves state the following.	

			"The current evidence is primarily observational and relies on self-reported data and may therefore be subject to measurement error and confounding." (p. 1). This should call for a cautionary interpretation of data and conclusions of causality.	
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We will send our comments in 5 parts. This is part 3 of 5	4. MECHANISMS This paragraph (p. 9-10) presents a series of hypotheses that are highly speculative and very uncritically conveyed. It has lots of errors that an expert in the processing of foods as an author or peer reviewer would have corrected. In addition, the hypotheses are not correlated with the processing of foods per se. We ask that the paragraph is completely removed. a. The authors state that UPFs have poor nutritional profiles. This is wrong, e.g. UPFs labeled with the Nordic Keyhole. There is no correlation between the level of processing food and drink undergoes and the nutritional content of the final product. It is the final composition of the product that matters when assessing health (Bothelo, R. et al., 2018). Processed or UPF can have a wide variety of nutritional qualities. The foods may also be very beneficial, especially to certain population groups, who may have more restricted diets, e.g. fortification with vitamins or higher levels of energy and proteins. Reformulation of food products to reduce salt content, saturated fat, and added sugars, and thereby in many	The section on mechanisms is required by the NNR committee (as stated in thedocument “The Nordic Nutrition Recommendations 2022 – Instructions to authors of chapter”). We state that diets high in UPF tend to be nutritionally unbalanced, which is supported by multiple epidemiological studies. Furthermore, we state that many (not all) UPF have poor nutritional profiles, which is also supported by empirical evidence. Concerning fortification: All fortified foods are not UPF, and fortification does not make a food ultra-processed. Reformulation to reduce e.g., salt content does not necessarily transform a non-UPF into an UPF. Concerning additives, several studies in animal models and in humans have suggested deleterious health effects for some of the roughly 330 additives currently approved for use in Europe, for instance through gut microbiome dysbiosis, inflammation, and DNA damage.

			cases turning them to UPFs, is supported by all nutrition societies and public health bodies as a tool to reduce the incidence of NCDs worldwide (Visoli F. et al., 2022). b. The concept of "less-satiating foods" lacks scientific grounds (Gibney M. J. et al., 2017) c. Marketing of foods has nothing to do with a level of processing per se. d. The paragraph discussing altering the physical structure of the food matrix versus health outcomes needs to be corrected. The authors discuss foods that are low in fiber and the health outcomes of a low-fiber diet. This cannot be generalized to UPF. Further, the processing of foods can even increase the bioavailability of essential nutrients (Visoli F. et al., 2022). e. The authors state that certain additives and ingredients may influence biological systems and health outcomes. The use of food additives in the EU/EEA is carefully regulated. The additives have undergone extensive toxicological assessments by EFSA, and other entities worldwide, which ensure their safety and healthiness (Gibney M.J. et al., 2022). EFSA is constantly monitoring and reviewing new scientific data (EFSA). f. It is true that extensive heat treatment may lead to the formation of process	Concerning contaminants formed during processing or from packaging materials: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds, including acrylamide (see e.g., Menichetti et al. Nature Communications 2023)

			contaminants, such as acrylamide. However, the formation of acrylamide is produced at any level of processing, not making a distinction between homemade or industrial goods, including UPFs. On the contrary, industrial processes have higher control over those chemicals (Van Boekel, M., et al. 2010). g. Trans fatty acids are not a health concern in the Norwegian diet. The intake has been below 1 E% since 2005 (The Norwegian Directorate of Health, 2021) h. Food contact materials in plastic packages are carefully regulated in the EU/EEA. Food packaging is not correlated with the level of processing of foods. Well-designed packaging of foods in all NOVA classes 1-4 can prevent spoilage and a decrease in some nutrients during the shelf life (Visoli F. et al., 2022). Also, the intake of bisphenol A from foods is below TDI. EFSA has concluded that there is no health concern for any age group from dietary exposure to bisphenol A (EFSA, 2015).	
Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We will send our comments in 5 parts. This is part 4 of 5.	5. MISLEADING THE CONSUMERS As stated by the authors (p. 12), diets high in UPFs tend to be high in foods and nutrients that should be limited according to the current FBDG. However, the lack of strong scientific support should lead to the conclusion of not including the level of processing as a new dimension in the future FBDG.	We have added statements of conflict of interest for the authors (Juul and Tufte Bere)

			On the contrary, we think the term UPF will be misleading. Consumers' understanding and implementation of NOVA are poorly known. There have been very few studies on consumers' conceptualization of the term UPF. Existing studies found mixed results with some of the participants perceiving processed food culinary ingredients and even more minimally processed foods as UPF (Ares G. et al., 2016, Sadler C.R. et al., 2021). Conflict and disagreement among professionals could also sow doubts and amplify consumers' confusion about the topic, leading to either an amplified or attenuated perception of risk, loss of trust, or rejection of any messages regarding FBDG (Sadler C.R. et al., 2021). An introduction of UPF and NOVA will jeopardize efforts in guiding consumers toward healthier and more sustainable diets. This transition, and the urge to feed the growing population, require the development of food products that satisfy nutritional requirements with innovative food production technology. 6. CONFLICTS OF INTEREST We cannot find any information on the declaration of interest for the authors and the peer reviewers in this chapter. We ask for updated information on this matter, especially since one of the peer reviewers is known to have commercial interests (Christensen et al., 2020).	

Anna Maria Karlsen	NHO Mat og Drikke / FoodDrinkNorway	We will send our comments in 5 parts. This is part 5 of 5.	References Ares, G., Vidal, L., Allegue, G., Giménez, A., Bandeira, E., Moratorio, X., et al. (2016). Consumers' conceptualization of ultra-processed foods. Appetite, 105, 611–617. Astrup, A., Monteiro, C.A. (2022). Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? NO. American Journal of Clinical Nutrition 2022:00:1-7 Botelho, R., Araújo, W., & Pineli, L. (2018). Food formulation and not processing level: Conceptual divergences between public health and food science and technology sectors. Critical Reviews in Food Science and Nutrition, 58(4), 639–650. Braesco, V., Souchon, I., Sauvant, P., Haurogné, M., Féart, C., Darmon, N. (2022). Ultra-processed foods: how functional is the NOVA system? European Journal of Clinical Nutrition 76(9): 1245-1253 Christensen et al. (2020). The Nordic Nutrition Recommendations 2022 – Principles and methodologies. Food & Nutrition Research, 64:4402 EFSA, European Food Safety Authority, www.efsa.europa.eu	

EFSA, European Food Safety Agency. (2015) Scientific Opinion on the risks to public health related to the presence of bisphenol A (BPA) in foodstuffs.

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			Thematic Analysis of Professionals' Perceptions of Processed Foods and Challenges for Communication. Frontiers in Nutrition, 9. Van Boekel, M., Fogliano, V., Pellegrini, N., Stanton, C., Scholz, G., Lalljie, S., et al. (2010). A review on the beneficial aspects of food processing. Molecular nutrition & food research, 54(9), 1215–1247. Visoli, F., Marangoni, F., Fogliano, V., Del Rio, D., Martinez, A., Kuhnle, G., Buttriss, J., Ribeiro, H. DC., Bier, D., Poli, A., (2022). The ultra-processed foods hypothesis: a product processed well beyond the basic ingredients in the package. Nutrition Research Reviews.	
Nina Elzer	CEEREAL asbl (European Breakfast Cereal Association)	When assessing a food's role in a healthy diet the focus should be on what is in the food and what it is eaten with – not its level of processing. Most classification systems based on processing disregard the fact that a food cannot be dissociated from its nutritional content (Sadler, et al., 2021). We are therefore strongly concerned by the use of references to so-called "ultra-processed foods" and to food classification systems such as NOVA, which are not based on scientific consensus. Experts themselves are confused when they need to allocate foods into categories based on the level of processing (Braesco et al., 2022) and there is no consensus on what factors determine the level of processing. Moreover, the most recent compilation of the scientific evidence shows that grouping foods	We strongly reject the general, uninformed, and inaccurate assumption that breakfast cereals, other than oatmeal or muesli based on grains, nuts, and dried fruits, are foods whose intake should be limited based on their level of processing. The general proposal for "ultra-processed foods" being "…more hypercaloric and less satiating than minimally processed foods and may therefore facilitate excessive energy intakes" is not accurate for breakfast cereals. By way of demonstration, a 30g portion of breakfast cereal with 125ml milk provides 169kcal (709kJ), whereas other breakfast choices, such as 2 slices of rye bread with 14g butter provide 241 kcal /	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. All included studies defined UPF according to NOVA. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is

		based on their level of processing is counter-intuitive and leads to opposite findings when looking at the risk of all-cause mortality related to "ultra-processed foods" (Taneri et al., 2022). The chapter in its current form does not state clearly what methods were used in the studies to classify foods as "ultra-processed" (e.g., if studies using non-NOVA food classification systems were also included), nor does it provide any specific details on the validity and reliability of the questionnaires used in the studies to assess the consumption of "ultra-processed foods". The use of classifications based on processing are prone to confusing and misleading consumers. Their use in nutrition guidance in the absence of robust evidence could lead to unintended consequences should important food groups, which are widely accepted and consumed as part of a healthy and balanced diet, be considered "highly" or "ultra-processed" and therefore omitted, excluded, or limited in the diet. Statistically significant differences in all nutrients, including whole grain, dietary fibre and food components of interest were observed when so-called "ultra-processed foods" were excluded from the diet, for example a higher risk of nutrient deficiencies (Thielecke F. et al., 2020; Estell M. et al., 2022). Processing is necessary to turn certain raw ingredients, e.g., grains, into safe, nutritious, palatable, convenient, and cost-effective foods. Grains, including those used for breakfast cereals, are one example of raw ingredients that cannot be consumed without prior processing. AESAN's report points out that many foods that are recommended for regular consumption require a	1,010 kJ (CEEREAL, Breakfasts in Europe 2016). Similarly, the concern that "Ultra-processed foods are generally low in dietary fibre, which provide substrate for microbial fermentation" is not correct for breakfast cereals, as breakfast cereals generally present a valuable source of fibre, promoting gut microbiota diversity and abundance (Jefferson et al., 2019). Decades of scientific research have clearly shown that breakfast cereals make a positive contribution to healthy diets: - Whilst noting that highest, relative to low, consumption of "ultra-processed foods" and specific food groups were associated with increased risk of mortality, a recent systematic review compiling 40 unique prospective cohort studies (Taneri et al., 2022) found that higher consumption of breakfast cereals was associated with a 15% lower mortality risk. - Regular consumption of fibre / whole grain breakfast cereals has been linked to a reduced risk of type 2 diabetes (Hu Y et al., 2020; Williams, 2014), while regular consumption of breakfast cereals that are sources of soluble fibre (oat-, barley- or psyllium-based breakfast cereals) has been associated with potentially better lipid profiles (Williams, 2014). - Furthermore, a substantial body of evidence supports a role for breakfast cereal consumption in body weight	questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. We have removed the example of breakfast cereals in order to not single out any individual type of ultra-processed food.

		stage (in some cases stages) of processing and clarifies that “just because a food is processed, it does not necessarily mean that it is damaging to one’s health”, elaborating further “not to associate the term ultra-processed with foods of poor nutritional quality as this does not depend solely on the intensity or complexity of processing but the final composition of the food itself” (ASEAN Scientific Committee (Working Group), 2020). Furthermore, a causal linear relationship between foods considered as “ultra-processed” and health outcomes has not been established. Nutrients in our diets come from the whole spectrum of foods. Attention on food processing ignores the nutritional reality that a balanced and varied diet is primarily determined by a combination of foods with their intrinsic nutritional composition, their amount and frequency of consumption, and the role they play in overall dietary patterns. We therefore underline that the role of food-based dietary guidelines should remain to guide consumers towards healthier foods choices. A greater degree of processing does not equate to poorer nutritional/health value. Similarly, the relationship between the degree of processing and health should not be assessed independently of the composition of the food. Full references could not be included due to space constraints but can be provided upon request.	management. For example, a systematic review concluded that children and adolescents who regularly consume breakfast cereals are slimmer and are less likely to be overweight or obese than those who consume breakfast cereals infrequently or not at all (de la Hunty et al., 2013). Another study indicated that regular consumption of breakfast cereals is associated with a lower body mass index (BMI) and a reduced risk of being overweight or obese in adults and children (Williams, 2014). Yet another study summarised that prospective studies indicate a link between ready-to-eat breakfast cereal consumption and modest reduction in weight gain or BMI in adults and children (Priebe et al., 2016). - Indeed, breakfast cereal consumption is associated with diets that are higher in vitamins and minerals, and lower in fat (Williams PG, 2014). They are an important contributor to dietary fibre (Stephen et al., 2017) and a key driver of dairy consumption (Michels et al., 2016), and are associated with intakes of other positive food groups, e.g., fruits and whole grains (Smith et al., 2022). Furthermore, it is crucial to emphasise the interconnectedness between reformulation, food processing and public health. Over the past decade, the breakfast cereal industry has made significant achievements in reformulation, reducing sugar by 10,2%, and increasing whole grain by 17,2% and fibre by 8,9% in their products	

			(www.from-seed-to-spoon.info). In conclusion, recommendations to limit consumption of certain breakfast cereals over others due to their assumed classification as “ultra-processed foods” are scientifically misguided and will not deliver the intended public health outcomes. Full references could not be included due to space constraints but can be provided upon request.	
Swedish Food Agency	Swedish Food Agency	The inclusion of ultraprocessed foods as a separate chapter in NNR is very welcome as it is both a relatively new topic and a hotly debated one. The concept is complex and far-reaching, attempting to capture important broad and unsustainable aspects of food consumption trends, yet is, according to the current most widely used definition, defined narrowly. It leaves itself therefore easily open to criticism. For these reasons we argue that it is important that the topic is handled by NNR carefully. The text in its current form could be written more neutrally in several places. The currently used definition, from the NOVA classification system, has several weaknesses. Briefly: - It includes an enormous range of foods, some long accepted to have a negative effect on health (e.g. sugar-sweetened soft drinks), others for which the evidence for negative effects on health cannot be said to be robust (e.g. any food with an additive: wholegrain bread produced in a factory, reduced-fat cream cheese where a stabiliser has been added etc).	Detailed comments continued, comments 3-6 3. Page 10 “In summary, ultra-processed foods may contribute to metabolic disturbances and inflammatory processes, which are present in obesity, cardiometabolic diseases, cancer, and depression.” It is questionable if this summary of the “Mechanisms” section accurately reflects what we (do not) know about mechanisms. 4. Page 11 “The systematic reviews and meta-analyses identified in our systematic search, of which several included multiple additional cross-sectional studies, consistently supported the findings of the present review.” An example of circular reasoning: the studies included supported this review – but the review is based on those studies.	The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. Our paper is a review of this literature. We have added an explanation of “acellular nutrients” We have removed the relevant sentence on page 11 (comment #4) We have edited the relevant sentences on page 9 A direct association means that there is a positive association between the exposure and the outcome in question. We have removed the word “direct” in order to avoid confusion.

		- By definition, exposure is almost impossible to quantify accurately in any study of dietary intake that does not have detail at food product level (i.e. very many of them). - It is also an exposure that is clearly heavily confounded by unhealthy dietary intakes, health behaviours and socioeconomic status. Although it is never possible to control for everything completely, and some studies do try to control well for it, this exposure is susceptible to residual confounding more than most. - A final weak point is that the mechanisms are far from clear. The fact that there are so many "plausible" mechanisms is not automatically a strong argument. It can also illustrate how far we are from understanding how these foods (or some of them) affect health in a way that is *due to their processing level*. While the authors have touched on the above issues, they are discussed only briefly. While we understand space is a limitation, they are so important for this particular issue that they are worth prioritising. Detailed comments 1 & 2 1. Page 5. We have identified an issue with Mertens et al's study, which is a good example of the risk of misclassification, discussed further below. Differences in methodology between dietary survey methodology goes a long way in explaining the otherwise unexplained large discrepancies seen between countries in the Nordic region and must be acknowledged. In the absence	5. The limitations section brings up major, not minor, limitations, and we suggest they are identified as such. Page 11 "It should be noted that a shared limitation across all existing observational studies is the lack of dietary assessment methods and nutrient databases specifically designed to assess ultra-processed food intake, which may have led to misclassification of individual foods and measurement error." Suggest "will inevitably/certainly" not "may" as this is in fact a serious hindrance to studying this properly. "Under- and overestimation of ultra-processed food intake due to misclassification of food items may have attenuated or strengthened the observed associations. However, misclassification error would likely be random, which would bias the associations toward the null." This second sentence is a standard phrase when discussing study limitations but is not entirely appropriate in this instance. This can apply in cases regarding errors due to memory failure, general errors in databases, volume estimation errors etc. When entire categories of foods (e.g. all bread, all salads) are classified as ultraprocessed or not without knowledge about	

		of information regarding whether meals consumed were homemade or not, Mertens et al classified all mixed dishes (e.g. lasagne, meat stew, soups, salads, sandwiches) as “ultraprocessed” in the Swedish dietary survey data in the form they obtained it from EFSA. Other countries disaggregate some of their data to e.g. meat, vegetables and pasta, before reporting to EFSA. This we argue has artificially inflated the percent of UPF in the Swedish results, making comparisons unreliable. To what extent it has affected other countries’ results we cannot be sure. 2. Page 6 and in three other places; “A direct association was observed in five studies,48, 50, 56, 57 while two studies47, 58 reported a null association with all-cause mortality .” What is the definition of a “direct” association? Strongly suggest all instances of “direct” are removed.	processing level, this can no longer be considered random. 6. Other minor suggestions Page 5 “An analysis of sales data from food retailers reported that ultra-processed foods represented 59% of the number of purchased items and 49% of the expenditure in Norway” Should it be volume, not number? Page 5 “In Sweden, the annual per capita consumption of ultra-processed foods increased from 125 kg in 1960 (20% of total diet by weight) to 302 kg in 2010 (38% of total diet by weight).” Would suggest sticking to per capita consumption rather than diet, i.e. 20% of total per capita consumption by weight. Page 9 “The large share of acellular nutrients” Acellular nutrients is a concept many may be unfamiliar with. Is it possible to explain it? Page 9 “Processing may alter a food’s health potential by removing beneficial nutrients...” Only negative effects of processing are mentioned here. They are mentioned in the background but the way the	

			sentence is written now sounds like processing only has negative effects. Suggest “Negative effects of processing can in” Page 9 “Notably, the randomized controlled trial by Hall and colleagues demonstrated that an ultra-processed diet (83.5 percent of total energy from ultra-processed foods) increased ad libitum energy intake by 500kcal/day compared to a minimally processed diet with a similar nutrient profile.” Suggest that this comes before previous sentence as it is support for the satiating hypothesis rather than the convenience hypothesis.	
Plant-food Sweden and Plantebranchen	Plant-food Sweden and Plantebranchen	Given the conflicting opinions on the association between ultra processed food intake and different health outcome, a chapter on ultra-processed food should include and focus on explaining different classification systems, their limitations and strengths as well as provide the strength of evidence for the relationships between UPF and different health outcomes. There is a risk that the chapter in its current form signal that ultra-processing is an important aspect to include in dietary guidelines. There is no common definition of UPF. The NOVA system is the most used, but it lacks clarity and consistency. Basing dietary recommendations on the NOVA system risk to create a perception that all foods that are processed or produced on an industrial scale, are unhealthy. The definition is problematic since it mixes disparate factors such as number of ingredients, focuses on specific ingredients, processing as such as well as several criteria that	Abstract (page 1) Delete “Ultra-processed foods, defined as” in the first sentence and in the next sentence add “according to the NOVA definition”. In addition, we suggest checking the number “12” for systematic review, as reference 91 is a narrative review and suggests deleting “Carefully conducted prospective cohort studies”, as it is unclear how it is defined. “Strong/strongest evidence” is a term used based on the synthesis of the RoB assessment, consistency in findings, etc., preferably using GRADE. We find the reference to "strong evidence" in this chapter as misleading, since strong evidence cannot be based on a certain study design or simply a certain number of studies. The sentence “The current evidence…” is	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods, not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. The concept of ultraprocessed foods is defined within the NOVA classification, and it is used in all included studies. A comprehensive evaluation of classification systems of food processing is outside of the scope of this chapter.

		are irrelevant in this context, e.g. if the producer is a transnational corporation. NOVA Group 4 is too broad, hampers innovative food production, and is too blunt to guide public health guidelines and recommendations. Reduced intake of foods based on degree of processing has been suggested to lead to detrimental effects on nutritional health and food security. (Tobias and Hall. Eliminate or reformulate ultra-processed foods? Biological mechanisms matter. Cell Metab. 2021;33(12):2314-2315; Gustafson et al. Making Healthy, Sustainable Diets Accessible and Achievable: A New Framework for Assessing the Nutrition, Environmental, and Equity Impacts of Packaged Foods. Curr Dev Nutr. 2022;6(10):nzac136). The wide range of foods classified as UPF is a heterogenous group nutritionally speaking. Evidence relating to UPF and negative health outcomes is almost exclusively epidemiological, correlations are seen rather than causation being proven, and conclusions on the negative effects of UPF are not scientifically substantiated. There is no agreed-upon, credible and substantiated mechanisms for the UPF effects seen in these studies (Astrup A, Monteiro CA. Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? NO. Am J Clin Nutr. 2022 Jun 7:nqac123). Other non-diet related behaviours, which are difficult to account for in studies of epidemiological design, could also indirectly be associated with levels of UPF consumption, impacting health outcomes and overall findings. Caution is needed when assessing results from observational studies not aimed at assessing intake of UPF. Foods from all NOVA categories contribute to nutritionally adequate diets (Hallinan et al. Some ultra-	not representative of the issues with UPF. It is a general problem with observational studies and could be mentioned in the discussion. The conclusion “Nevertheless...” in the abstract, presents a broad conclusion not representative of where the research currently stands. The sentence "Diets high in ultra-processed foods ….", is also not representative of the totality of the evidence. Methods (page 3) Table 1 should state if intervention and comparators were according to the NOVA classification, or other definitions. Methods (page 5) We lack a presentation of which kind of foods/food groups the studies found in the high UPF group. Without that it is hard to understand the totality of the concept. The strength of evidence should be systematically assessed and presented in the results section. A narrative review, which is included as a “high-quality” systematic review in the results section (ref 91) for all cause mortality, obesity and type 2 diabetes, and should be removed. We also suggest scrutinizing whether the statistical adjustment for cofactors that are highly correlated (such as UPF and nutrition indices) is valid and how to interpret these results. Do they mean that they do not add anything to the other indices? Food-Based Dietary Guidelines (page 10) The presentation of evidence and conclusion, in the last sentence, lacks disclosure of the fact that the	We agree that randomized controlled trials are the golden standard to prove cause and effect, however such studies are not always ethical, practical, or feasible in nutrition research. Other dietary recommendations, such as decreasing the intake of red and processed meat, are largely based on epidemiological evidence. We have removed the words “carefully conducted” and graded the evidence using the World Cancer Research Fund criteria, as recommended by the NNR project. Concerning fortification: All fortified foods are not UPF, and fortification does not make a food ultra-processed. Reformulation to reduce e.g., salt content does not necessarily transform a non-UPF into an UPF. We have removed the example of plant-based alternatives in order to not single out any one specific food, as the chapter evaluated UPF as a group We have excluded ref 91 (Dicken & Batterham) from the systematic literature review assessing the association between UPF & health outcomes (see figure 1). However, ref 91 is used to discuss the extent to which diet quality/dietary patterns may explain the observed associations between UPF and health outcomes in the reviewed studies.

		processed foods are needed for nutrient adequate diets: linear programming analyses of the Seattle obesity study. Nutrients 2021;13(11):3838). Many plant-based products are, e.g., fortified with vitamins, minerals or other nutrients which have a positive nutritional impact. However, the benefit of these fortificants, added during processing, is not recognised by the UPF concept. Fortifying a processed product can make it UPF, despite the nutritional improvement. Since the studies referred to in the NNR chapter were based on the NOVA classification, negative findings for 'ultra-processed' foods (NOVA Group 4) will apply to a very broad range of products, from nutrient-poor snacks and confectionary to healthy nutrient-dense plant-based meal centres. The optimal solution would be to delete the specific reference to plant-based food and drinks and to take into account the position of the American Society of nutrition in this matter. Many plant-based foods are nutrient dense and healthy and shows the need to decouple degree of processing from nutritional profile/density – e.g., 100% of Findus' plant-based-food range is 'healthy' according to the UK Government Nutrient Profiling Model yet 100% would fall into NOVA Group 4.	mechanisms are highly uncertain and would not hold for either reformulation or broad recommendations. Summary (pages 10 - 11) There is only one RCT, the Hall study. This study is assessed as having low RoB, the 'highest quality'. It can be commented that it lacks blinding and has low directness (short-term study, all foods provided, fiber in drinks instead of fiber-rich foods, etc.). Study quality seems to be generally overrated also in the observational studies, which is serious, as it violates the very foundation of the upcoming recommendations. Integration (page 12) This chapter should provide a summary of mitigating facts needed to answer important questions, such as: a) Is the UPF concept of ultra-processed foods valid, reliable and objective? b) Is there research to substantiate specific metrics to allow recommendations regarding UPF? Is it appropriate to base recommendations on novel and controversial concepts? c) Does the UPF concept help by providing an additional solution to the dietary challenges of the Nordic countries better, or differently, than the current reductionistic concept, i.e., focus on food groups and nutrients (e.g. whole grains, sugar, salt, energy density, etc)? d) To what degree does the inclusion of UPF promote adherence to the Food Based Dietary Guidelines? e) How might recommendation to limit	Answering questions a-g in the last comment is beyond the scope of the current chapter and the task we were asked to perform by the NNR committee.

			UPF affect the shift from animal-based to more sustainable plant-based diets in the Nordic countries? f) Is there an affordability and food security impact assessment for application of the NOVA concept to the Nordic population? g) Does the inclusion of UPF promote or penalise industry reformulating products for nutritional improvement? If these questions cannot be assessed, this is a clear signal that more research is needed before UPF can be included wi...	
Elisabet Rytter	Livsmedelsföretagen Service i Sverige AB	In total general comments will be sent in 6 parts. Part 1 (6): • There is at present no scientific consensus on the association between ultra-processed food intake and different health outcomes. This needs to be clearly reflected in this chapter. A large number of scientific articles including critical analyses on the use of the NOVA classification (specified below) are not included in the chapter, which is a major weakness that would need to be rectified. • Considering the conflicting scientific opinions on this matter, a chapter on ultra-processed food is welcome - provided that it includes and focuses on explaining different classification systems (including NOVA), their limitations and strengths, and providing the strength of evidence for the relationships between UPF and different health outcomes (in the same way as in e.g. the chapter Eggs). Such analysis might not have been included in the aim of the chapter; however, in order to fulfill the role "to describe the background that is relevant for setting DRVs and FBDGs" (see "Instructions to authors of chapters") we consider	In total detailed comments will be sent in 4 parts. Part 1 (4) Abstract Page 1 • The definition of ultraprocessed "ready-to-eat/heat formulations whose manufacture involves several stages and various processing steps and ingredients" is missing a reference and is not aligned with the one used in this chapter, e.g. the NOVA definition. • "Additional experimental studies and high-quality prospective cohort studies in diverse populations and settings are warranted, with special emphasis on disentangling to what extent adverse health consequences of ultraprocessed foods are mediated through their nutritional composition versus non-nutrient based mechanisms. Nevertheless, the current evidence	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general or a comprehensive evaluation of food classification systems (including the merits of NOVA) are beyond the scope of this chapter and not discussed. We do not negate that food processing is necessary and may confer many benefits. The definition of ultra-processed foods is aligned with the nova definition and we have added a reference (Monteiro 2019). The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. As a result, it is

		it is an absolute necessity. In its current form, the chapter risks giving the impression there is clear evidence that ultra-processing is an important aspect to include in dietary guidelines, which is not the case, and thereby undermining the credibility of NNR. • The NOVA classification dismisses decades of nutrition research showing the relationship between nutrients and health, challenging the overall scientific approach that is accepted worldwide and that has been the state-of-the-art approach in NNR's work. The knowledge and scientific evidence on nutritional content, food quality (e.g. content of wholegrain and other healthy whole food components), and energy balance and its relationship to non-communicable diseases, is very strong compared to the evidence for ultra-processing. • It is questionable whether the NOVA classification improves the existing classifications based on dietary quality indexes or nutrient profiling scores for researching the relationship between diet and health (1, 2). We think that there are already better classification systems such as FoodEx2 (EFSA) or EPIC (European Prospective Investigation into Cancer and Nutrition) with a better correlation between processing and health (3). • The NOVA classification hampers the improvement and development of healthier and sustainable food products. This is very problematic if we want to enhance sustainability of the food system, where processing will be essential. To feed the growing world population sustainably and reduce greenhouse gas emissions, a transition to more plant-based foods will be needed. This	consistently supports that limiting the consumption of ultra-processed foods may be protective of weight gain, obesity, type 2 diabetes, CVD, and premature death". This broad conclusion is not representative of where the research currently stands and is not supported by any strength of evidence for the different health outcomes. Using the word" nevertheless" in this sentence and context undermine the importance of disentangling the nutritional and food composition (and energy balance). Introduction Page 2 Paragraph 2 • "While there is longstanding and ample evidence showing an association between specific foods (e.g. sugar-sweetened beverages) and nutrients (e.g., sodium, trans fats) and increased risk of non-communicable diseases like diabetes type II and coronary heart disease (9) studies on ultra-processed foods are fairly recent". Ref 9 is not about processing or UPF according to the NOVA model. This has to be mentioned and taken into consideration when making conclusions. Paragraph 3 • "The purpose of the NOVA is to classify foods according to processing level and the classification does not consider the nutrient composition of foods.". This is not in accordance with the NOVA classification.	questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. Ref 9 is not included among the 65 evaluated studies. It is simply a reference used in the introduction of the chapter. Re table 1: We did not limit search criteria to UPF defined by NOVA but all included studies used the NOVA definition

		transition requires development of food products that satisfy nutritional requirements with innovative food production technologies, including "ultra-processing." It seems clear that the NOVA classification would be counterproductive to such current nutrition and environmental challenges. There is no scientific evidence on how this model might affect food security and maintain the sustainability of the food system (3, 4). Guidelines based on food processing could be misinterpreted as meaning that processing in itself is bad. Such consumer rejection could hamper innovations that contribute to a more (environmentally and socially) sustainable food system (5).	Page 3: Paragraph 1 • Ref 1 and 11 are not per reviewed publications. • "Nevertheless, some ultra-processed foods, for example reformulations and plant-based alternatives, are identified as 'healthy' based on nutrient profiling. As a result, it is currently debated if nutrient reformulation is sufficient or not to address the issues surrounding ultra-processed foods". Challenging nutrient profiling and reformulations without any scientific backup is highly questionable and also contradictory to other chapters in NNR Paragraph 2 • "This chapter will focus on describing the totality of the available evidence regarding ultra-processed foods in relation to health-related outcomes…". As many studies are missing in the chapter (cf above) the totality of available evidence is not provided. Methods Page 4 • The authors claim that there are 5 meta-analyses done on UPF. To our knowledge there are no meta-analyses on UPF. • Limitations of the systematic Reviews included in the chapter are missing: • Ref 9 is not about processing or UPF according to the NOVA model. This has	

			to be mentioned and taken into consideration when making conclusions • Ref 35 states that there are disparities found in the studies, and the difference in food classification makes the comparisons between studies difficult. • Ref 36 states "Due to the heterogeneity in the operationalization of the exposure and outcome variables, it was impossible to perform a quantitative synthesis (meta-analysis). This fact introduces a limitation in summarizing these results." • Ref 3, 33-41 are observational studies and is not a base for causality. • Table 1 should state if intervention and comparators were according to the NOVA classification, or other definitions.	
Sara Sundquist	Livsmedelföretagen	Part 2 (6) • Foods from all NOVA categories contribute to nutritionally adequate diets (6). There is literature on the risks of limiting UPF, for instance linear programming studies and reviews (4, 6-10). Many foods regarded as UPF according to NOVA have a positive nutritional impact (7). The benefit of fortifier, which are added during processing (7), is not recognised by the UPF concept, neither in this chapter. A recent consensus paper state that restricting UPFs is inconsistent with modern life, nutritional health, food safety and sustainable food systems (8). Likewise, Tobias & Hall (4) and Astrup & Monteiro (9) state how the NOVA system is too blunt a tool to guide public health, and that uniformly reducing UPFs could cause unintended harm, including detrimental effects on nutritional health. Furthermore, food groups categorized as UPF contribute positively to the healthy eating index in the US (4). The inclusion of UPFs is, in fact,	Part 2 (4) Dietary intake in Nordic and Baltic countries Page 5 • Reference 87 has been analysed by the Swedish Food Agency. The Swedish consumption have been somewhat overestimated in the Belgian study. All dishes, such as a sausage stew, both homemade and purchased, as well as soups and salads, ended up in ultra-processed for Sweden and Great Britain, while other countries had divided the dishes into theirs components such as sausage and potatoes. The researchers could not distinguish between whether it was homemade dishes or purchased ready meals, because the level of detail was not available from the participants. This is an example of misclassification.	The study by Mertens et al., which found no association between UPF and BMI in Europe, is an ecological study and was therefore not included in the systematic literature review (see inclusion criteria). Ecological studies have a high risk of bias as such studies (a) do not provide data on intake and disease risk at the individual level, (b) are cross-sectional, and (c) do not allow for adjustment for confounding factors. We have added that non-beverage energy density and eating rate differed between diets in the RCT by Hall et al. As a narrative review, ref 91 (Dicken & Batterham) is not included among the

		essential in achieving nutritionally adequate food patterns (6) and sustainable meals (10). Policies targeting elimination of UPFs, such as the FAO, seriously neglect to consider the time, skill, expense, access, and effort required to safely produce enjoyable, nutritious meals without UPFs (4). In addition, avoidance of foods deemed as ultra-processed foods could decrease intakes of dietary fiber and micro-nutrients like folate, calcium (11-12). It has been shown that a narrow range of food choices may lead to dietary inadequacies, a particular concern in elderly people (13). • Nordic populations have a consumption pattern that differs to other countries. For example, Nordic wholegrain bread and lunch traditions are UPFs frequently consumed. These differences need to be extensively addressed. The unique nature of the Nordic diet and how it aligns with products recommended under guidelines such as RCT needs to be addressed. Some Keyhole-labelled products and food included in the national dietary guidelines e.g. wholegrain industrial made bread is classified as UPF. This might question dietary guidelines in the Nordic countries and the Keyhole that is used by Nordic authorities as a health promoting tool (symbol for healthier products). • Consumers understanding of NOVA is poorly known. There have been very few studies on consumers' conceptualization of the term Ultra-processed food. Existing studies found mixed results with some of the participants perceiving processed food culinary ingredients and even some minimally processed foods as ultra-processed foods. (5, 14-15).	The reference also looked at the associations between UPF consumption and BMI in Europe. The authors concluded that there was no association between intakes of UPF and BMI, a finding that should be of interest to include in the chapter. Health outcomes Page 6 Obesity • "The findings support that a diet high in ultra-processed food increases energy intake and promotes weight gain in the short-term". The mechanisms are unclear. The energy density of consumed foods did significantly differ between the two diets and the eating rate was also higher for the UPF diet, see ref 42. This element should be considered further. Page 6-7 As we can see a narrative review is included as a "qualified" systematic review, see ref 91. (Supplementary table 2). Ref 91 is placed under "All cause mortality" but data from that study (91) is incorrectly reported under three subheadings: All cause mortality, Obesity and Type 2 diabetes. The reference does not meet the NNR inclusion criteria for qualified SRs for the following three criteria (obtained from the NNR methodology paper, "The Nordic Nutrition Recommendations 2022 – principles and methodologies", 2020):	65 studies in our systematic literature review assessing the association between UPF & health outcomes (see figure 1). Rather, ref 91 is used to discuss the extent to which diet quality/dietary patterns may explain the observed associations between UPF and health outcomes in the reviewed studies. Concerning contaminants formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds, including acrylamide (see e.g., Menichetti et al. Nature Communications 2023) We have excluded ref 91 (Dicken & Batterham) from the systematic literature review assessing the association between UPF & health outcomes (see figure 1) and removed the text under the subheadings All cause mortality, Obesity and Type 2 diabetes. However, ref 91 is used to discuss the extent to which diet quality/dietary patterns may explain the observed associations between UPF and health outcomes in the reviewed studies.

		• Conflict and disagreement among professionals could sow doubts and amplify consumer confusion about this topic, leading to either (a) amplified or attenuated perception of risk; (b) loss of trust; (c) rejection of any messages (16) • If additives are portrayed as unhealthy and made part of the ultra-processed definition, it risks undermining EFSA's work and risk assessment, and also confuse consumers as regards the use of additives. If additives and other components are merged under a wide definition, such as ultra-processed food, it will be difficult to address and identify health implications of different additives or components. If additives are considered a risk component, that is an issue which should be addressed in its own right, since there is such a wide range of additives and a wide range or their uses. Also, it needs to be taken into account that additives are an enabler for consumption of certain food components that we know are healthy, based on much more solid evidence than the notion that (EFSA evaluated and approved) additives would be unhealthy.	1. Includes a clear description of SR methodology, which should be similar to the methodology used in NNR2022 . 2. Includes an assessment of the quality of primary studies 3. Provides an evidence grade for the overall quality of the evidence. These remarks are important, as reference 91 is key for the conclusion in the chapter that "the adverse health outcomes associated with ultra-processed food intake are independent of nutrient content and overall dietary patterns quality and patterns" (see "Integration, paragraph 1, page 12 in NNR chapter). Page 7 CVD • Ref 47 and 67: Not all UPF food groups were associated with CVD risk. Associations seem to be driven by meat and salty snack consumption, and in the Zhong paper especially sugary products and soft drinks were drivers. No association with soft drinks was found in the Juul paper. This supports the position that UPF consist of a very heterogenous group of products and not all are adverse for health. Type II Diabetes • "Higher intake of ultra-processed foods was associated a greater risk of developing type 2 diabetes in all studies". This is true when looking at UPF consumption in general, but within the Lifelines cohort, researchers also	

			looked at UPF consumption patterns and showed that only in one group out of four was there an association with T2DM risk, see ref 70. Mechanisms Page 9 Paragraph 1: • Processing may alter a food's health potential by removing beneficial nutrients and naturally-occurring bioactive components, introducing added sugar, sodium, food additives and substances formed during processing (e.g. acrylamide), and modifying the physical structure of the food matrix.". Only negative aspects of processing are listed here, neglecting the many ways in which processing may improve nutritional properties. . Process contaminants such as acrylamide is forming in all processed foods (not only ultra-processed foods) and regardless of whether food is processed at home (baking bread, frying potatoes, etc) or in industrial food production. Also to be noted that the control of its formation is much higher in indust...	
Marie Rydén	Livsmedelsföretag	Part 3 (6) • Only the negative impacts of processed foods are discussed in the chapter. We would like to see a more balanced and objective assessment, where also the positive impacts and benefits of food processing are considered, e.g. positive impact on shelf life (reduce food waste), process optimization (reduce water/energy consumption/food waste), innovation, food safety, taste, convenience, affordability as well as health.	Part 3(4) Paragraph 2 • "Notably, the randomized controlled trial by Hall and colleagues demonstrated that an ultra-processed diet (83.5 percent of total energy from ultra-processed foods) increased ad libitum energy intake by appr 500kcal/day compared to a minimally processed diet with a similar nutrient	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing

		• Proposed mechanisms for health effects of UPF are speculative and uncritically described (excluding nutrient composition which is very well described in decades of NNR publications). • This chapter should provide a summary of facts needed to answer very essential questions, such as: A. Is the UPF concept of ultra-processed foods valid? B. Is there research to substantiate specific metrics to allow recommendations regarding UPF? C. Does the UPF concept help by providing a solution to the dietary challenges of the Nordic countries which is better than, or different to the current reductionistic concept, i.e., focus on food groups and nutrients (e.g. whole grains, sugar, salt, energy density, etc)? D. How might a recommendation to limit UPF affect the shift from animal-based to sustainable plant-based diets in the Nordic countries? If these and other (9) questions cannot be satisfactorily assessed or answered, this should be a clear signal that more research is needed and essential before UPF can be included within Food Based Dietary Guidelines, like the Nordic Nutrition Recommendations. Classification of UPF including NOVA • The NOVA classification is too broad as regards the definitions (2-3, 12, 17-19). There is a lack of a universally accepted definition of ultra-processed foods and there have been several schemes, which has limited the prospective epidemiologic evidence on the selection of items for the studies (1, 20-21). There's no legal definition for this term, and its description does not meet the criteria established for the terms "processing" and "processed foods"	profile (42)". The limitations of this clinical trial need to be included as well. It does show that actual eating rate and energy density differed. Satiety and palatability did not differ. Paragraph 3. • (31) in our reference list provides some interesting mechanistic insights, suggesting that food texture accounted for observed differences in the amount (g) of food consumed across minimally processed and ultra-processed foods and that texture and energy density accounted for observed differences in energy intake. • This paragraph discusses foods that are low in fiber and the health outcomes of a low fiber diet and cannot be generalized to UPF. Paragraph 4 (continues on page 10, paragraph 1) • "Animal studies indicate that artificial sweeteners (101) and emulsifiers (102) may disrupt gut microbiota integrity and promote a pro-inflammatory status and metabolic dysregulation." Some animal studies indeed showed negative effects of low energy sweeteners on the gut microbiota, but these studies do not translate into human studies, because the dose of low energy sweeteners is very high and the way of administration (in water) is also not representative for the human situation. Moreover, the gut microflora of animal models differs from	are necessary and may confer many benefits. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition alone. As a result, it is questionable if a food can be considered "healthy" or "unhealthy" solely based on its nutrient profile. That said, the chapter does not suggest to completely ignore the nutrient composition of foods. We advised the NNR-committee to include recommendations regarding UPF to complement the other recommendations, not to replace them. The lack of dietary assessment methods and nutrient databases specifically designed to assess ultra-processed food intake, which may lead to misclassification of individual foods and measurement error, is discussed in the chapter. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds, including acrylamide (see e.g., Menichetti et al. Nature Communications 2023)

		by Regulation (EC) No 852/2004 on the hygiene of foodstuffs • Food products classified as UPF have different nutritional qualities. Within the ultra-processed foods categories, we also find products such as whole-grain, pre-packaged bread and unsweetened breakfast cereals. This suggests that processing itself may not be a causal determinant of the nutritional quality of foods (1). Statistically significant differences in all nutrients, including whole grain, dietary fiber and food components of interest was observed when UPF were excluded from the diet, risking important nutrient deficiencies (12, 22). Even some product labelled with the Keyhole (the Nordic symbol for healthier products) and food included in the national dietary guidelines e g whole grain industrial made bread are classified as UPF. A diet free from all ultra-processed foods is not necessarily nutritionally adequate, as foods from all levels of processing can contribute to a balanced diet (2, 6, 23-26). • There are no scientific, measurable or precise reference parameters when categorizing food products according to the classification, implying a significant arbitrary component (3, 17). This leads to an increased risk of misclassification of products along the categories proposed within NOVA and SIGA (1) since the processing information is not usually available on the package of the product. Also, the NOVA classification is applied to databases with no distinction of industrial made products. One of the main sources of variation among study protocols is the tools used for estimating UPF intake. Most of the data on UPF consumption have been derived from FFQs and 24 h dietary recall, which are not specifically validated	the microflora of humans (39). There are a few human studies in which low energy sweeteners were used within the level of the acceptable daily intake (ADI) which do not show a negative effect on the gut microbiota (40-42). Polyols may actually have beneficial effects on the gut microbiota by stimulating growth of beneficial bacteria such as bifidobacterial and lactobacilli and increased production of short-chain fatty acids (43-47). Page 10 Paragraph 2 • “Extensive heat treatment and extruding during processing may lead to the formation of contaminants”. Extruding is not always “extensive” as the moisture content (dry or wet extrusion) and the extrusion parameters (heat, time, shear) can be modified and the most suitable parameters can be chosen to prevent formation of process contaminants. Besides extrusion processing is well-known to significantly reduce anti-nutritional factors. Furthermore, extensive heat treatment is not classified as ‘ultra-processing’ by NOVA classification, although it may indeed be detrimental. • Again, the formation of acrylamide is not something that happens only in large-scale food processing but also when processing food at home. . A home-made cookie is not better in terms of acrylamide then a cookie	We have added text and references regarding RCTs in humans demonstrating negative effects of certain artificial sweeteners and emulsifiers when consumed in realistic doses within the ADI.

		for estimating UPF; thus, such data should be considered with caution (27,28).	manufactured by the food industry. On contrary, acrylamide formation is much better controlled in the industry than at home. The industry has toolboxes to mitigate and limit the formation of acrylamide and makes regular analyses of acrylamide in the products. . • "Furthermore, industrial partial oil hydrogenation may lead to the creation of trans-fatty acids, which are linked to cardiovascular disease and diabetes". Processing-induced trans-fatty acids are nowadays a minor concern in Europe as industrially manufactured retail foods are not allowed to contain more than 2 g of trans-fatty acids per 100 g of fat ((EU) 2019/649). In the Nordics countries consumption of industrial TFA is low and well below the WHO recommendation of 1E%. The majority of dietary TFA comes from ruminant TFA, in the Nordic countries. See also (48). It is therefore misleading to criticize processed foods as a public health issue in relation to trans fat content. Paragraph 3 • It is not only so called UPF that are prepacked in plastic bags but also e g fresh salads, apples etc. This has nothing to do with the level of processing.	
Ulrika Ehrhardt	Livsmedelsföretagen	Part 4 (6) • The misclassification is demonstrated by (29); nutrition and food science researchers, medical doctors, and dietitians showed inconsistency and difficulties classifying 231 food products. In a recent study (29), which included more than 150	Part 4(4) Parapgraph 4 • "In summary, ultra-processed foods may contribute to metabolic disturbances and inflammatory processes, which are present in obesity,	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which is defined by NOVA), not food processing *per se.* As a result, an

		nutrition experts, it was concluded that there are inconsistencies in assigning foods to NOVA groups. Another publication, which categorized foods in the 3 largest U.S. cohort studies (Nurses' Health Studies, Health Professionals Follow-up Study, Growing Up Today Study), showed that there is no single gold standard for applying the NOVA categorization and mentions that the approach is not validated yet (30). • Processing itself may not be a causal determinant of the nutritional quality of foods (1) and that from the perspective of food science and technology, processing and nutritional value do not have a linear relationship and these concepts need to be dissociated. A study which examined the underlying basis of food classification systems based on processing concluded that it is a chaotic conception, and there is no consensus around what factors determine the level of processing. Most classification systems do not include quantitative measures but, instead, imply correlation between "processing" and nutrition (5). Referring to food processes in general terms is misleading. Food processes are not alike and depends on several factors. Some processes may reduce the nutritional quality of foods, while others improve the quality – or have no effect. • The epidemiological studies researching the relationship between ultra-processed food and disease are limited by the potential of reverse causality. i.e. This relationship does not indicate the validity of the classification (1, 5). • Authors of NOVA classification also consider ultra-processed foods as intentionally hyperpalatable and addictive. There are not many	cardiometabolic diseases, cancer, and depression". The presentation of evidence and conclusion lacks disclosure of the fact that the mechanisms are highly uncertain Food-Based Dietary Guidelines Page 10 Paragraph 1 • As strength of evidence for the different health outcomes is not added in the chapter the scientific base is missing for the sentences "Carefully conducted prospective studies consistently …". Paragraph 2 • The Hall study, ref 42 in the chapter, is assessed as 'highest quality'. It should be recognised explicitly that it lacks blinding and has low directness (short-term study, all foods provided, differences in intrinsic fiber, etc.). Also, the Hall study suggest that the main differences between UPFs and non UPFs can be understood through conventional dietary metrics (9). Further, as pointed out by (9) causality cannot be established from observational studies. Paragraph 3 • "The current literature is suggestive of an association between ultra-processed foods and hypertension, cancer, and depression, however the limited number of studies and subjects investigated preclude strong conclusions". The chapter includes the epidemiological	evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. We agree that randomized controlled trials are the golden standard to prove cause and effect and state so in the chapter. However, RCTs are not always ethical, practical, or feasible in nutrition research. Other dietary recommendations, such as decreasing the intake of red and processed meat, are largely based on epidemiological evidence. The current literature review excluded cross-sectional studies which have a higher potential of reverse causation. We have graded the strength of the evidence using the World Cancer research Fund Criteria, as recommended by the NNR project. We have removed the words 'carefully conducted'. Regarding Hall et al.: We have removed the words "highest quality" and added text acknowledging the lack of blinding and the potential role of differences in non-beverage energy density. The evidence supports that the association between ultra-processed foods and health outcome is not explained by their nutrient composition. We have clarified that the biological mechanisms underlying UPF-disease associations are not yet determined.

		studies to date that compares the satiating efficiency of the same food material whether it is a minimally processed or ultra-processed, therefore this assertion has no scientific grounds and the term hyperpalatable could be considered the same as palatable (3). Some studies show no empirical evidence from clinical trials for a disproportionate contribution of specific tastes of ultra-processed foods in promoting excessive daily energy intakes (31-32). • The latest research links the disruption of the food matrix produced by processing to overconsumption and higher calory intakes (33). To link specific matrix effects and taste–nutrient relationships to food processing, there is a need to explore sensory and metabolic responses to foods that have equivalent nutrients but differ in their degree of food processing (31-32). • The authors of the NOVA classification also define food additives as ingredients that cause poor health. Food additives have undergone extensive toxicological assessments by EFSA and other entities worldwide, which ensures the safety and healthiness of those (32). Additives are needed for different technological and functional reasons and the food industry uses them when it is necessary. Additives themselves are not much different than perceived food-based ingredients (e.g. salt), they provide the same functionality, and sometimes, even an improved functionality towards health (e.g. additives that provide the technical characteristic of salt but with a lesser impact on health).	studies on the associations between NCDs; cancer, mortality, etc. linked to UPFs. These studies conclude that diets with a high consumption of sugar, fat and salt, and lesser consumption of vegetables, fruits and fiber, has a negative effect on health. According to our interpretation this clearly demonstrate that the main factor is nutritional composition, not the processing or the additives applied, something that many of the studies included in the chapters also reports. Data gap for future research Page 11 Paragraph 1 • 'Nevertheless, the reviewed studies were conducted in multiple different countries and populations, including various European countries, which increases the generalizability of the results". Ref 87 showed that within Europe there was no association between prevalence of overweight and UPF consumption. • "Given that there are national differences in food supplies, health status and culinary traditions, more studies in Nordic and Baltic populations are warranted". This fact creates a lack of evidence for the health outcome for the Nordic population. Paragraph 2 • "Further research is also warranted to clarify the biological mechanisms	Ref 87 (Mertens et al.) is an ecological study and was therefore not included in the systematic literature review (see inclusion criteria). Ecological studies have a high risk of bias as such studies (a) do not provide data on intake and disease risk at the individual level, (b) are cross-sectional, and (c) do not allow for adjustment for confounding factors.

			through which ultra-processed foods may influence health outcomes and the proportional harm associated with the nutritional composition, food additives, physical structure, and other properties of ultra-processed foods". The authors have missed papers from e g (48) that consider the physical properties. Integration Page 12 Paragraph 2 • "Diets high in ultra-processed foods tend to be high in foods and nutrients that should be limited according to the current FBDGs, including processed meats, sweets, sugar-sweetened beverages, refined grains and added sugars, while low in recommended dietary components such as fruit, vegetables, whole grains, and fiber." and "Recommendations to limit ultra-processed foods, and choose foods of lower processing level, when possible, may enhance and support several of the existing FBDGs and help individuals select more healthful foods that align with the overall NNR2022 guidelines within each food category." These are general statement that do not recognise the large heterogeneity between foods classified as UPF. They lack a critical assessment as to whether the UPF concept brings any added value to the current FBDGs. It is also important to note that minimally processed foods or home-cooked meals are not by definition healthy based on how and	

			where they were prepared. The practical impact of avoiding certain foods should also be further considered ...	
Nicklas Amelin	Livsmedelsföretagen	Part 5 (6) • Studies referring to the NOVA classification also mention processed contaminants such as acrylamide or polycyclic hydrocarbons as a negative effect of ultra-processed foods. These contaminants are produced at any level of processing and without making a distinction between home-made or industrial goods. As a matter of fact, industrial processes have higher control over those contaminants (18, 34). The same is valid for other contaminants such as pesticide residues, antibiotics, heavy metals, mycotoxins and packaging migrants. Those contaminants are not inherent to the ultra-processed foods group and the NOVA classification does not provide information on its presence in any of the categories of the classification (18). Association UPF and health: • Principles for assessment of evidence is not in place (precise definition of factor to be tested, a plausible mechanism of action, support from complementary research designs (e.g., observational and mechanistic), and confirmation in randomized controlled trials (RCTs)). This must be achieved before being relevant for setting FBDGs (9). • It is not clear if the claimed association between UPF and disease is related to processing itself or the energy/nutrient content of the selected foods under the classification also taking into account consumers' dietary habits and lifestyle. The study (35) is often used as the best example to demonstrate how a diet with UPF could cause	In total references will be sent in 2 parts. Part 1 (2) 1. Poti, J. M., Braga, B., & Qin, B. (2017). Ultra-processed Food Intake and Obesity: What Really Matters for Health—Processing or Nutrient Content? Current Obesity Reports, 6(4), 420–431 2. Vergeer L, Veira P, Bernstein JT, Weippert M, L'Abbé MR. The Calorie and Nutrient Density of More- Versus Less-Processed Packaged Food and Beverage Products in the Canadian Food Supply. Nutrients. 2019 Nov 15;11(11):2782. doi: 10.3390/nu11112782. PMID: 31731664; PMCID: PMC6893502. 3. Gibney, M. J., Forde, C. G., Mullally, D., & Gibney, E. R. (2017). Ultra-processed foods in human health: a critical appraisal. The American Journal of Clinical Nutrition. 4. Tobias, Hall. Eliminate or reformulate ultra-processed foods? Biological mechanisms matter. Cell Metab. 2021;33(12):2314-2315 5. Sadler, C. R., Grassby, T., Hart, K., Raats, M., Sokolović, M., & Timotijevic, L. (2021). Processed food classification: Conceptualisation and challenges. Trends in Food 6. Hallinan et al. Some ultra-processed foods are needed for nutrient adequate diets: linear programming analyses of the Seattle obesity study. Nutrients 2021;13(11):3838. 7. Drewnowski A, et al. Perspective:	

		diverse health issues. However, the UPF diet the participants consumed in this study is taken to the extreme. It does not contain any healthy UPF like whole grain products or ready meals containing vegetables which led to a higher energy density of the consumed UPF compared to the control diet. In addition, the residual confounding is high in many studies (1-3, 23-24,27, 36-37). It remains unclear whether associations between ultra-processed food intake and higher fasting glucose, metabolic syndrome, increases in total and LDL cholesterol, and risk of hypertension can be attributed to processing itself or to the nutrient content of ultra-processed foods (1). Hence, more mechanistic insights are needed. • The lack of a universally accepted definition of ultra-processed foods and the fact that there have been several schemes, has limited the prospective epidemiologic evidence on the selection of items for the studies (1, 20-21). • The use of the term 'ultra-processed' within which fall the majority of pre-packaged foods, as a part of segmenting foods for epidemiological research, may demonstrate associations with health effects linked to the known societal challenge of healthy balanced diets, but other causation cannot be inferred. Thus, the term 'ultra-processed' in itself carries inference as to causality and this is exacerbated by descriptions of how it is defined (5,38). • Beyond the specific criticism of the NOVA classification system and of its theoretical background, it is important to remember that the use of such a classification in observational (or cohort) epidemiological studies must be	Achieving Sustainable Healthy Diets Through Formulation and Processing of Foods. Curr Dev Nutr. 2022 Apr 30;6(6):nzac089. 8. Gustafson et al. Making Healthy, Sustainable Diets Accessible and Achievable: A New Framework for Assessing the Nutrition, Environmental, and Equity Impacts of Packaged Foods. Curr Dev Nutr. 2022;6(10):nzac136. 9. Astrup A, Monteiro CA. Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? NO. Am J Clin Nutr. 2022 Jun 7:nqac123 10. Eustachio Colombo et al. Designing Nutritionally Adequate and Climate-Friendly Diets for Omnivorous, Pescatarian, Vegetarian and Vegan Adolescents in Sweden Using Linear Optimization. Nutrients. 2021;13(8):2507. 11. Jones, J. M. (2019). Food processing: criteria for dietary guidance and public health? The Proceedings of the Nutrition Society, 78(1), 4–18. 12. Thielecke F. et all., 2020) Thielecke, F., Lecerf, J-M., Nugent, A. P. (2020). Processing in the food chain: do cereals have to be processed to add value to the human diet?. Nutrition Research Reviews, (), 1–43. 13. Bernstein, M. A., Tucker, K. L., Ryan, N. D., O'Neill, E. F., Clements, K. M., Nelson, M. E., et al. (2002). Higher dietary variety is associated with better nutritional status in frail elderly people. Journal of the American Dietetic	

		interpreted with caution and in the context of the general limitations typical of this type of study design. These include the relative inability of the dietary intake assessment methods used in such studies to determine accurately and precisely the intake of individual foods (and, therefore, nutrients), the relationships among these individual constituents and the health outcomes resulting from their consumption. No matter how well such epidemiological studies are carried out and how few residual confounders remain in the analyses, they can never prove causality; intervention trials are required to provide this type of evidence alongside supporting information from mechanistic studies.	Association, 102(8), 1096–1104 14. Ares, G., Vidal, L., Allegue, G., Giménez, A., Bandeira, E., Moratorio, X., Molina, V., & Curutchet, M. R. (2016). Consumers' conceptualization of ultra-processed foods. Appetite, 105, 611–617. https://doi.org/10.1016/j.appet.2016.06.028 15. Aguirre, A., Borneo, M. T., El Khori, S., & Borneo, R. (2019). Exploring the understanding of the term "ultra-processed foods''' by young consumers." FoodResearch International, 115, 540. https://doi.org/{10.1016/j.foodres.2018.09.059 16. Sadler C.R., Grassby T., Hart K., Raats M.M., Sokolović M., Timotijevic L. (2022). "Even We Are Confused": A Thematic Analysis of Professionals' Perceptions of Processed Foods and Challenges for Communication. Frontiers in Nutrition, 9. 17. Weaver, C. M., Dwyer, J., Fulgoni, V. L., King, J. C., Leveille, G. A., MacDonald, R. S., Ordovas J., Schnakenberg, D. (2014). Processed foods: contributions to nutrition. The American Journal of Clinical Nutrition, 99(6), 1525–1542 18. Braesco V., Corrieu G., Feillet P., Giacchetti I., Pascal G., Risse J., Serpelloni M., This H., Trystram G. (2019). Aliments dits "ultra-transformés et santé: que faut-il en penser? Publication of the Academie d'Agriculture de France. 19. de Araújo, T.P., de Moraes, M.M., Afonso, C., Santos, C., Rodrigues, S.S.P.	

			(2022). Food Processing: Comparison of Different Food Classification Sy...	
Jimmy Sandell	Livsmedelsföretagen	Part 6 (6) Other scientific deficiencies/weaknesses • The articles/studies (3, 17, 33, 38) included in the chapter are well structured and defined on their area of research, but do not include a critical analysis of the use of NOVA classification, and the link to processing • The scientific articles not included in the chapter (including critical analyses on the use of the NOVA classification) are listed in the enclosed Reference list under heading “Not included”. Authors and reviewers According to our assessment the authors and reviewers of the chapter are lacking knowledge about food science (incl food manufacturing). As a result, important perspectives and understanding of the processing of foods are missing in the chapter. Since ultra-processed food is a research area including process and other factors linked to food products, beyond nutrients, expert in the field of food science should be included as author/reviewer. The description of the NNR organization states, that the chapters will be peer reviewed by scientific experts. This chapter has been peer reviewed by Marit Kolby, who do not have a PhD degree. It could be question whether a person that do not have a PhD-degree can be appointed as scientific expert.		The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which are defined by NOVA), not the Nova framework or food processing classifications per se. We conducted a systematic literature review of prospective cohort studies, systematic reviews end meta-analyses on this topic. As stated in the inclusion/exclusion criteria we did not include narrative reviews, commentaries or opinion pieces, which is why the mentioned references were not included. The NNR committee chose the chapter authors and the reviewers. The authors have no influence over this selection.
Karin Thapper	Livsmedelsföretagen	In total references will be sent in 3 parts. References part 2 (3) 20. Gibney, M. J. (2019). Ultra-processed foods: definitions and policy issues. Current	References part 3 (3) 37. Lorenzoni, G., Di Benedetto, R., Silano, M., & Gregori, D. (2021). What Is the Nutritional Composition of Ultra-	

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Magnus Därth	Swedish Meat Industry Association	Considering the strong but many times flawed discussion, a chapter on ultra processed food is welcome if it includes and focus on explaining the classification, it´s limitations and strength and providing the strength of evidence for the relationships between UPF and different health outcomes. The chapter in its current form do not meet these requirements. We see a risk that chapter in its current form signals that ultra-processing is an important aspect to include in dietary guidelines. We think that the NOVA classification dismisses decades of nutrition research showing the relationship between nutrients and health, which overrules the overall scientific approach accepted worldwide and that have been the state-of-the-art approach in work with NNR. The knowledge and scientific evidence of nutritional content, food quality (e.g. content of whole grain and other healthy whole food components), and energy balance and its relationship to non-communicable diseases is very strong compared with the evidence for ultra-processing. The chapter do not include analysis of limitation and strength of classification systems for UPF. Such analysis may not have been included in the aim of	The definition of ultraprocessed “ready-to-eat/heat formulations whose manufacture involves several stages and various processing steps and ingredients” is missing a reference and is not aligned with the one used in this chapter, e.g. the NOVA definition”. Mechanisms Page 9 Paragraph 1: Only negative aspects of processing are listed, neglecting the many ways in which processing may improve nutritional properties. Text – “Processing may alter a food’s health potential by removing beneficial nutrients and naturally-occurring bioactive components, introducing added sugar, sodium, food additives and substances formed during processing (e.g. acrylamide), and modifying the physical structure of the food matrix. “ Home cooking is also food processing and may have the same effects. Cooking can also cause the formation of acrylamides and there is actually greater control of this during industrial food	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which are defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that food processing is necessary and may confer many benefits. Likewise, the task was not to evaluate the Nova framework or food processing classifications. A comprehensive analysis of the NOVA framework is beyond the scope of this chapter. We conducted a systematic literature review of prospective cohort studies, systematic reviews end meta-analyses on this topic. As stated in the inclusion/exclusion criteria we did not include narrative reviews, commentaries or opinion pieces, which is why the mentioned references were not included.

		the chapter, but to fulfill the role "to describe the background that is relevant for setting DRVs and FBDGs" (see "Instructions to authors of chapters") we consider it is necessary. Such an analysis should include also other classification than Nova. It is not clear if the association between UPF and disease is related to processing itself or the energy/nutrient content of the selected foods under the classification also taking into account consumers' dietary habits and lifestyle. The study from Hall et al (2019) is often used as the best example to demonstrate how a diet with UPF could cause diverse health issues. However, the UPF diet the participants consumed is taken to the extreme. It does not contain any healthy UPF like whole grain products or ready meals containing vegetables which led to a higher energy density of the consumed UPF compared to the control diet. There are many published papers criticising the NOVA classification that have been omitted from this report. They should also be included to give a scientifically balanced description.	processing. See also Forde&Decker Annual Review of Nutrition 2022 https://doi.org/10.1146/annurev-nutr-062220-030123 Food-Based Dietary Guidelines Page 10 Paragraph 1 As strength of evidens for the different health outcomes is not added in the chapter it is hard to evaluate if the sentences "Carefully conducted prospective studies consistently …" is appropriate. Paragraph 2 The Hall study is assessed as 'highest quality'. It should be commented that it lacks blinding and has low directness (short-term study, all foods provided, differences in intrinsic fiber, etc.). Also, the Hall study suggest that the main differences between UPFs and non UPFs can be understood through conventional dietary metrics (1). Further, as pointed out by Astrup & Monteiro (1) causality cannot be established from observational studies. Integration Page 12 Paragraph 2 "Diets high in ultra-processed foods tend to be high in foods and nutrients that should be limited according to the current FBDGs, including processed meats, sweets, sugar-sweetened beverages, refined grains and added	We have added a reference for the definition of ultra-processed foods and confirmed that the definition is aligned with the Nova definition. Concerning contaminants formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds, including acrylamide (see e.g., Menichetti et al. Nature Communications 2023) We have added that the RCT by Hall et al. was not blinded and discuss the potential role of differences in non-beverage energy density and eating rates. We have graded the strength of the evidence using the World Cancer research Fund Criteria, as recommended by the NNR project.

			sugars, while low in recommended dietary components such as fruit, vegetables, whole grains, and fiber." and "recommendations to limit ultra-processed foods, and choose foods of lower processing level, when possible, may enhance and support several of the existing FBDGs and help individuals select more healthful foods that align with the overall NNR2022 guidelines within each food category" These are general statement and there is large heterogeneity between foods classified as UPF. It is also important to note that minimally processed foods or home-cooked meals are not by definition healthy based on how and where they were prepared. The practical impact of avoiding certain foods should also be further considered in the guidance.	
L. M. Granskog	concerned citizen	Elling Bere, one of the authors of this chapter and Nina Cecilie Øverby one of the reviewers are coauthors with others on an article https://doi.org/10.1111/mcn.13101 which describes the New Nordic Diet. There is no red meat or indeed any meat mentioned in the description of this diet in that article. The most recent reference they refer to https://doi.org/10.1017/S1368980012004521 describing this New Nordic Diet does include some meat but indicates that the increase in legumes is designed to increase protein from plant sources for environmental reasons, there is also some increase in whole grains. This environmental and health bias against meat is not well founded scientifically and does not take into account the totality of the evidence. https://doi.org/10.1007/s10669-015-9577-y Kids especially have small stomachs, they	It's a good question if any good data can be obtained from observational studies. They are by nature low quality evidence and fraught with confounding factors. Diabetes is epidemic https://www.dietdoctor.com/diabetes/what-happened-how-to-fix-it . Some medical students and doctors have used a more direct method to understand the health effects of different foods, continuous glucose monitoring https://doi.org/10.1177/15598276221119989 The most common responses to this learning experience were reduction of carbohydrate intake and time restricted eating. One of the students reported cutting out rice and most	The chapter does not discuss animal vs. plant protein sources. This comment is beyond the scope of the chapter. While we agree that randomized controlled trials are the golden standard to prove cause and effect, such studies are not always ethical, practical, or feasible in nutrition research. As a result, many dietary recommendations are largely based on epidemiological evidence.

		need nutrient dense foods. Variety is important. Animal source foods are important for health. https://doi.org/10.3389/fnut.2022.806566 India, with many vegetarians has also a significant percentage of children with stunting. The DIAAS score for beans and peas is considerably lower than that for red meat. Protein from legumes comes with more calories. Micromanagement of dietary advice without taking into account nutrient density, place based traditions, the preferences and values of the people affected is also not acceptable. This is a reason for GRADE or the equivalent when considering dietary recommendations as suggested by the NASEM report Redesigning the Process for Establishing the Dietary Guidelines for Americans (2017) https://doi.org/10.17226/24883 https://doi.org/10.1093/pnasnexus/pgac107 . The issue of meat might have relevance to the discussion of ultra processed foods due to the well known article cited in the chapter by Hall, K.D. et.al. https://doi.org/10.1016/j.cmet.2019.05.008 Mentioned in that article as a possible partial explanation for the weight gain with ultra-processed food is the protein leverage hypothesis, these references are cited in the Hall et.al. article: https://doi.org/10.1017/S1368980017001574 https://doi.org/10.1111/j.1467-789X.2005.00178.x Animals that don't get enough protein will apparently keep eating until they do. https://doi.org/10.1038/508S66a Near the end of the chapter processed meat is lumped together with other foods that should be limited according to current FBDGs, sweets, sugar-sweetened beverages, refined grains and added sugars. Not all processed meats are ultra-processed foods, and processed meats contain EAA and other important nutrients that SSB do not. Lumping these together does not acknowledge the true value of meat in the	processed foods, another was shocked at how current dietary guidelines seem to totally miss the mark. This study is worth reading. There are repeated complaints amongst these students about the dietary guidelines. There is great variability in how people respond to different foods https://doi.org/10.1016/j.cell.2015.11.001 but do note that in figure S6 of https://doi.org/10.1016/j.cell.2015.11.001 beef winds up in the good diet category whereas wholemeal bread winds up in the bad diet category. Dietary guidelines recommend "whole grains" and advise restricting the amount of red meat. Serious questions need to be raised about this. Another reference worth reading is this one https://academic.oup.com/advances/article/8/4/532/4558118 Recently another study https://doi.org/10.1371/journal.pbio.2005143 using continuous glucose monitoring also found individual variability in response to various foods but also that some foods cause elevated blood glucose into the pre-diabetic range in a majority of adults. Cornflakes and milk was such a meal. It is a good question how many of the ultra-processed foods with various forms of added sugar would yield similar results. The article suggests that it is plausible that commonly eaten foods which cause elevated blood sugar might be adverse for the health of the majority of the world's population. The article also	

		diet. A multivariate analysis of fast food transactions found that only soft drink intake is correlated with changes in BMI; not animal fat products https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3949530/pdf/BLT.13.120287.pdf/ The various forms of sugar in ultra-processed food is not much discussed. One study investigating caloric and noncaloric sweeteners in US consumer packaged foods found that caloric sweeteners were present in 74% of them. https://doi.org/10.1016/j.jand.2012.07.009 If caloric sweeteners are added to most ultraprocessed food, the only way to avoid most of this sugar is to avoid most ultraprocessed food. Articles advising the regulation of sugar/ultraprocessed food (here meaning a whole range of caloric sweeteners) are worth having a look at to understand the issues. Some examples can be found at the following links https://doi.org/10.1038/482027a https://doi.org/10.3390/nu12113401. Martínez Steele E. et.al. (2016) found that approximately 90% of the energy intake from added sugar in the diet was coming from ultra-processed foods, and that decreasing the consumption of ultra-processed foods would be an effective way to decrease excessive added sugar consumption in the US http://dx.doi.org/10.1136/bmjopen-2015-009892 . See also https://doi.org/10.3389/fnut.2021.748847	mentions that as CGM becomes more accurate, less invasive and less expensive usage will increase among the pre-diabetic, diabetic and healthy members of the population. The new Food Compass apparently is claiming that cornflakes are healthier to eat than a cheeseburger, and that SSB (sugar sweetened beverages) are more healthy to consume than beef. https://now.tufts.edu/2021/10/14/ranking-healthfulness-foods-first-worst https://www.nature.com/articles/s43016-021-00381-y Cheeseburgers without the bun are now being eaten by some low carb eaters who keep an eye on their blood sugar. Raspberries ranked the highest by the Food Compass do not have the EAA you need to survive.There are apparently over 250 names for added sugar used in processed food and beverages https://hypoglycemia.org/added-sugar-repository/ . It might be a good idea for people giving nutritional advice to consider joining the ranks of those wearing CGM for a few weeks.	
Oatly AB	Oatly AB	Recommendations on reducing UPF would cause unintended harm, including detrimental effects on nutritional health (1-8). Food tech and food processing are essential enablers of food production and innovation. Policies and guidelines must reflect this.	ABSTRACT. The definition of UPF should be replaced by a balanced, critical, sentence illustrating the state of art. For example: “The Nova classification of ultra-processed foods (UPF) rests on poorly defined food processes and the presence of food additives” (from ref 1,	The task presented to us by the NNR committee was to evaluate the evidence regarding the health effects of ultra-processed foods (which are defined by NOVA), not food processing *per se.* As a result, an evaluation of the effects of food

		There is a distorted conversation regarding ultra-processed foods (UPF). Avoiding UPF is portrayed as a panacea against 'industrial' ingredients such as hydrolysed proteins, flavour enhancers, colours, emulsifiers, etc., believed to be responsible for 'hyper-palatability' and poor nutrition. However, while the scientific evidence of nutritional content, food quality, and energy balance and its relationship to NCDs is very strong, this is not the case for UPF (1). In fact, many foods regarded as high UPF according to NOVA are essential for meeting nutrient requirements (2-5). Setting of food or nutrient recommendations requires mechanistical studies, as well as RCTs, showing causality between individual ingredients (or processes) in relation to chronic disease. Fusing 'industrial' ingredients or processing techniques in into one category of foods (UPF), dominated by foods which are high in fat, sugar and salt and low in dietary fiber, violates decades of nutrition research (1). 'Industrial' food ingredients and processing techniques have been approved by EFSA. The lack of research on the individual components of UPF and the subjectivity in the choice of components in different UPF definitions hampers a legal and universally approved definition of 'UPF' and high-quality studies (1, 6). Restricting UPF is inconsistent with modern life, nutritional health, food safety and sustainable food systems (1, 7). Policies targeting elimination of UPF, such as the FAO, seriously neglect to consider the time, skill, expense, access, and effort required to safely produce enjoyable, nutritious meals without	general comments). The abstract should be cleared of adjectives such as "carefully" conducted and "strong" evidence, as these have not been defined in the methods section. "Strong/strongest evidence" is normally used based on the synthesis of the RoB assessment, consistency in findings, etc., preferably using GRADE. The way "strong evidence" is used in this chapter appear arbitrary and, thus, misleading. Strong evidence cannot be based on a certain study design, or simply a certain number of studies. The sentence "The current evidence…" is not a crucial issue with UPF. It is a general problem with observational studies. Replace. The conclusion (Nevertheless...) presents a broad conclusion not representative of where the research stands. The sentence "Diets high in ultra-processed foods ….", is not representative of the totality of the evidence. PAGE 3. The criticism against UPF should be given equal review (see "general comments"). METHODS. Table 1 should state if intervention and comparators were according to the NOVA classification, or other.	processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. We have graded the strength of the evidence using the World Cancer research Fund Criteria, as recommended by the NNR project. We have removed the words 'carefully conducted'. We have added that the RCT by Hall et al. was not blinded and discuss the potential role of differences in non-beverage energy density and eating rates. We have removed the words "highest quality". We have excluded ref 91 (Dicken & Batterham) from the systematic literature review assessing the association between UPF & health outcomes (see figure 1) and removed the text under the subheadings All cause mortality, Obesity and Type 2 diabetes. However, ref 91 is used to discuss the extent to which diet quality/dietary patterns may explain the observed associations between UPF and health outcomes in the reviewed studies.

		UPF (8), as well as the fact that it misclassifies numerous healthy, nutrient-dense foods (1). The inclusion of foods categorized as UPF according to NOVA is essential in achieving nutritionally adequate food patterns (2, 3) and acceptable and climate friendly meals without animal foods (5). The distorted portrayal of processed foods also has detrimental effects on people who eat them for medical, health, environmental, ethical and other reasons. ---------- OATLY, headquartered in Malmö, Sweden, is the world´s original and largest oat drink company offering a broad range of nutritious and sustainable oat-based alternatives to traditional dairy products. We make products for people who cannot or do not want to consume traditional dairy products. References: 1. Astrup A, Monteiro CA. Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? NO. Am J Clin Nutr. 2022 Jun 7:nqac123 2. Hallinan et al. Some ultra-processed foods are needed for nutrient adequate diets: linear programming analyses of the Seattle obesity study. Nutrients 2021;13(11):3838. 3. Estell ML, et al. Fortification of grain foods and NOVA: the potential for altered nutrient intakes while avoiding ultra-processed foods. Eur J Nutr. 2022 Mar;61(2):935-945. 4. Drewnowski A, et al. Perspective: Achieving Sustainable Healthy Diets Through Formulation and Processing of Foods. Curr Dev Nutr. 2022 Apr 30;6(6):nzac089. 5. Eustachio Colombo et al. Designing Nutritionally Adequate and Climate-Friendly Diets for	PAGE 5. Lack of presentation of which kind of foods/food groups were found in the high UPF groups. A table or another kind of illustration is vital to understand the concept at the food level. The strength of evidence in the SR:s should be presented in the results section. A narrative review is repeatedly referred to as a “qualified” systematic review in the results section (ref 91). Statistical adjustment for cofactors that are highly correlated (such as UPF and nutrition indices) is highly questionable and ref. 91 is given far too much weight, whereas contradictory facts are neglected. MECHANISMS. Highly speculative. Not clear that most proposed mechanism lack evidence of causality with respect to disease. The last sentence should acknowledge this. SUMMARY: The Hall study is assessed as ‘highest quality’. It should be commented that it lacks blinding and has low directness (short-term study, all foods provided, differences in intrinsic fiber, etc.). In fact, the Hall study suggest that the main differences between UPF and non UPF can be understood through conventional dietary metrics (1). INTEGRATION: Current text:	

		Omnivorous, Pescatarian, Vegetarian and Vegan Adolescents in Sweden Using Linear Optimization. Nutrients. 2021;13(8):2507. 6. Gibney, M.J., Forde, C.G. Nutrition research challenges for processed food and health. Nat Food 3, 104–109 (2022). 7. Gustafson et al. Making Healthy, Sustainable Diets Accessible and Achievable: A New Framework for Assessing the Nutrition, Environmental, and Equity Impacts of Packaged Foods. Curr Dev Nutr. 2022;6(10):nzac136. 8. Tobias, Hall. Eliminate or reformulate ultra-process...	"Furthermore, diets high in ultra-processed foods tend to be...": No data are presented in this chapter on details of food in the UPF category from the observational studies. This sentence dismisses misclassification, e.g. the fact that many foods that are essential to nutrition will be classified as UPF. In fact, fruit, vegetables, cereals (often fortified or whole-grain) made up 30% of UPF in the NutriNet-Santé study. Ready-to-eat dishes are also often seen to be included. Data on food level is necessary for the integration of this chapter in the NNR. It is concluded that the concept of UPF has gained wide acceptance among health researchers, and that limiting the intake of UPF may offer additional advantages compared to current FBDG and recommendations on nutrients. In contrast, well-informed nutrition researchers reject conflating current conventional and quantifiable dietary factors into the concept of UPF (see general comment). The totality of the evidence is that more research is needed. Principles for assessment of evidence must first be in place, e.g. precise definition of factor to be tested, a plausible mechanism of action, support from complementary research designs (observational and mechanistic), and confirmation in randomized controlled trials (RCTs) (see refs. 1, 6 in general comment).	

			Until otherwise shown, the NOVA system should be considered largely redundant and should not be employed outside...	
Katrine Grytter	Mars Multisales North Europe - Norway, Denmark, Sweden, Finland & Ireland	We welcome an evidence based review and the opportunity to provide input into this consultation. The level of processing our food and drink undergoes does not determine the nutritional quality of the final product. Classifying and legislating food on the basis of the level of processing is not a scientifically-sound approach to food policy and would lead to negative outcomes for food systems. As indicated in the review, processing foods can lead to significant benefits, including increasing food safety, extending shelf-life (e.g., through freezing, pasteurization and canning), improving nutritional content (e.g., cooking tomatoes improves the quality of some antioxidants), increasing convenience and availability of recommended foods (e.g., canned beans), increasing access to diet-specific foods (e.g., gluten free, allergen free) and improving affordability for consumers. There is no evidence that food produced in a factory from safe and approved ingredients is less healthy than food produced in the home. We oppose calls for foods to be broadly classified as “less healthy” simply because they have been produced in a factory, exceed an arbitrary number of ingredients or contain certain ingredients or additives. We support evaluating foods using evidence-based factors, such as nutrient density	Definitions of Ultra-Pocessed Foods (UPF) There is no legal or regulatory definition of an ultra-processed food using the NOVA classification. As such, the definitions are broad and subject to interpretation and vary between researchers preventing comparison between studies (Weaver C.M. et al., 2014, Gibney M.J. et al., 2017, Braesco V. et al., 2019, Vergeer L. et al. 2019, Thielecke F. et all., 2020, de Araujo T.P. et al., 2022). In defining UPF in scientific studies, there is variability in how the term is employed; it may refer to products of poor nutrition quality, or those high in fat sugar and salt, and there is no alignment on whether specific additives such as citric acid classify a product as ultra-processed or not. A recent study of French food and nutrition experts showed that although assignments of packaged foods to NOVA categories were more consistent for some foods than others, overall consistency among evaluators was low, even when ingredient information was available suggesting that the NOVA criteria do not allow for robust and functional food assignments (Braesco V. et al., 2019).	The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods (which ais a term defined by Nova), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. UPF are not defined by the number of ingredients

		and role in the diet, to form the basis of dietary guidance. Classification by other means, such as the degree of processing, or the use of certain additives or ingredients, is arbitrary and may act to limit intake of nutritious foods. We believe that all foods can be part of a healthy diet when consumed appropriately in terms of amount and frequency, and we are committed to enabling consumers to make informed choices through serving size options, education and clear labeling.	Food ingredients There is no evidence that products with 3 or 4 ingredients are healthier than those with 5 or more No studies to date have examined the impact of foods with 3 or 4 ingredients versus those with 5 on health parameters. The use of five or more ingredients in the NOVA definition is arbitrary. Food processing can increase access to and affordability of nutritious diets While not all processed food is the same, and some processed foods contain high levels of nutrients to limit, processed food can also be highly nutritious, abundant in vitamins, minerals, fiber, fruits, vegetables, and other healthy components. Food processing is not in itself the problem and can be a key part of the solution in delivering healthy, safe, and tasty food to many people around the world. An analysis of individual diets showed that ultra-processed foods did not necessarily have the least healthful nutritional profile, but diets high in these foods did (Poti, J. M., et al., 2017, Thielecke F. et all., 2020, Estell M. et al., 2022). An analysis of foods for nutrient density by level of processing demonstrated that 17.8% of ultra-processed foods were in the highest tertile of nutrition quality.	

			As highlighted in the review, not all factory processes have a negative impact on nutrition, in many cases the nutrition quality is improved. The impact of a specific process on nutrient content is dependent on a multitude of factors including temperatures, pressures, mechanical forces, and timings. Some factory processes may alter the nutrient content of foods. In some cases, this can lead to a reduction in nutrient quality by reducing complex carbohydrates to simple sugars or removing the fiber content of wholegrains, these changes are accounted for in the nutrient label. Factory processing can also increase the nutrition quality of a product. For example, ready to heat rice has a higher resistant starch content than rice cooked from scratch leading to a lower glycemic index. Processing of tomatoes into a paste results in greater lycopene content compared to raw tomatoes and higher flavanol content compared top canned tomatoes. Factory processes can also destroy anti-nutritional factors in foods such as beans and legumes. It is often regarded that home prepared products are healthier than those manufactured, however this is not scientifically established, in some cases, the home recipe could have lower nutritional quality than the processed alternative (Poti, J. M., et al., 2017, Braesco V. et al., 2019, Estell M. et al., 2022, Petrus, R. R., et al., 2021, Capozzi	

			F. et al., 2021). A full list of the mentioned references can be given, just contact Katrine Grytter - katrine.grytter@effem.com	
Marina Heinonen	Department of Food and Nutrition, University of Helsinki	Using processing as indicator for unbalanced diet is not a scientific approach. Although fat, salt and sugar contents are mentioned, the NOVA "classification" of ultra-processed foods seems to omit their significance toward health and blindly "blame" food industrial practices. How can it be justified that e.g. mass-produced, packaged rye bread or margarine are "classified" as ultra-processed foods i.e foods that should be limited in our diet ? Food processing such as extrusion or use of food additives per se are not the factors leading to nutritionally unbalanced diet. On the contrary, food processing is of advantage to food structure, sensory quality, and bioavailability of many nutrients as well as a sustainable choice when developing processed (often extruded) foods with use of plant based ingredients including side streams for meat and dairy analogues. Nutritional recommendations should not be based on level of processing. Overall the chapter does not much discuss processing or use of whole food fractions or food additives.	p.9 Mechanisms: no beneficial consequences regarding food processing are introduced e.g. effect of food processing on food structure, sensory quality, and bioavailability of many nutrients as well as extrusion being a widely used technique in developing meat and dairy analogues. p.9 "Firstly": convenience, omnipresence, affordability, large portion sizes, marketing are not associated with the processing of food p.9 "Third": Please include also EFSAs safety evaluation of emulsifiers where there is an expert Panel statement regarding the animal studies referred to here https://www.efsa.europa.eu/en/efsajournal/pub/4152 (see p. 50) p.9 "Fourth". Adverse health effects of advanced glycation end products, acrylamide and trans fatty acids are known, but these are rather general associations with all types of ultra-processed foods when the reactions are formed only with certain types of food matrices and processes. Please specify. p.9 "Finally". Packaging material may be	The objective of the chapter is to evaluate the evidence regarding the health effects of ultra-processed foods (a term defined by Nova), not food processing *per se.* As a result, an evaluation of the effects of food processing in general is out of scope and not discussed. We do not negate that many types of food processing are necessary and may confer many benefits. Concerning contaminants from packaging materials and/or formed during processing: Epidemiological studies support that higher consumption of ultraprocessed foods is associated with higher blood/urine biomarkers of problematic compounds (see e.g., Menichetti et al. Nature Communications 2023)

			a source of possible contaminants no matter how the food is processed. Perhaps not well justified to include this aspect based on one study but overlooking many other sources of pthalates and bisphenol A. p. 10 summary: The studies may be carefully conducted. However there are serious limitations. Thus, it should be even more strongly highlighted that the food compositional data was outdated and most likely not representing the current diet of the Nordic population. In addition in many of the studies the food intake data was self reported which is subject to errors. As poor nutritional profile frequently is associated with increased health risk it seems that common determinants of the ultra-processed category are fat, salt and sugar and low fiber and not the means of processing. The conclusion may be supported that "The literature is suggestive of an association ... however the limited number of studies and subjects investigated preclude strong conclusions" - good that also other limitations discussed p.12 last sentence: The example given on yoghurt, cereal food and chicken is about choosing the nutritionally better choice regarding fat and sugar and does not address the NOVA "classified" indicators of ultra-processed foods such	

			as extrusion, fractioning whole foods into substances, or use of food additives. This example actually supports the statement that its not the processing but the amount of fat, salt and sugar that defines an unbalanced diet.	

14. Potatoes

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comments from authors
Elisabet Rytter	Swedish Food Federation		Abstract, page 1: "However, potatoes are often consumed in processed forms with added fat and salt…" Reference is missing. Reference (8) do not include details about process methods. "However the health effects vary greatly depending on cooking methods and studies indicate that the intake of French fries/fried potatoes should be limited or avoided." The word "avoid" is not appropriate to use when food intake is discussed. All food products that comply with the requirements of the food legislation can be consumed, but from a public health point of view in different quantities. Mechanisms, page 5 "High GI diets have been associated with an increased risk of some chronic diseases …" This is not in line with chapter Carbohydrates, see - Abstract ("limited evidence that total carbohydrates and glycaemic index and load of the diet are related to health outcomes" - Summary of main results ("In addition, there were no consistent benefits on 18 clinical outcomes when changing the glycaemic index of a diet and that the findings from prospective studies of diets characterized by glycaemic index or load are inconsistent."). The expression "High GI diets" should be replaced by using the terms glycaemic index or glycaemic load, e g "Diets with a high glycaemic load".	These points have now been taken into consideration.

15. Fruit juice

Name	Organization	General comments to the chapter	Specific comments to the chapter	Comment from authors
Marton Gellert	AIJN - European Fruit Juice Association	AIJN – European Fruit Juice Association welcomes the opportunity to provide comments to the NNR2022 public consultation in relation to the background paper on fruit juices. 100% Fruit juice naturally contains the same vitamins, minerals, and bioactive compounds, e.g. polyphenols, in similar amounts as the constituent fruit (C Morand et al. (2011) Hesperidin contributes to the vascular protective effects of orange juice: a randomized crossover study in healthy volunteers. American Journal of Clinical Nutrition 93, 73-80). Internationally, fruit juices and nectars are defined in GENERAL STANDARD FOR FRUIT JUICES AND NECTARS (CODEX STAN 247-2005). There is currently no definition for vegetable juices, though a draft standard is being prepared. Fruit juice is defined in section 2.1.1 of this standard and in particular must have the following essential characteristics, " .....The juice is prepared by suitable processes, which maintain the essential physical, chemical, organoleptical and nutritional characteristics of the juices of the fruit from which it comes....." We emphasise that the standard requires that fruit juice must "maintain the essential	Page 3, Diet intake in Nordic and Baltic countries: There is no evidence or association of health issues or mortality linked to moderate fruit juice consumption, therefore there is no reason to recommend decreasing consumption, particularly since current intakes in many countries are less than 100ml daily per person (2018 | AIJN - European Fruit Juice Association). Recent evidence from Eurostat shows that only a third of people drink fruit juice on a regular basis: https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_fv5e/default/table?lang=en The table includes data on consumption levels in Lithuania too, which confirms that 65% of the population 'never or occasionally' consumes fruit juice, therefore there is no risk of overconsumption on a population level. Page 4, Health outcomes relevant for Nordic and Baltic countries, paragraph 2: Regular consumption of 100% fruit juice has a neutral impact on risk of type 2 diabetes as long as overall calories are not excessive. Two meta-analyses (super studies) found that 100% fruit juice was not associated with risk of developing type 2 diabetes. The studies can be found at: https://pubmed.ncbi.nlm.nih.gov/24682091/ https://pubmed.ncbi.nlm.nih.gov/33150530/ The EPIC-Norfolk Study (https://pubmed.ncbi.nlm.nih.gov/25944371/),	The definition of the term fruit juice according to the EU legislation is now clarified in the introduction. That fruit juice contains same, or similar amounts of nutrients, as whole fruits is stated both in the introduction, mechanisms, and discussion section. That fruit juice may have positive health effects, similar to whole fruit, is now stated more clearly in the text. The chapter summarises current available evidence regarding fruit juice and health outcomes. Recommendations are set by the NNR committee, taking many factors into consideration, such as the current intakes and possible negative or positive effects on the diet as a whole. The literature search was focused on systematic reviews (SR) and meta-analyses (MA) investigating possible health effects of fruit juice in general. Hence, original studies as well as SR and MA on specific types of fruit juices, such as orange juice or apple juice, were not included in the literature search. Neither was literature search focused on specific components in fruit juice, such as hesperidin. This limitation is commented upon in the discussion and is now further clarified. Regarding diabetes: The most recent and

		physical, chemical, organoleptical and nutritional characteristics of the juices of the fruit from which it comes." Therefore, it is not possible to reformulate fruit juice. Furthermore, on European level, Directive 2012/12/EU also requires that fruit juices are directly derived from the constituent fruit, with a similar composition to fruits they come from, including all elements naturally present in fruit. Components such as preservatives, sugars, sweeteners, colourants, cannot be added or removed. Fruit juices have a significant role to play in increasing the overall fruit and vegetable consumption which is still to date insufficient in European population. As per the latest Eurostat survey, 1 in 3 people (33%) in the EU reported not consuming any fruit or vegetables daily and only 12% of the population consumed the recommended 5 portions or more daily. Furthermore, in December 2021, the WHO European Office for the Prevention of Non-Communicable Diseases (NCDs) published a factsheet "Plant-based diets and their impact on health, sustainability and the environment A review of the evidence." This factsheet concludes that the benefits of plant-based diets provide strong evidence for public health guidelines recommending "healthful plant-base diets as a means to prevent and control NCDs." It also reviews the macro- and micronutrient intake in plant-based diets, the associated nutritional adequacy, and potential insufficiencies of such nutrients.	which tracked the beverage habits of 25,639 UK adults without diabetes, found that 100% fruit juice did not increase the risk of type 2 diabetes. Similar conclusions were reported by large observational studies from: - France (https://pubmed.ncbi.nlm.nih.gov/23364017/) - the Netherlands (https://pubmed.ncbi.nlm.nih.gov/31943054/) - 8 EU countries (https://pubmed.ncbi.nlm.nih.gov/23620057/) - Japan (https://pubmed.ncbi.nlm.nih.gov/22917499/) Furthermore, there is consistent evidence that regular consumption of fruit juice is associated with lower cardiovascular risk and significantly improved vascular function: Six systematic reviews and meta-analyses – of both clinical trials and epidemiological studies – showing that regular fruit juice consumption is associated with lower cardiovascular disease risk, particularly stroke risk (Zurbau 2020, J Am Heart Ass 9:e017728; D'Elia 2020, Eur J Nutr 60:2449-2467; Sahebkar 2017, Pharmacol Res 115:149-161; Wang 2021, Eur J Nutr 60:615-639; Liu 2019, PLoS ONE 8: e61420; Liu 2019, J Am Heart Assoc 8:e010977). In randomised controlled trials, daily orange juice consumption significantly lowered blood pressure and improved flow-mediated dilation (a marker of vascular function) in adults (Morand 2011, Am J Clin Nutr 93:73–80; Li 2020, J Nutr 150:2287-2294; Valls 2021, Eur J Nutr 60:1277-1288). Meta-analyses which report blood pressure lowering effects for fruit juice have stated	comprehensive meta-analysis by Halvorsen 2021 is presented in the chapter, with similar results presented by D'Elia. Regarding cardiovascular disease: The MAs by Zurbau 2020, D'Elia 2020 and Liu 2029 are presented in the chapter. The study by Liu PLoS ONE is from 2013 and should be covered by the more recent study by D'Elia 2020. The other suggested studies are on specific types of fruit juice, which is outside the scope of this chapter. Clarifications have been made in the text regarding studies on cardiovascular disease as well as cardiovascular risk factors. A study on uric acid is also included from the updated literature search. Possible mechanisms are described in the mechanisms section. Regarding body weight: The results from the MA by D'Elia 202 are presented in the chapter. The other suggested studies are on specific types of fruit juice, or are original studies, see previous comment on the literature search. It is clarified in the chapter that the pooled analysis based on three cohorts in the US is an older study from 2013. That the evidence regarding body weight is limited (especially regarding long-term effects) is now emphasized in the first paragraph in the discussion. Regarding dietary patterns and fruit juce: The suggested study, as well as two additional studies on this topic, is now

		For further independent scientific research on fruit juice consumption, please refer to the studies of the Fruit Juice Science Centre at https://fruitjuicesciencecentre.eu/en.	that this is probably due to the potassium content, as well as polyphenols (e.g. D'Elia 2020). Page 4, Health outcomes relevant for Nordic and Baltic countries, paragraph 5: According to three meta-analyses (super studies) of randomised controlled trials, a daily glass of 100% fruit juice has no clinical impact on body weight or weight gain in adults. The studies can be found at: D'Elia L et al. (2020) https://pubmed.ncbi.nlm.nih.gov/33150530/ Alhabeeb H et al. (2020) https://pubmed.ncbi.nlm.nih.gov/33350317/ Motallaei M et al. (2021) A clinical trial reported that a low-calorie diet helped obese adults to lose weight, whether or not they drank 500 ml of orange juice daily (Ribeiro C et al (2017) https://pubmed.ncbi.nlm.nih.gov/28526377/). European observational studies report no association, or a beneficial association, between fruit juice consumption and obesity risk (Buso MEC et al. (2022) Dose-Response and Substitution Analyzes of Sweet Beverage Consumption and Body Weight in Dutch Adults: The Lifelines Cohort Study - PubMed (nih.gov). Page 5, FBDG, paragraph 2: Observational studies show that diet quality is higher in children who regularly drink fruit juice versus non-fruit juice drinkers (https://doi.org/10.1186/s40795-020-00347-6).	included in the discussion and the text has been revised highlighting the relevance of taking food patterns into consideration.

Elisabet Rytter	Swedish Food Federation	We suggest that following information is added to the chapter: EU legislation Directive 2012/12/EU defines the term juice in the Nordic and Baltic countries (https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02012L0012-20120427&from=EN). The legislation requires, among other things, that o juice must be directly derived from the constituent fruit, with a similar composition to fruits they come from, including all elements naturally present in fruit. o Components such as preservatives, sugars, sweeteners, colourants, cannot be added or removed.		This has now been included in the introduction.