Results of the public consultation on the WHO draft guideline on carbohydrate intake

Comments were received from the following individuals and organizations

UN agencies	
David Eyayu Eboku	FAO, Italy
Nongovernmental and consumer organizations and associations	
Mei Yen Chan	NNEdPro Global Institute for Food, Nutrition and Health, UK
Veronika Haslinger	International Association for Cereal Science and Technology, Austria
Amy Hope	Cereals & Grains Association, US
Private sector (including industry/trade organizations and associations)	
Michela Bisonni*	ENSA - European Plant-Based Foods Association, Belgium
Themistoklis Choleridis	CEFS - Comité Européen des Fabricants de Sucre, Belgium
Allison Cooke	Corn Refiners Association, US
Nina Elzer	CEEREAL asbl, Belgium
Aintzane Esturo	International Fruit and Vegetable Juice Association IFU, France
Marton Gellert	AIJN - European Fruit Juice Association, Belgium
Karima A. Kendall	Calorie Control Council, US
Sara Lamonaca	FoodDrinkEurope, Belgium
Petr Mensik	EU Specialty Food Ingredients, Belgium
Andries Olie	Cosun Nutrition Center, Netherlands
Diane Welland	Juice Products Association, US
Academic/research	
David Jenkins	University of Toronto, Canada
John Miklavcic	Chapman University, US
Andrew Stronach	Quadram Institute, UK
Other	
Shana Harshan	Krishi Vigyan Kendra (government system hosted by NGO), India

* Comments submitted, but completed declaration of interest forms not received

UK, United Kingdom of Great Britain and Northern Ireland; US, United States of America

Summary comments and WHO responses

Comments were compiled and summarized (and/or paraphrased), and brief responses prepared. (Comments received without completed DOI forms were not included in this process).

Scope of the recommendations and guideline

Summary comment	Response
It is strongly suggested that the WHO guideline provides a quantitative recommendation for intake of whole grains. The level of scientific evidence related to whole grains was found to be comparable or even higher (for some health outcomes) to that of fruit and vegetables or dietary fibre. Moreover, the report also states that "Dose-response relationships were also observed between consumption of whole grains and most outcomes"	There were several reasons behind the decision of the NUGAG Subgroup on Diet and Health to not formulate quantitative recommendations for whole grain consumption. They concluded that providing quantitative recommendations for whole grains would likely be more challenging to implement than those for dietary fibre or vegetables and fruits, given that unlike vegetables and fruits, whole grains are often not consumed directly but as part of prepared foods such as bread or pasta, and unlike dietary fibre, whole grains are generally not included on nutrient declaration and labels on packaged foods. The NUGAG Subgroup on Diet and Health also did not want to be overly prescriptive in terms of how much whole grains, vegetables, fruits and pulses, to consume. Quantitative recommendations are provided for vegetables and fruit as an update to existing WHO recommendations. The recommended values for vegetables and fruits have been in place for nearly two decades and are widely used and referenced by relevant stakeholders. It was therefore considered important to review the evidence and update the existing quantitative recommendations for vegetable and fruit intake.
The WHO carbohydrate recommendations would be strengthened by consideration of the glycaemic index/load. Conversely, dismissal of the concept may weaken confidence in the thoroughness of the WHO assessment of the literature. The guideline states that "Although evidence for low glycaemic index and glycaemic load was reviewed, there was little consistency observed in benefit on mortality or noncommunicable disease incidence from observational studies". Several recent studies and reviews demonstrate an association between glycaemic index and/or glycaemic load and type 2 diabetes – including the WHO commissioned review from Reynolds et al.	In interpreting the results observed for lower glycaemic index and glycaemic load, the NUGAG Subgroup on Diet and Health noted that there was a lack of consistent benefit from diets with lower glycaemic index or glycaemic load in observational studies, and little to no improvement in cardiometabolic risk factors in RCTs associated with lower glycaemic index and glycaemic load. In addition, because the recommendations on carbohydrate intake were formulated in the context of other WHO guidance on healthy diets, a key consideration for the NUGAG Subgroup on Diet and Health is that glycaemic index and glycaemic load only provide information about how a food affects

(2019), cardiovascular disease, and coronary heart disease. With respect to cardiometabolic risk factors, although the guideline states that there was "little to no improvement in cardiometabolic risk factors observed in randomized controlled trials", however a recent meta-analysis of RCTS suggests a wide range of protective effects of low glycaemic index diets.	postprandial glucose levels; they do not take into consideration other potentially undesirable components of the food that may contribute to a reduction in diet quality. Because more robust, consistent evidence was available for the health benefits of foods containing dietary fibre and whole carbohydrate, the NUGAG Subgroup on Diet and Health concluded that providing guidance on dietary fibre and food sources of carbohydrate was the most effective means of addressing carbohydrate quality. Recommendations on glycaemic index and glycaemic load were therefore not made.
The guideline includes a remark that states that although a recommended amount of carbohydrate intake (as a percentage of energy intake) was out of scope for the guideline. However, a recommendation on a range of total carbohydrate intake compatible with a healthy diet should be included in the WHO report. Ample evidence supports a recommendation of total carbohydrate intake of 40–70% of total energy intake. The guideline itself references results from a 2018 systematic review suggesting that greatest health benefits in terms of reduced risk of mortality are observed at intakes of 40–70% of total energy intake.	As noted in the guideline, a quantitative value for carbohydrate intake was not included in the scope of the guideline because carbohydrate intake is determined largely by what remains after defining amounts of dietary fat and protein intake – both of which have quantitative levels of intake recommended by WHO. The remark in question has been revised to further clarify that carbohydrate intake should continue to be derived by subtraction based on fat and protein intakes.
The guidelines states that the majority of the evidence used to develop the recommendations on dietary fibre comes from studies in which dietary fibre was primarily consumed as that naturally-occurring in foods (i.e. not extracted fibre). It further states that there was limited evidence for a reduction in total cholesterol with use of extracted fibre and therefore, the recommendations specifically cover dietary fibre naturally-occurring in foods. However, here is no molecular / physiological difference between "naturally-occurring", "extracted" or "synthetic" fibre and there is substantial scientific evidence demonstrating the health benefits of extrinsic/extracted fibre, such as reductions in blood glucose, cholesterol levels, blood pressure and energy intake, as well as increases in mineral absorption and improved laxation. Several global regulatory authorities have recognised these effects of	A) Noting that other authoritative bodies define dietary fibre and consider associated health benefits in different ways, WHO performs its own independent assessment of the evidence and develops guidelines based on the WHO guideline development process. The authors of the Reynolds et al. 2019 systematic review state that: *The large body of literature that contributed to this article and other systematic reviews and meta-analyses relate principally to fibre-rich foods as most of the studies were undertaken before synthetic and extracted fibre were widely used.* The same systematic review identified randomized controlled trials assessing the effects of extracted fibre and found limited evidence for a beneficial effect on total cholesterol, but not on other cardiometabolic risk factors. Importantly, no evidence was identified linking extracted fibre to disease outcomes or mortality.

extracted or synthetic fibre to human health following rigorous scientific review. Excluding extracted or synthetic fibre from the recommendation for dietary fibre is therefore inconsistent with global regulatory authorities who consider health benefits of fibre in their definitions of fibre and/or their approvals of health claims for fibre (current definitions of dietary fibre include "naturally-occurring", "extracted" and "synthetic" fibres). Additionally, food labels refer to total fibre making no distinction between sources, and some front-of-pack labelling schemes also include extracted fibre, which would make it difficult for consumers to identify fibre naturally occurring in foods. While whole grains, vegetables, fruits and pulses are good sources of dietary fibre, as noted in the guideline, current intakes are generally below recommended intakes because of supply, access and availability, as well as individual behaviours and preferences. Dietary fibre-enriched products and supplements expand consumer choice while offering similar health benefits. We would therefore advise against distinguishing between naturally occurring fibre and extracted or synthetic fibre in the overall recommendation as it is unnecessary and unsubstantiated by science. An alternative would be to add the word "preferentially" to the recommendations (e.g. rephrase the recommendations as follows: *WHO recommends an intake of at least X grams of fibre per day, preferentially naturally-occurring dietary fibre as consumed in foods*	Because the evidence for dietary fibre was largely based on dietary fibre naturally occurring in foods, and there was limited evidence for health effects of extracted fibre, the NUGAG Subgroup on Diet and Health formulated the recommendations for dietary fibre naturally occurring in foods. The recommendations in the guideline do not preclude the consumption of extracted fibre or products containing extracted fibre, however, the dietary goal of at least 25 grams of fibre per day is for naturally occurring fibre in foods.
The guideline cites evidence suggesting that the naturally occurring structure of intact whole grains contributes to its observed health effects and therefore minimally processed whole grains are preferred. Minimally processed is undefined and ignores that processing of whole grains (e.g., cooking) is required to make them edible since grains cannot be eaten "raw" or "fresh". Dry and wet methods including milling, sprouting, malting, and fermenting are	Statements made in the remarks are not recommendations, rather they are intended to help interpret the recommendations. The text in the remarks indicates that minimally processed whole grains, vegetables, fruits and pulses are *preferred*, not recommended or required. The NUGAG Subgroup on Diet and Health acknowledged that whole grains, pulses and some vegetables and fruits need to be cooked or otherwise "processed" in order to be able to

processes necessary to make cereal grains safe, edible and palatable. Processing (e.g. milling) can also enhance the nutritional quality of foods by increasing the bioavailability and/or digestibility of nutrients. Such processing may change the characteristic of ingredients, such as digestibility, but does not impact the nutritive value of whole grains. Processing extends shelf-life, helps prevent food waste and some methods of processing (such as freezing or pasteurization) decrease the activity of bacteria and maintain quality. The small number of studies that are cited in the remark, focus on glycaemic response and is limited to a few types of whole grain-based products. The observed beneficial effects of whole grain in the overall body of evidence are based on actual intakes, i.e., all types of whole grain products (including fortified products), and show that, regardless of level of processing, whole grains are beneficial to health. Therefore, in the remarks related to whole grains, we strongly recommend removing references to processing and suggest against the use of the word 'fresh' (as, for example, whole grains and pulses can usually not be eaten 'fresh') to prevent some confusion among the recipients of the guidelines.	consume and extract nutrients from them. However, based on the evidence, they recognize that there is benefit in consuming minimally processed whole grains, vegetables, fruits and pulses, and made recommendations accordingly. To clarify that some foods need to be processed in order to be able to consume them, the text in the remarks has been modified as follows: *Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects (106-108), minimal~~ly processed~~ processing of whole grains beyond that necessary to ensure edibility ~~are~~ is preferred.* The small number of studies cited in the Remark (i.e. references 106-108) are further supported by the results of the systematic review by Reynolds et al. 2019, in which the authors state: *The large body of literature that contributed to this article and other systematic reviews and meta-analyses relate principally to fibre-rich foods as most of the studies were undertaken before synthetic and extracted fibre were widely used.* Regarding "fresh", the statement as shown below indicates fresh or otherwise minimally processed as it refers to not only whole grains, but also vegetables, fruits and pulses. The statement has also modified as the statement above: *Therefore, fresh foods or those otherwise minimally processed or modified beyond that necessary to ensure edibility, without added fat, sugars or salt are preferred.*
The role of dietary fibres on digestive wellness and microbiome-related outcomes was not considered. Therefore, as a result, the true fibre recommendations may in fact be inaccurate, potentially under-estimated. As an example, the European Food Safety Authority (EFSA) sets Adequate Intake for dietary fibre at adults at 25g per day, though benefit of fibre intakes greater than 25g per day is also. Also, the Scientific Advisory Committee on Nutrition in the UK set a recommendation of 30g per day in 2015.	Outcomes were carefully prioritized by the NUGAG Subgroup on Diet and Health, and evidence for almost all critical outcomes suggested benefit with dietary fibre intake. "Digestive wellness" in the context of bowel habits was considered and results for this outcome were consistent with robust evidence for benefit in terms of disease risk and mortality. Microbiome-related outcomes were not classified as high-priority outcomes as work in this field is still evolving. Regarding values from other authoritative bodies, WHO performs its own independent assessment of the evidence and develops

	guidelines based on the WHO guideline development process. In addition, the recommendation is not to consume 25 g per day, but to consume at least 25g per day. This together with the remark explaining that higher intakes may also provide additional benefit as noted below, allow for higher fibre intakes from food where feasible.
We would advise that fibre is explicitly mentioned in this recommendation as follows: WHO recommends that carbohydrate intake should come primarily from fibre-containing grains, whole grains, vegetables, fruits and pulses (strong recommendation).	Although whole grains, vegetables, fruits and pulses can be good sources of dietary fibre, the evidence reviewed for whole grains, vegetables, fruits and pulses was not limited to or based on their fibre content. And as noted in the remarks, these foods contain many other nutrients and molecules that may contribute to the observed health benefits. It is therefore not appropriate based on the evidence to limit the recommendation to only fibre containing whole grains, vegetables, fruits and pulses.
The recommendations for fruits and vegetables (and also other foods) include amount but not variety of different fruits and vegetables. However, there is a vast amount of research showing that eating a variety of fruits and vegetables is associated with decreased risk of chronic diseases as well as a more diverse gut microbiota. We believe it is important to highlight the need for variety alongside amount of intake.	Currently, the guideline contains a remark stating: *The recommendations included in this guideline cover all types of whole grains, vegetables, fruits and pulses, with caveats related to processing and preparation as noted in the following remarks.* The intention of this remark was to indicate that a variety of such foods should be consumed. To make this more explicit, the following text has been added: *A variety of such foods should be consumed where possible.*
A) WHO is requested to reconsider their recommendation that juice should be consumed sparingly. Fruit juice is a healthful beverage that delivers significant vitamins and minerals to the diets of children and adults and improves overall diet quality. B) And, while the reference to the WHO recommendations on free sugars intake is acknowledged, as reported in the GRADE subgroup analysis in the draft guideline, an inverse correlation between all-cause mortality, stroke, and coronary heart disease with fruit juices was reported in the systematic review used to develop the recommendations, which means that fruit juices protect against these	A) The text on fruit juice and other sources of concentrated sugars is not a WHO recommendation, but a remark which is intended to provide additional context and information so that the recommendations can be understood and acted upon by end-users of the guideline. In addition, neither the recommendations in this guideline, nor the existing recommendations on free sugars intake prohibit the consumption of fruit juice. Noted that the use of the word sparingly is vague, and therefore have revised the corresponding text to read: “Specific evidence for dried fruits and fruit juices in the systematic reviews is very limited and results inconsistent,

diseases. Therefore, the analysis on which WHO bases its recommendation does not support its own recommendation. C) Consumption of fruit juice does not displace fibre and can help promote fibre intake. D) Also, fruit juices are not a "concentrated source of sugars" as mentioned in the draft guideline. The Directive 2012/12/EU of the European Parliament relating to fruit juices intended for human consumption, is aligned with the international Codex Standard for fruit juices and nectars (Codex Stan 247-2005) and has a clear definition of juices, the prohibition to add sugar to fruit juices, and indicates that fruit juices must have the same Brix as the fruits used in their production. Hence, the sugar content of fruit juice is the same as for fruit.	however both are concentrated sources of sugars, as are fruit concentrates and fruit sugars (i.e. sugars and syrups obtained from whole fruits), and should therefore be consumed ~~sparingly and~~ in accordance with WHO recommendations on free sugars intake." B) The finding in the subgroup analysis of the systematic review, does not negate earlier findings for fruit juice in terms of risk of dental caries and unhealthy weight gain, including in children, for which the systematic review in question provides no data. Evidence in the subgroup analysis was very limited with only two studies contributing to each of the outcomes in the subgroup analysis. Based on the available evidence, the NUGAG Subgroup on Diet and Health concluded that whole fruits and vegetables are the healthiest choice. C) Juicing a fruit or vegetable removes most if not all of the dietary fibre, regardless of how much fibre the fruit or vegetable contains. Although some fruits have limited amounts of dietary fibre, most make an important contribution to overall dietary fibre intake. D) Juicing a fruit concentrates the available sugars on a weight basis. The amount that sugars are concentrated varies based on fruit. Therefore it is accurate to describe juice as a source of concentrated sugars. Noting however that sugar concentration of juice may be adjusted, the text has been modified as follows: "Specific evidence for dried fruits and fruit juices in the systematic reviews is very limited and results inconsistent, however both are ~~concentrated~~ <u>can be</u> significant sources of sugars, as ~~are~~ <u>can be</u> fruit concentrates and fruit sugars (i.e. sugars and syrups obtained from whole fruits), and all should therefore be consumed ~~sparingly and~~ in accordance with WHO recommendations on free sugars intake.
The guideline does not address the health effects of refined starches. Refined carbohydrates have been linked to overweight, obesity and some NCDs in recent systematic reviews.	The guideline contains recommendations on preferred sources of carbohydrates, i.e. whole grains, vegetables, fruits and pulses. By providing recommendations on what should be consumed in terms of carbohydrates, what shouldn't be consumed or consumed to a lesser extent is addressed indirectly.

Because all fermentable carbohydrates are cariogenic, a discussion of the role of carbohydrate intake on risk of dental caries should be included. It has been shown that starchy foods, particularly those with higher glycaemic index can increase risk of dental caries. The authors of the systematic review commissioned by WHO (Halvorsrud et al. 2019) state that "rapidly digestible starches intake may significantly increase caries risk". And although assessed as low certainty evidence by GRADE, because WHO recommendations have been made for sugars even based on very low evidence for example, low evidence should be sufficient to support discussing carbohydrate restrictions in the diet based on the risk of dental caries.	As noted in the guideline, the evidence for effects of carbohydrate intake on oral health (in the form of the commissioned systematic review) was reviewed by the NUGAG Subgroup on Diet and Health. Because the NUGAG Subgroup on Diet and Health concluded that there is not currently a robust way to directly and consistently measure the digestibility of starch, the best approach in addressing carbohydrate quality was to identify good food sources of carbohydrates. The systematic review on oral health identified three studies in total that directly assessed caries risk in humans in response to what the authors classified as rapidly digested starches, two of which were cohort studies considered to represent the best evidence (10 other mechanistic studies were also identified). These two studies could not be meta-analysed (none of the studies could in fact be meta-analysed due to not suitable for pooling due to heterogeneity in design, outcomes, dietary exposure, and demographic characteristics) and did not use the same exposure: one used "processed starches" (potato chips, etc.) and the other a sugars to starch ratio (only low-sugar/high-starch diets containing baked goods were associated with caries risk). Therefore neither were considered adequate representations of rapidly digested starches. As such, the limited evidence from these small number of studies was considered insufficient on its own as a base for recommendations, but was not inconsistent with the data used in formulating the five recommendations in the guideline.
Recommendations on potato intake would be welcomed. The potato is a nutrient-rich food and contain important vitamins, minerals, and antioxidants.	Potatoes are considered a vegetable from the perspective of the guideline. As noted elsewhere, however, a variety of vegetables and fruits should be consumed where possible.
A discussion of whole cereal grains are missing; specifically, studies to measure the value of including raw whole grains and processed whole grains in healthy diets.	The evidence reviewed was for all whole grains and recommendations made accordingly.

Recommendations/discussion on diets in order to prevent diseases in those countries where grain/legume storage can be problematic unless partially processed are missing.	Specific preparation and storage methods for pulses is beyond the scope of the guideline.
The current set of recommendations also did not provide any guidance on the types of sugars (e.g. fructose, sucrose) and their effects on human health outcomes.	Guidance on sugars intake is provided in the WHO guideline on sugars intake.
In relation to Recommendation 1, what about legumes? In some cultures, it is common to eat the other parts of the legume plant in addition to the pulses and it seems a little restrictive to use "pulses" instead of legumes.	The non-seed parts of legumes (e.g. leaves, shoots, roots) would be considered vegetables.

Evidence/methods

Summary comment	Response
The GRADE evidence profiles contain figures for both relative and absolute effect sizes for the various health outcomes. It would be helpful to include a brief comment on the population(s) to which they refer, and/or the method used to calculate these estimates.	The absolute effects are based on the baseline risk of each outcome in the studies contributing to that outcome. Methodological details of the systematic review can be found in the original publication.
The studies underpinning the guideline have focused on diets for people with existing health issues and the value of the quality of carbohydrates in their diet. Similar studies in normal populations are not supported as well.	The majority of data used in the development of this guideline comes from prospective cohort studies in which participants were generally free from illness at baseline, so as to allow assessment of the exposure's impact on risk of developing disease or dying.

Research gaps and future initiatives

Summary comment	Response
In terms of "Research gaps and future initiatives" food manufacturers also face challenges with regards to improving the provision of foods containing higher amounts of dietary fibre. We would suggest that future research/initiatives ought to include opportunities for the food industry to increase naturally occurring dietary fibre within processed foods.	The research gaps and future initiatives section of the guideline is not intended to include information on reformulation strategies.

General comments

Summary comment	Response
The draft guideline acknowledges that dietary fibre is "defined in various ways" but does not provide an analytical definition of fibre to which they refer. It would be helpful to provide an explicit definition of dietary fibre used as the basis for these recommendations, such as, for example, that provided by Codex Alimentarius.	The definition of dietary fibre used in the guideline is "naturally-occurring dietary fibre as consumed in foods" as noted in the recommendations.
The rationale for dietary fibre being 'naturally-occurring' is based on preservation of grain tissue and cell structures. This is not the same as 'minimally processed', as many foods within the NOVA definition of 'minimally processed' do not retain such structures. A more precise definition could be included, as suggested below: *"Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects, minimally processed whole grains (particularly those that preserve plant cell and/or tissue intactness) are preferred."*	The use of "naturally-occurring" and "minimally processed" are intended to provide end-users with a guide on how to interpret and implement the recommendations, without reference to external methods of categorizing levels of food processing.
One remark notes: "However, an increased risk for all-cause mortality and cardiovascular diseases was observed for tinned fruits in a small number of studies, presumably because of the free sugars added to the syrups in which many tinned fruits are packaged." There is no evidence presented in the relevant systematic review that free sugars added to the syrups of tinned fruits are the cause off an observed risk for all-cause mortality and cardiovascular diseases and therefore the presumption should not be made.	This is noted. However, the evidence reviewed for the development of this guideline suggests increased risk for all-cause mortality and cardiovascular diseases with consumption of tinned fruits in a small number of studies. Therefore the text has been revised as indicated: "However an increased risk for all-cause mortality and cardiovascular diseases was observed for tinned fruits in a small number of studies~~, presumably because of the free sugars added to the syrups in which many tinned fruits are packaged~~.
The recommended foods as preferred sources of carbohydrates does not reflect what is actually consumed in terms of carbohydrates in many settings, where often a majority of consumed carbohydrates are of "low quality".	The recommended food sources of carbohydrates (i.e. whole grains, vegetables, fruits and pulses) are designed to address consumption of "lower quality" carbohydrates which occurs in many settings. The recommendation is designed to therefore convey what should be done, not what is the current state in terms of carbohydrate consumption.

While data from studies examining glycaemic index is being considered, there is very limited information in the drafted guidelines on how cooking and preparation (e.g. frying, soaking, heating, fermenting) of different carbohydrates could subsequently affect their absorption and digestion.	A systematic assessment of how cooking methods might impact the absorption and digestion of different carbohydrates was beyond the scope of the guideline.
It would be useful to provide examples of foods that contain naturally occurring dietary fibre. It would be useful to provide examples of pulses.	The recommendations are to be translated into culturally and contextually specific food-based dietary guidelines that take into account locally available food and dietary customs. Because diets and foods can vary greatly across different populations, specific examples of foods are not included.
The guideline contains the following text: "A high level of free sugars intake, for example, can lead to spikes in blood glucose and insulin, and contributes to the overall energy density of diets." This should be removed or rephrased as it is a misconception that free sugars have on average greater influence on the rise of blood glucose levels than other digestible carbohydrates.	Noted. This text has been removed from the guideline.
The term "quality of carbohydrates" is noted as being characterized by proportion of sugars, nature of polysaccharides, and amount of dietary fibre. This is inaccurate. Carbohydrates in itself cannot be classified or divided with regard to quality. A more accurate description would be "type, amount and source of carbohydrates".	"Quality" with respect to carbohydrates can be interpreted in different ways in different contexts. When discussing carbohydrates as part of the diet, it is wholly appropriate to equate quality with the proportion of sugars, nature of polysaccharides, and amount of dietary fibre. To clarify that this is how quality is being used, the following revisions have been made in the Executive summary/Background: *Among other dietary factors, the "quality" of carbohydrates ~~(e.g. proportion of sugars, nature of polysaccharides, and amount of dietary fibre)~~ in the diet (e.g. proportion of sugars, nature of polysaccharides, and amount of dietary fibre) have been extensively*…..; and in the Introduction/Background of the main text: *The concept of carbohydrate "quality" refers to the nature and composition of carbohydrates in a food or in the diet, including proportion of sugars….*

Annex. Original comments as received during the call for comments

Comments are listed in the order in which they were received **[to be added]**

Call for comment: draft WHO guideline on carbohydrate intake

Survey response 1

General information

Family/last name
Harshan

Given/first name
Shana

Organization/affiliation
Krishi Vigyan Kendra

Sector
Other

Country
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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments
After going through the given recommendations I would like to give my comments here in below. 1. It would have been informative if the whole grains,fruits,vegetables and pulses are to be graded according to the carbohydrate quality. 2. Under the category ‘whole grain’ as a source for high quality carbohydrate, possibility of germinated whole grains can also be considered. 3. The possibilities of Millets-‘The Nutri cereals’ can be considered especially in the guidelines for children.

Upload comments

Survey response 2

General information

Family/last name
Miklavcic

Given/first name
John

Organization/affiliation
Chapman University

Sector
Academic/research

Country
United States of America

Comments on the draft guideline

Summary of evidence

Evidence to recommendations
Since the main update to the carbohydrate guidelines is centered around fiber, it is appropriate that fruits are not differentiated from vegatables.

Recommendations and supporting information
In the summary: -Should operational definitions for pulses be provided? Many people do not have a good grasp of this term. -Good that 'natural' was defined, I would also consider listing 'intrinsic' as a synonym. Some places (US) call include fiber that is added to food as "dietary fiber" on Nutrition Facts Panels on the food, if it has a demonstrated health benefit. -Suggest rewording "This guideline provides guidance..."

Other comments

Upload comments

Survey response 4

General information

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Choleridis

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Themistoklis

Organization/affiliation
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Sector
Other

Country
Belgium

Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

Upload comments
[{ "title":"CEFS' comments on draft WHO guideline for carbohydrate intake","comment":"","size":"734.537109375","name":"CEFS%20comments%20-%20WHO%20pc%20on%20carbs%20intake.pdf","filename":"fu_y489ks9x8mraixd","ext":"pdf" }]

Brussels Monday, 24 October 2022

CEFS' COMMENTS ON THE DRAFT WHO GUIDELINE ON CARBOHYDRATE INTAKE

General comments

The World Health Organization (WHO) is updating their guidelines on carbohydrate intake in children and adults with the objective "to provide guidance on carbohydrate intake including dietary fibre and healthy food sources of carbohydrates to be used by policymakers, program managers, health professionals and other stakeholders to promote healthy diets". "One of the original aims of updating the guidance on carbohydrate intake was to provide guidance on carbohydrate quality."

Against this background it is surprising that in the draft document open for consultation, WHO did not rate the role of allover (refined) starches at all, but only focuses on whole grains, fruits and vegetables, fibre as well as pulses and a little addressed the physiological rule the glycemic index/load.

Particularly, since all fermentable carbohydrates are cariogenic a section discussing the effects of carbohydrates on dental caries is missing. Although discussed briefly, it is nowadays more and more clear that the glycemic index also plays a role in oral health, which should be discussed by WHO. In line with that it is known that certain types of carbohydrates sources (e.g. rice, potatoes or some kinds of breads) have a high glycemic index, which should also be discussed in the guidelines.

In detail

On page 14, WHO describes that the original aim to update the guidelines on carbohydrate intake is to provide guidance on carbohydrate quality. However, WHO changed its approach and instead of assessing the different categories of carbohydrates separately, it was decided that dietary fibre and food sources of carbohydrates with proven benefit in terms of important health outcomes were the most effective means of addressing carbohydrate quality. As a result, WHO guidelines on carbohydrates singled out specific food group as carbohydrates source, namely whole grain products fruits and vegetables, pulses and discussed the rule of dietary fibre.

However, this selection of certain food groups does not reflect the general dietary patterns and carbohydrate intakes. For example, in the US around 50 % of total energy intake comes from carbohydrates but not even 10 % of total energy intake comes from "high-quality carbohydrates"

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(such as whole grains, fruits or legumes) whereas more than 40 % of total energy intake come from "low-quality carbohydrates" (such as refined grains, potatoes or starchy vegetables) (Shan et al. 2019, JAMA). These findings show that the WHO does not rate the role of the main part of carbohydrate intake in the populations in its current guideline on carbohydrate intake. Against this background, the guideline at its current stage is not appropriate to rate overall carbohydrate intake.

Furthermore, several publications indicate that carbohydrate intake, especially refined grains, is associated with coronary heart disease, stroke and type 2 diabetes (results from meta-analysis) and therefore refined grains should be consumed less (Mozaffarian 2016, Circulation). In line with that, a recent systematic review and dose-response meta-analysis of prospective cohort studies showed a positive association of refined grains intake with overweight and obesity (Schlesinger et al. 2019, Adv Nutr). Therefore, it is not comprehensible why WHO does not discuss refined grains as an essential part of total carbohydrate intake in their guidelines.

Additionally, the WHO's comments on the glycemic index/load are incomplete. Although WHO discussed the effects a low glycemic index/load diet compared to a high glycemic index/load diet, WHO did not discuss that some carbohydrates have a high glycemic index/load. For example, starchy food groups, including breads, potatoes or potato products and cereal grains, like rice are rather high glycemic index foods than low glycemic index foods (Atkinson et al. 2021, Am J Clin Nutr). Furthermore, WHO states on page 13 that free sugars induce "spikes" in blood glucose level, which is an assumption (also marked duet to a missing reference) and not the current state of sciences, which clearly indicates that other carbohydrates sources induce stronger spikes (Brand-Miller et al. 2009, Am J Clin Nutr). Therefore, WHO should delete this assumption and discuss the role of glycemic index/load in more detail, including the differences in glycemic index/load of carbohydrate-containing food groups. If not possible, WHO should highlight the limitations of their research regarding glycemic index/load of carbohydrates.

It is well known that all fermentable carbohydrates (not only sugars) are cariogenic (Touger-Decker and van Loveren 2003, Am J Clin Nutr). Moreover, it was recently shown that starchy foods, in particular those with a higher glycemic index, may play a role in increasing the risk of dental caries. Higher glycemic index starchy foods produced greater acute plaque pH decreases compared to lower glycemic index starchy foods (Atkinson et al. 2021, Nutrients).

In the current state, the WHO guideline on carbohydrates do not discuss the topic of carbohydrates (and glycemic index/load) and dental caries, although this association as well as the biological mechanism are well-known. The systematic review 3 (reference 36) by Halvorsud et al. 2019, which was commissioned by WHO and used as one of seven systematic reviews for the scientific evaluation of the current WHO guidelines described a biological plausible mechanism, how carbohydrates increase the risk of dental caries: "Oral bacteria do not metabolize starch per

se, but it is plausible for starch to be cariogenic if hydrolysed to sugars intraorally by amylase. The experimental data indicated that RDS (which are -by definition- processed starches) can lower pH and cause demineralization if retained in the mouth long enough for hydrolysis to occur (i.e., >45 min). This suggests that for RDS, oral retentiveness (e.g., food sticking to or trapped between teeth) is important in determining the cariogenic potential." (Halvorsrud et al. 2019, J Dent Res). Furthermore, the authors state that "RDS intake may significantly increase caries risk" and that "This systematic review shows evidence that RDS intake, but not total starch intake is associated with increased risk of caries." Although the quality of evidence of this outcome was rated as "low" (Halvorsrud et al. 2019, J Dent Res), WHO used even lower ratings for recommendations, like the WHO recommendations for "Sugars intake for adults and children", in which even a "very low" evidence was sufficient to recommend a free sugars intake below 5 % of total energy intake (conditional recommendation) (Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015). Low evidence should therefore be sufficient to be considered to discuss carbohydrate restrictions in the diet based on the risk of dental caries.

Taken together, these results highlight that dental caries should be discussed in the current guidelines of WHO on carbohydrate intake and since Halvorsud and colleagues also used the GRADE system to rate the quality of evidence, an adaption of the results should not be difficult.

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Survey response 5

General information

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UN organization

Country
Uganda

Comments on the draft guideline

Summary of evidence

Evidence to recommendations
In the interest of brevity certain text appears more than once n the document. This could be placed once and abbreviated and referenced in other sections. Example: the statement the following statement appears three times"certainty in the evidence, desirable and undesirable effects of the intervention, priority of the problem that the intervention would address, values and preferences related to the effects of the intervention in different settings, the cost of the options available to public health officials and programme managers in different settings, feasibility and acceptability of implementing the intervention in different settings, and the potential impact on equity and human rights." Accuracy: The statement “less than 20-30% of individuals in many LMICs do not meet WHO recommendations for vegetable and fruit consumption (29, 30)” repeated three times in the document is not accurate. The correct statement should be “less than 20-30% of individuals in many LMICs meet WHO recommendations for vegetable and fruit consumption (29, 30).” Delete the phrase “do not” because the statement intends to indicate negative outcome as reported in the papers quoted. The alternative statement could be ""“more than 70-80% of individuals in many LMICs DO NOT meet WHO recommendations for vegetable and fruit consumption (29, 30).”

Recommendations and supporting information
The statements on antinutrients (bullet three on pages 12 and 48) could be edited. Move the phrase, 'although many have also been shown to have heath benefit unrelated to their impact on nutrient absorption' from second statement to the first statement and remove the phrase, 'Although these compounds have been shown to inhibit absorption of other nutrients,' from the third statement. Edit the word 'sometime' to 'sometimes' and the word heath to health in both cases. the final text could be Plant-based foods including whole grains, vegetables, fruits and pulses, contain a variety of compounds, some of which have been shown to inhibit absorption of certain nutrients, most notably minerals such as iron, zinc and calcium, although many have also been shown to have heath benefit unrelated to their impact on nutrient absorption. These ‘antinutrients’ as they are sometimes called include lectins, oxalates, phytates, goitrogens, phytoestrogens, tannins, saponins, and glucosinolates. The extent to which these compounds actually inhibit absorption varies from person to person and is generally only observed at very high intakes and in those with existing nutritional deficiencies; ...

Other comments

Upload comments

Survey response 6

General information

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United States of America

Comments on the draft guideline

Summary of evidence
JPA would like the WHO to reconsider their recommendation that juice should be consumed sparingly. Below JPA has provided scientific data and rationale to support the fact that in appropriate amounts, fruit juice provides benefits that contribute to general good health among worldwide populations.

Evidence to recommendations

•Fruit juice is a healthful beverage that delivers significant vitamins and minerals to the diets of children and adults.
One hundred percent fruit juice supplies valuable vitamins, minerals and other beneficial plant nutrients, such as polyphenols, in the diets of children and adults. Many of these nutrients, like potassium and vitamin C are nutrients of need in populations.

oSource of Potassium:
Juice is a top contributor to dietary intakes of potassium (a nutrient of concern across all populations), providing 8% of total potassium intake (higher than whole fruit) for children 2 to 18 years old and 5% in adults1,2,3 while supplying less than 3% of total calories in the diet of Americans.

In fact, among children aged 2 to 18 years old, 100% fruit juice is the second major contributor of potassium (8%), respectively, second only to milk (19%) in the US. Whole fruit ranks fourth (5%) for this nutrient.4

oImportant for Vitamin C intake
One hundred percent fruit juice is the number one source of vitamin C (35%) among children 2-18 years of age (including fortified juices).5 Recent population-based research found dramatic declines in vitamin C intakes in all age levels. These declines are largely driven by decreases in 100% juice consumption coupled with modest increases in whole fruit consumption. This could have significant health implications given the importance of vitamin C to immunity, skin health and collagen formation, this could have significant health implications.6

The U.S. Scientific Report of the 2015 Dietary Guidelines Advisory committee specifically notes that for U.S. population ages 2 years and older, vitamin C is under-consumed relative to the Estimated Average Requirement.7

Furthermore, vitamin C specifically was identified by the National Academies of Medicine (NAM) as a nutrient with evidence of inadequate intake among low-income pregnant, breastfeeding or postpartum women 19 to 50 years of age. Vitamin C can also help with the absorption of iron, which was also highlighted in the NAM Committee's phase I report.8

oFortified juices help increase calcium and vitamin D
Along with potassium and vitamin C, vitamin D and calcium are also nutrients of concern for the majority of the US population. The levels of vitamin D3 and calcium added to 100% juices and juice drinks are similar to those found in milk. Milk has 300 mg calcium in 8 fluid ounces, while 100 percent juice can have up to 330 mg of calcium.9 These fortified juices are particularly important for consumers who do not consume milk or dairy products with vitamin D and calcium and are at higher risk for inadequacy levels.

Fortified 100% juices are top contributors of vitamin D (ranked #8 – from fortified juices) and calcium (ranked #9 – from fortified juices).10

oImportant for folate, magnesium, thiamin, riboflavin and niacin intake
Overall, among children under 2 years of age, 100% fruit juice is a major contributor of potassium, vitamin C, folate, magnesium, thiamin, riboflavin and niacin.11

oSource of bioactives
Fruit juice contributes to significant polyphenol intake in the US and around the globe, thereby helping to bridge the gap in intake of these important bioactive components, which include carotenoids, flavonoids, polyphenols and others.12-18

Many of the polyphenols found in fruits are in the skin and seeds, which individuals often discard when eating the whole fruit. Because the juicing process often includes the skin and seeds, naturally occurring polyphenols are transferred in part and retained in 100% juice. Thus, consuming 100% fruit juice may in fact provide a higher concentration of these health-promoting plant nutrients than whole fruit.19

Diets rich in plant compounds like polyphenols have been associated with several health benefits including risk of several chronic and degenerative diseases such as cardiovascular disease, diabetes and age-related macular degeneration as well as having broad beneficial effects on health such on neurocognitive function and exercise performance (See Table 1).20,21,22

Table 1. The roles fruits and vegetables may have in prevention of chronic and degenerative diseases adapted from Li et al. 2019.
Chronic Disease|Strength of Evidence|Study Type|Source
Cardiovascular disease|Convincing|Meta-analysis|Zhan et al. 2017
Coronary heart disease|Convincing|Meta-analysis|Gan et al. 2015
Hypertension|Convincing|Meta-analysis|Wu et al. 2016
Stroke|Convincing|Meta-analysis|Hu et al. 2014
Asthma|Possible|Meta-analysis|Seyedrezazadeh et al. 2014
Obesity|Possible|Meta-analysis|Schwingshackl et al. 2015
Type II diabetes|Convincing|Meta-analysis|Wu et al. 2015
|Critical Review|Boeing et al. 2012
Chronic obstructive pulmonary disease|Possible|Prospective Cohort|Kaluza et al. 2017

Cognitive impairment|Convincing|Meta-analysis|Jiang et al. 2017
Osteoporosis|Possible|Prospective Cohort|McTiernan et al. 2009
||Longitudinal Cohort|Tucker et al. 1999
Eye disease|Possible|Cross-sectional study|Moeller et al. 2004
||Case Control|Seddon et al. 1994
Arthritis|Possible|Prospective Cohort|Cerhan et al. 2003

•|Drinking 100% fruit juice can help improve diet quality compared to those who do not drink 100% juice.
There are several ways drinking 100% juice can improve the diet of both adults and children.

o|Helps increase fruit and vegetable intake
Several studies show that 100% fruit juice drinkers have higher consumption levels of whole fruit than non-fruit juice drinkers, and this association, which has been shown to occur across all age groups, is relative to intake.23,24,25 Based on these results, 100% fruit juice is complementary and not competitive with whole fruit intake and may actually encourage the intake of whole fruit in the diet. Similar patterns -- 100% fruit juice drinkers tend to consume more fruit and vegetables and have a more nutrient-dense dietary pattern than non-consumers – has also been found in research done in Europe.26

o|Helps Improve Diet Quality
Including 100% juice in the meal pattern of children not only helps increase fruit consumption and adds variety to the diet, but may also help with diet quality. Research examining 2007-2010 National Health and Nutrition Examination Survey (NHANES) data published in the 2015 International Journal of Child Health and Nutrition shows that 100% fruit juice consumption in children 2 to 18 years of age was associated with higher micronutrient intake and improved nutrient adequacy compared to non-juice drinkers. In fact, the children who drank 100% juice had better quality diets and higher Healthy Eating Index (HEI) scores than their non-juice counterparts. They also had lower intakes of added sugars and were more likely to meet Estimated Average Requirements for vitamins C, magnesium and Adequate Intakes for potassium.27 While 100% fruit juice contributes significant nutrients to the diet, on average it supplies only about 100-120 calories per day among 2 to 18-year olds.28 This is about the same amount of calories in a 1 cup fruit equivalent.

Furthermore, these positive dietary habits track through time. Research published in 2020 by Lynn Moore tracked diet quality, fruit intake and HEI scores related to juice intake over a ten-year period from preschool to adolescence. She found that kids who drank juice tracked higher for diet quality, HEI scores and total fruit intake than non-juice drinkers.29 Thus, children who drink 100% juice along with fruit will likely have long term benefits, leading to a more positive dietary pattern than their non-juice drinking counterparts.

Adults who consume 100% fruit juice also had better diet quality compared to non-juice drinkers. Research shows adult juice drinkers had lower body mass index, lower body weight, a 22% lower risk for being overweight or obese and a 27% lower risk of metabolic syndrome compared to non-consumers.30

o|Does not displace fiber and can help promote fiber intake
A modeling study published in Current Nutrition & Food Science in 2015, showed that if replacing 100% fruit juice with whole fruit in the diet, there was a significant drop in vitamin C (-8%), while only a slight decrease (only 6 grams or 24 calories) in total sugar. Moreover, fiber increased by only 1 gram/d.31 This may be due to the fact that fruit is not a major source of fiber in the diet.

Of the top three fruits eaten in the world – bananas, tomatoes and watermelons – only one is also consumed in juice form and none are considered high fiber foods.32 In fact, compared to other foods such as whole grains, beans and legumes, fruit has a low fiber content on a per serving basis.33

•|100% juice is particularly important for helping low-income populations increase fruit and vegetable intake
For people on limited food budgets, 100% fruit juice can offer an affordable and nutrient-dense option that can help them meet recommended dietary goals. Drinking 100% juice is an easy way for both adults and children to enjoy the benefits of fruit from a variety of sources year-round and nationwide. This is especially true for families receiving food assistance, as they are more likely to identify access, affordability and higher levels of waste as barriers to fresh fruit and vegetable consumption.34

A study done by Drewnowski at the University of Washington, Seattle, found fruit juice helped improve total fruit consumption and did not displace whole fruit in the diet.35 Study results also showed that whole fruit consumption among adults was tied to education and incomes. Those least likely to consume whole fruit were adults with low-incomes and non-Hispanic blacks. Those groups made up the fruit shortfall with 100% juice.36

The combination of fruit and juice is cost neutral while meeting fruit shortfalls with whole fruit alone increased cost. The fruit and juice model was nutritionally similar or better with the exception of fiber to the whole fruit model. Thus, the combination of 100% juice and fruit is an optimum way to meet fruit shortfalls.37

•|Drinking 100% juice does not increase risk of chronic illness and may even protect against certain conditions
Two recent European review papers looking at 100% juice found juice to have protective affects for cardiovascular health at

intakes of up to 200 ml/day, and significant improvements in vascular function, blood pressure and inflammation at higher intakes.38,39 This reinforces a 2018 study by Auerbach systematically reviewed the current evidence associated with 100% fruit juice consumption and various chronic health conditions in children and adults. The study, which evaluated systematic reviews and meta-analyses, concluded that no adverse health effects were found to be associated with 100% juice consumption and diabetes, cardiovascular disease, glucose homeostasis, lipid levels, liver enzymes or blood pressure. 40,41 The study also found no significant associations between juice and weight gain in children or adults.42

Recommendations and supporting information
JPA supports making dietary choices that include a variety of foods that contribute to a healthy overall diet, and in this context, 100% fruit juice, when consumed in appropriate amounts and in balance with other food groups and individual physical activity, is a healthy, nutrient dense beverage, providing valuable nutrients essential for growth and good health. It is also convenient, affordable and widely available and as such can be an important and valuable part of a healthful diet. Scientific References 1.Nicklas T., O'Neil, C., and Fulgoni, V. (2015). Consumption of 100% fruit juice is associated with better nutrient intake and diet quality but not with weight status in children: NHANES 2007-2010. International J of Child Health and Nutrition, 4, 112-121. doi: 10.6000/1929-4247.2015.04.02.7 2.Fox MK., Reidy K., Novak P. and Ziegler P. Sources of energy and nutrients in the diets of infants and toddlers. 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Other comments

The Juice Products Association (JPA) appreciates the opportunity to submit our response to the World Health Organization (WHO) on the WHO Carbohydrate Consultation during the public consultation period. JPA is a trade association whose international membership consists of major processors, growers, packers, brokers and distributors of a wide variety of 100% fruit and vegetable juices, juice beverages, drinks, and other fruit products.

Upload comments

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Juice Products
ASSOCIATION

November 4, 2022

To the World Health Organization:

The Juice Products Association (JPA) appreciates the opportunity to submit our response to the World Health Organization (WHO) on the WHO Carbohydrate Consultation during the public consultation period. JPA is a trade association whose international membership consists of major processors, growers, packers, brokers and distributors of a wide variety of 100% fruit and vegetable juices, juice beverages, drinks, and other fruit products.

JPA would like the WHO to reconsider their recommendation that juice should be consumed sparingly. Below JPA has provided scientific data and rationale to support the fact that in appropriate amounts, fruit juice provides benefits that contribute to general good health among worldwide populations.

- ***Fruit juice is a healthful beverage that delivers significant vitamins and minerals to the diets of children and adults.***
  One hundred percent fruit juice supplies valuable vitamins, minerals and other beneficial plant nutrients, such as polyphenols, in the diets of children and adults. Many of these nutrients, like potassium and vitamin C are nutrients of need in populations.

  - *Source of Potassium:*
    - Juice is a top contributor to dietary intakes of potassium (a nutrient of concern across all populations), providing 8% of total potassium intake (higher than whole fruit) for children 2 to 18 years old and 5% in adults[1,2,3] while supplying less than 3% of total calories in the diet of Americans.

    - In fact, among children aged 2 to 18 years old, 100% fruit juice is the second major contributor of potassium (8%), respectively, second only to milk (19%) in the US. Whole fruit ranks fourth (5%) for this nutrient.[4]

  - *Important for Vitamin C intake*
    - One hundred percent fruit juice is the number one source of vitamin C (35%) among children 2-18 years of age (including fortified juices).[5] Recent population-based research found dramatic declines in vitamin C intakes in all age levels. These declines are largely driven by decreases in 100% juice consumption coupled with modest increases in whole fruit consumption. This could have significant health implications given the importance of vitamin C to immunity, skin health and collagen formation, this could have significant health implications.[6]

- The U.S. Scientific Report of the 2015 Dietary Guidelines Advisory committee specifically notes that for U.S. population ages 2 years and older, vitamin C is under-consumed relative to the Estimated Average Requirement.[7]

- Furthermore, vitamin C specifically was identified by the National Academies of Medicine (NAM) as a nutrient with evidence of inadequate intake among low-income pregnant, breastfeeding or postpartum women 19 to 50 years of age. Vitamin C can also help with the absorption of iron, which was also highlighted in the NAM Committee's phase I report.[8]

    - *Fortified juices help increase calcium and vitamin D*
        - Along with potassium and vitamin C, vitamin D and calcium are also nutrients of concern for the majority of the US population. The levels of vitamin D_3 and calcium added to 100% juices and juice drinks are similar to those found in milk. Milk has 300 mg calcium in 8 fluid ounces, while 100 percent juice can have up to 330 mg of calcium.[9] These fortified juices are particularly important for consumers who do not consume milk or dairy products with vitamin D and calcium and are at higher risk for inadequacy levels.

        - Fortified 100% juices are top contributors of vitamin D (ranked #8 – from fortified juices) and calcium (ranked #9 – from fortified juices).[10]

    - *Important for folate, magnesium, thiamin, riboflavin and niacin intake*
      Overall, among children under 2 years of age, 100% fruit juice is a major contributor of potassium, vitamin C, folate, magnesium, thiamin, riboflavin and niacin.[11]

- *Source of bioactives*
    - Fruit juice contributes to significant polyphenol intake in the US and around the globe, thereby helping to bridge the gap in intake of these important bioactive components, which include carotenoids, flavonoids, polyphenols and others.[12-18]

    - Many of the polyphenols found in fruits are in the skin and seeds, which individuals often discard when eating the whole fruit. Because the juicing process often includes the skin and seeds, naturally occurring polyphenols are transferred in part and retained in 100% juice. Thus, consuming 100% fruit juice may in fact provide a higher concentration of these health-promoting plant nutrients than whole fruit.[19]

Diets rich in plant compounds like polyphenols have been associated with several health benefits including risk of several chronic and degenerative diseases such as cardiovascular disease, diabetes and age-related macular degeneration as well as having broad beneficial effects on health such on neurocognitive function and exercise performance (See Table 1).[20,21,22]

Table 1. The roles fruits and vegetables may have in prevention of chronic and degenerative diseases adapted from Li et al. 2019.

Chronic Disease	Strength of Evidence	Study Type	Source
Cardiovascular disease	Convincing	Meta-analysis	Zhan et al. 2017
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Type II diabetes	Convincing	Meta-analysis	Wu et al. 2015
		Critical Review	Boeing et al. 2012
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Cognitive impairment	Convincing	Meta-analysis	Jiang et al. 2017
Osteoporosis	Possible	Prospective Cohort	McTiernan et al. 2009
		Longitudinal Cohort	Tucker et al. 1999
Eye disease	Possible	Cross-sectional study	Moeller et al. 2004
		Case Control	Seddon et al. 1994
Arthritis	Possible	Prospective Cohort	Cerhan et al. 2003

- ***Drinking 100% fruit juice can help improve diet quality compared to those who do not drink 100% juice.***
  There are several ways drinking 100% juice can improve the diet of both adults and children.

  - *Helps increase fruit and vegetable intake*

Several studies show that 100% fruit juice drinkers have *higher* consumption levels of whole fruit than non-fruit juice drinkers, and this association, which has been shown to occur across all age groups, is relative to intake.[23,24,25] Based on these results, 100% fruit juice is complementary and not competitive with whole fruit intake and may actually encourage the intake of whole fruit in the diet. Similar patterns -- 100% fruit juice drinkers tend to consume more fruit and vegetables and have a more nutrient-dense dietary pattern than non-consumers – has also been found in research done in Europe.[26]

- *Helps Improve Diet Quality*

  Including 100% juice in the meal pattern of children not only helps increase fruit consumption and adds variety to the diet, but may also help with diet quality. Research examining 2007-2010 National Health and Nutrition Examination Survey (NHANES) data published in the 2015 *International Journal of Child Health and Nutritio*n shows that 100% fruit juice consumption in children 2 to 18 years of age was associated with higher micronutrient intake and improved nutrient adequacy compared to non-juice drinkers. In fact, the children who drank 100% juice had better quality diets and higher Healthy Eating Index (HEI) scores than their non-juice counterparts. They also had lower intakes of added sugars and were more likely to meet Estimated Average Requirements for vitamins C, magnesium and Adequate Intakes for potassium.[27] While 100% fruit juice contributes significant nutrients to the diet, on average it supplies only about 100-120 calories per day among 2 to 18-year olds.[28] This is about the same amount of calories in a 1 cup fruit equivalent.

  Furthermore, these positive dietary habits track through time. Research published in 2020 by Lynn Moore tracked diet quality, fruit intake and HEI scores related to juice intake over a ten-year period from preschool to adolescence. She found that kids who drank juice tracked higher for diet quality, HEI scores and total fruit intake than non-juice drinkers.[29] Thus, children who drink 100% juice along with fruit will likely have long term benefits, leading to a more positive dietary pattern than their non-juice drinking counterparts.

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- *Does not displace fiber and can help promote fiber intake*

A modeling study published in *Current Nutrition & Food Science* in 2015, showed that if replacing 100% fruit juice with whole fruit in the diet, there was a significant drop in vitamin C (-8%), while only a slight decrease (only 6 grams or 24 calories) in total sugar. Moreover, fiber increased by only 1 gram/d.[31] This may be due to the fact that fruit is not a major source of fiber in the diet.

Of the top three fruits eaten in the world – bananas, tomatoes and watermelons – only one is also consumed in juice form and none are considered high fiber foods.[32] In fact, compared to other foods such as whole grains, beans and legumes, fruit has a low fiber content on a per serving basis.[33]

- ***100% juice is particularly important for helping low-income populations increase fruit and vegetable intake***

  For people on limited food budgets, 100% fruit juice can offer an affordable and nutrient-dense option that can help them meet recommended dietary goals. Drinking 100% juice is an easy way for both adults and children to enjoy the benefits of fruit from a variety of sources year-round and nationwide. This is especially true for families receiving food assistance, as they are more likely to identify access, affordability and higher levels of waste as barriers to fresh fruit and vegetable consumption.[34]

  A study done by Drewnowski at the University of Washington, Seattle, found fruit juice helped improve total fruit consumption and did not displace whole fruit in the diet.[35] Study results also showed that whole fruit consumption among adults was tied to education and incomes. Those least likely to consume whole fruit were adults with low-incomes and non-Hispanic blacks. Those groups made up the fruit shortfall with 100% juice.[36]

  The combination of fruit and juice is cost neutral while meeting fruit shortfalls with whole fruit alone increased cost. The fruit and juice model was nutritionally similar or better with the exception of fiber to the whole fruit model. Thus, the combination of 100% juice and fruit is an optimum way to meet fruit shortfalls.[37]

- ***Drinking 100% juice does not increase risk of chronic illness and may even protect against certain conditions***

  Two recent European review papers looking at 100% juice found juice to have protective affects for cardiovascular health at intakes of up to 200 ml/day, and significant improvements in vascular function, blood pressure and inflammation at higher intakes.[38,39] This reinforces a 2018 study by Auerbach systematically reviewed the current evidence associated with 100% fruit juice

consumption and various chronic health conditions in children and adults. The study, which evaluated systematic reviews and meta-analyses, concluded that **no adverse health effects were found to be associated with 100% juice consumption** and diabetes, cardiovascular disease, glucose homeostasis, lipid levels, liver enzymes or blood pressure. [40,41] The study also found no significant associations between juice and weight gain in children or adults.[42]

JPA supports making dietary choices that include a variety of foods that contribute to a healthy overall diet, and in this context, 100% fruit juice, when consumed in appropriate amounts and in balance with other food groups and individual physical activity, is a healthy, nutrient dense beverage, providing valuable nutrients essential for growth and good health. It is also convenient, affordable and widely available and as such can be an important and valuable part of a healthful diet.

JPA appreciates the World Health Organization's consideration of these comments.

Sincerely,

Diane Welland

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Scientific References

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# # #

Survey response 7

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Comments on the draft guideline

Summary of evidence
Please see our comments submitted as pdf

Evidence to recommendations
Please see our comments submitted as pdf

Recommendations and supporting information
Please see our comments submitted as pdf

Other comments
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[{ "title":"CEEREAL comment to WHO consultation on draft guidelines on carbohydrate intake","comment":"This submission is on behalf of CEEREAL asbl, the European Breakfast Cereal Association, representing the breakfast cereal and oat milling industry","size":"233.5703125","name":"20221027%20CEEREAL%20input%20to%20WHO%20carbs%20consultation_FINAL.pdf","filename":"fu_8fahhcrwdc8nj7y","ext":"pdf" }]

CEEREAL Comments to the online public consultation on the WHO draft guidelines on carbohydrate intake for adults and children

27 October 2022

CEEREAL represents the European breakfast cereal and oat milling industry and consists of 10 member companies and 9 national associations from 8 countries. We bring together international brands as well as family-owned businesses of all sizes. Our members provide consumers with enjoyable, safe, nutritious, affordable, and sustainable breakfast cereals, which are valued by all people.

CEEREAL welcomes the public consultation on the WHO draft guidelines and recommendations on carbohydrate intake. As breakfast cereals are predominantly grain-based, an important source of carbohydrates, as well as key vehicle for whole grain and fibre intakes, we have strong insights and expertise on this topic and would like to share the following comments:

(1) On the recommendations for dietary fibre

- While the authors reviewed evidence related to effects on body weight and risk of cardiovascular disease, type 2 diabetes, and cancer, they did not consider the role of dietary fibres on digestive wellness and microbiome-related outcomes. Therefore, as a result, the true fibre recommendations may in fact be inaccurate, potentially under-estimated. To emphasize this point we refer to The European Food Safety Authority's (EFSA) Scientific Opinion on Dietary Reference Values for carbohydrates and dietary fibre[1] which has also set an Adequate Intake for dietary fibre for adults at 25g per day. This is based on normal laxation in adults; however, benefit of diets rich in fibre containing foods at dietary fibre intakes greater than 25g per day is recognized. We'd also draw attention to the higher adult fibre recommendation of 30g per day advised by the Scientific Advisory Committee on Nutrition in 2015 in the UK[2].
- Excluding extracted or synthetic fibre from the recommendation for dietary fibre is inconsistent with global regulatory authorities (including FDA and EFSA) who consider health benefits of fibre in their definitions of fibre and/or their approvals of health claims for fibre. Also, food labels refer to total fibre, making no distinction between sources. We would therefore advise against distinguishing between naturally occurring fibre and extracted or synthetic fibre in the overall recommendation.
- In addition, several global regulatory authorities have recognised the beneficial physiological effects of extracted or synthetic fibre to human health following rigorous scientific review. For example, EFSA has recognized a cause-and-effect health relationship between beta glucans and

[1] EFSA (2010) Scientific Opinion on Dietary Reference Values for carbohydrates and dietary fibre. EFSA Journal 8, 1462.
[2] SACN (2015) Carbohydrates and Health. London: Scientific Advisory Committee on Nutrition

lowering both cholesterol and post-prandial glycemic response[3] or wheat bran fibre and reduction of intestinal transit time[4]."

(2) On the recommendations for whole grains

- We would like to strongly suggest that the WHO guidelines provide a quantitative recommendation for intake of whole grains. Indeed, the level of scientific evidence related to whole grains was found to be comparable or even higher (for some health outcomes) to that of fruit and vegetables or dietary fiber (WHO draft guidelines, Annex 7). Moreover, the report also states that "Dose-response relationships were also observed between consumption of whole grains and most outcomes" (WHO draft guidelines, page 26).
- Such a quantitative guidance would help establish concrete consumer messaging, as well as potential product level information and guidance for manufacturers of food products, since whole grains have been recognised as critical components of healthy, sustainable, and more resilient diets[5].
- Excluding quantitative recommendations for whole grains would appear to be not proportionate to the overall body of existing scientific evidence as demonstrated in the commissioned systematic review from Reynolds et al., 2019 (table 2 and figure 2)[6].
- In addition, in the paragraphs related to whole grains, we would like to strongly recommend removing references on processing for the following reasons:
    - Processing grains (e.g., cooking) is required to make them edible since grains cannot be eaten raw. Besides contributing to food safety, processing was shown to enhance the bioavailability of some nutrients as well as the digestibility and accessibility of phenolic compounds[7].
    - The observed beneficial effects of whole grain are based on actual intakes, i.e., all types of whole grain products.
    - The cited literature focuses on glycemic response and is limited to a few types of whole grain-based products.
    - There is evidence that reducing intake of 'processed' whole grain-based products can lead to reduced nutritional intakes including fibres[8].

[3] EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA); Scientific Opinion on the substantiation of health claims related to beta-glucans from oats and barley and maintenance of normal blood LDL-cholesterol concentrations (ID 1236, 1299), increase in satiety leading to a reduction in energy intake (ID 851, 852), reduction of post-prandial glycaemic responses (ID 821, 824), and "digestive function" (ID 850) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. *EFSA Journal* 2011; 9(6):2207. [21 pp.]. doi:10.2903/j.efsa.2011.2207.

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- Increasing the variety of whole grain-based products would help in the promotion of whole grain consumption. Specifically highlighting the need to limit choice to 'minimally processed' whole grains may lead to the unintended consequences of individuals not choosing more nutritious options.

- For above-mentioned reasons, we would like to suggest the following changes:
  - on pages 11 and 47, in the paragraph starting with "Whole grains contain the naturally-occurring components of the kernel", we would like to suggest deleting "~~some processed~~" and start the sentence with "Foods are labelled whole grain as long as these three components of the grain are included".
  - We would also like to suggest deleting the rest of the sentence: ~~"regardless of the extent to which the grains have been processed, and highly processed products labelled as whole grain are becoming increasingly available (e.g., products containing flour from milled whole grains with added fat, sugar, or salt). Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects (106-108), minimally processed whole grains are preferred.~~"

(3) On the role of food processing and formulation of foods

- We support the rationale behind the information provided by WHO with regards to limiting the addition of sugars, sodium, or fat in food products, as such additions can lead to intakes exceeding recommended levels.
- We welcome the acknowledgment that processing and the transformation of foods can lead to increased availability and shelf life and can lower the effect of some compounds on nutrient absorption.
- Grain-based foods make important contributions to fibre intake, and foods like high-fibre ready-to-eat cereals can provide up to 40% of daily intake in a single serving.
- Increasing fibre intake by the equivalent of one portion of fibre-containing breakfast cereals per day could lead to significant economic benefits and reduction in diet-related morbidity[9,10,11,12].
- As a result, we suggest simplifying the following paragraphs and remove the mention of 'processing' or 'fresh' (as, for example, whole grains and pulses can usually not be eaten 'fresh') to prevent some confusion among the recipients of the guidelines

  - "The method of preparation and ~~level of processing~~ food formulation should be considered when consuming whole grains, vegetables, fruits and pulses, and should be compatible with other WHO macronutrient recommendations as indicated in the following bullet. For example, frying and addition of sauces or condiments can significantly increase~~s~~ the amount of fat, sugars or salt. Therefore, ~~fresh~~ foods ~~or those otherwise minimally processed or modified~~ without added fat, sugars or salt are preferred"

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- However, it is also important to consider the accessibility of fibre sources: in reality 3.1 billion people worldwide struggle to afford these foods[13]. Grain-based foods make important contributions to fibre intake, and foods like high-fibre ready-to-eat cereals can provide a convenient and affordable way to boost fibre intake.

- ~~o~~ Whole grains contain the naturally occurring components of the kernel (i.e., bran, germ, and endosperm). ~~Some processed~~ Foods are labelled whole grain as long as these three components of the grain are included, ~~regardless of the extent to which the grains have been processed, and highly processed products labelled as whole grain are becoming increasingly available (e.g., products containing flour from milled whole grains with added fat, sugar or salt). Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects (106-108), minimally processed whole grains are preferred.~~

For the latter paragraph specific to whole grains, we strongly recommend removing references on processing for the following reasons:

- The observed beneficial effects of whole grain are based on actual intakes, i.e., all types of whole grain products.
- The cited literature focuses on glycemic response and is limited to a few types of whole grain-based products.
- There is evidence that reducing intake of 'processed' whole grain-based products can lead to reduced nutritional intakes including fibers[14].
- Increasing the variety of whole grain-based products would help in the promotion of whole grain consumption. Specifically highlighting the need to limit choice to 'minimally processed' whole grains may lead to individuals not choosing more nutritious options.

(4) On the carbohydrate sources

We would advise that fibre is explicitly mentioned in this recommendation as per below:

- WHO recommends that carbohydrate intake should come primarily from fibre-containing grains, whole grains, vegetables, fruits and pulses *(strong recommendation)*
- This is in line with the evidence presented "*The certainty in the available evidence for an association between intake of dietary fibre and outcomes in adults was considered to be moderate overall.*"

For further information, please contact the CEEREAL Secretariat:
Nina Elzer, Senior Manager Public Affairs & Communications, elzer@ceereal.eu

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https://doi.org/10.4060/cc0639en

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Survey response 8

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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

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RESPONSE TO WHO

Authors: David J A Jenkins and Walter C Willett

We believe the summary of the WHO advice is balanced and unremarkable. The focus on fiber and whole grains is as expected and has been standard advice given internationally. However, their dismissal of the glycemic index/load as irrelevant to health is unexpected in view of the current literature.

GI/GL and lack of evidence for a role in chronic disease

"Although evidence for low glycemic index and glycemic load was reviewed, there was little consistency observed in benefit on mortality or noncommunicable disease incidence from observational studies (very low to moderate certainty evidence)."

This statement suggests that the evidence was inconsistent. Do the authors mean that there were many studies equally placed on either side of the no effect unity line? If this statement covers diabetes incidence, it is clearly not correct. The early studies by Willett and Salmerón in 1997 (1, 2) nicely demonstrated the independent and additive effects of high glycemic load and low cereal fiber in increasing the risk of type 2 diabetes in men and very clearly in women. Subsequent meta analyses have confirmed these conclusions, e.g. by Livesey et al, in 2019 (3), Dwivedi et al, 2022 (4), and even Reynolds et al, 2019 (5), on whom the WHO advice is based, showed a significant association between GI and diabetes in their supplement that was not mentioned in the manuscript. Failure to deal with these significant *"low certainty"* associations reduces the credibility of WHO recommendations.

Similarly, early studies by Liu and Willett in 2000 (6) demonstrated in women that along with BMI, GL was associated with CHD, with the greater the BMI the more marked the GL association with CHD. These findings have been supported by further Cohort studies, e.g. the EPIC cohort in which 338,325 participants demonstrated an association between GL and CHD especially in those with BMI > 25kg/m^2(HR 1.22, 95% CI: 1.07,1.40) (Sieri et al, 2020) (7). These associations appear to have international relevance since a study using the international PURE cohort also demonstrated significant associations with GI and CVD outcomes including CVD and all cause morality. When the PURE cohort data were added to the Reynolds meta-analysis, the result was an association of GI and CVD death with a risk ratio of 1.26 (1.12-1.41) (Jenkins et al, 2021) (8). In 2022, two other prospective cohort studies, the Shanghai men's and women's health studies combined (59,770 men and 74,735 women) found that higher GI and GL was associated with an increased risk of CVD mortality in Chinese adults (Zhao et al, 2022) (9) with adverse effects of GI for total mortality, CVD and cancer seen most clearly in women as reported in earlier studies. Additionally, in 2022, the Dwivedi meta-analysis demonstrated associations especially for glycemic load and CHD.

Furthermore, a comprehensive review of meta-analyses by Miller et al, 2022 (10) implicated glycemic load and index as nutritional characteristics strongly linked to CHD, CVD and diabetes. Drawing strong comparative conclusions from the WHO commissioned report in the

Lancet is also problematic as the number of incident cases for fiber was ~80,000 and ~90,000 for whole wheat, while for GI/GL the figure was only ~7,000. Assessing the confidence in the data on a comparative basis in this situation is problematic.

No benefit of low GI/GL on CVD risk factors

"and little to no improvement in cardio metabolic risk factors observed and randomized controlled trials (very low to high certainty evidence)."

This statement is a little strong in view of the broad associations found in a meta-analysis of clinical trials undertaken by Chiavaroli and colleagues (2021) (11) that demonstrated a wide range of protective effects of low glycemic index diets.

Finally, randomized trials (STOP NIDDM (12) and ACE (13)) of a glycosylase inhibitor (acarbose), that pharmacologically reduces the rate of amylolytic digestion of starch effectively creating a low glycemic index/load diet, show a reduction in risk of type 2 diabetes. This finding adds powerful evidence for the benefit of reducing the GI of diet, independent of fiber, micronutrients and other variables that are difficult to control in observational studies of diet.

We believe that the promotion of increased consumption of fiber and whole grains makes for excellent advice for the public. However, this message would be strengthened by consideration of the glycemic index/load. On the other hand, active dismissal of the concept may weaken confidence in the thoroughness of the WHO assessment of the literature

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Survey response 9

General information

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Organization/affiliation
FoodDrinkEurope

Sector
Private sector

Country
Belgium

Comments on the draft guideline

Summary of evidence

Evidence to recommendations

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October 2022

FoodDrinkEurope comments on draft WHO guideline on carbohydrate intake

FoodDrinkEurope appreciates the opportunity to provide comments to the WHO online public consultation on the draft WHO Guideline on carbohydrate intake. FoodDrinkEurope would like to highlight the following elements of the draft guideline.

Level of processing

The draft WHO guideline states that the *"method of preparation and level of processing should be considered when consuming whole grains, vegetables, fruits and pulses."* FoodDrinkEurope acknowledges the rationale provided by WHO with regards to the need to consider the method of preparation. On the other hand, there is no correlation between nutrition and the level of processing. The level of processing a food undergoes does not reflect the nutritional value of that product. Indeed, many foods are processed to make them safe, edible, and palatable. Food processing can also enhance the nutritional quality of foods by adding essential nutrients, like vitamins and minerals, or by increasing the bioavailability of nutrients. Food processing extends shelf-life and helps prevent food waste. Some methods of food processing (such as freezing or pasteurisation) decrease the activity of bacteria and maintain quality.

To achieve a healthy diet, the overall nutritional value of the products consumed, the frequency and amount of consumption, should be considered– not the level of processing. All foods can be enjoyed as part of a balanced diet and healthy lifestyle.

Therefore, we would suggest simplifying the following paragraphs and remove the mention of 'processing' or 'fresh' (whole grains and pulses can usually not be eaten 'fresh' as the body would not be able to digest them) to prevent confusion among the recipients of the guideline.

- On page 11, in the first bullet point starting with *"The method of preparation and level of processing should be considered,"* we would suggest removing the reference to *"level of processing"* and replace it with *"nutritional composition."*
- On page 11, in the first bullet point, in the sentence *"for example, frying and addition of sauces..."*, we would suggest the insertion of "*can*" before *"significantly increases the amount of fat, sugars or salt."*
- On page 11, in the first bullet point, the sentence *"Therefore, fresh foods or those other minimally processed or modified without added fat, sugars or salt are preferred."* Here we would suggest removing the reference to *"fresh"* and deleting the part *"or those otherwise minimally processed or modified."*

Whole grains

Concerning whole grains, we suggest making the intake recommendations stronger. The level of evidence is similar to fruit and vegetables and shown in the report. The 2019 Global Burden of Disease study reported diets low in whole grains were the second leading diet-related cause of death behind high sodium [1]. Quantitative guidance would help establishing concrete consumer messaging as well as potential product level information and guidance for manufacturers.

[1] Christopher J L Murray, Aleksandr Aravkin, Peng Zheng, (ordered authors) and Michael Brauer, Ashkan Afshin, and Stephen S Lim, Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic

Moreover, we would suggest simplifying the following paragraphs:

- On page 11, in the second bullet point, the sentence starting with "*Some processed foods are labelled whole grain as long as these three components are include* (…)" Here we would suggest removing "some processed" and just refer to "foods." We would also suggest deleting the part *"regardless of the extent to which the grains have been processed, and highly processed products labelled as whole grain are becoming increasingly available (e.g. products containing flour from milled whole grains with added fat, sugar or salt). Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects (106-108), minimally processed whole grains are preferred."*

For the latter paragraph specific on whole grains, we strongly recommend removing references to processing for the following reasons:

- The observed beneficial effects of whole grain are based on actual intakes, i.e., all types of whole grain products.
- The cited literature focuses on glycaemic response and is limited to a few types of whole grain-based products.
- There is evidence that reducing intake of 'processed' whole grain-based products can lead to reduced nutritional intakes including fibres [2].
- Increasing the variety of whole grain-based products would help in the promotion of whole grain consumption. Specifically highlighting the need to limit choice to 'minimally processed' whole grains may lead to individuals not choosing more nutritious options.
- Processing of whole grains is what makes them palatable and more digestible.

Fibre

Regarding recommendation 4 (adults recommended intake of at least 25 grams of naturally-occurring fibre as consumed in foods), we would like to point out that the definition of fibre and the recommendations should be in line with the CODEX definition of fibre [3] and not exclude *a priori* fibres manufactured by fermentation, which are recognised as dietary fibre for nutrition labelling purposes in some jurisdictions (e.g., the United States) [4] due to their demonstrated physiological effects in humans. The term "synthetic" fibre is not specifically defined, but it is included in the reference to "dietary fibre" in the draft guideline.

In this context, FoodDrinkEurope would suggest the WHO to reconsider the recommendation to consume only fibre naturally occurring as consumed in foods. Within the recent reviews considered by WHO, it is not possible to extrapolate whether the fibre intake from foods consumed comes exclusively from fibres inherently/naturally present. Processed foods are an important contributor to a healthy and balanced diet for people all around the world. Therefore, we believe that ruling out sources of fibre (other than naturally occurring) is not effective.

analysis for the Global Burden of Disease Study 2019, The Lancet, Volume 396, Issue 10258, p.1223-1249, 2020, DOI:https://doi.org/10.1016/S0140-6736(20)30752-2.

[2] 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. https://doi.org/10.1007/s00394-021-02701-1

[3] CODEX Definition of fibre can be found in the CODEX Guidelines on Nutrition Labelling (CXG 2-1985) § 2.

[4] Food Labeling: Revision of the Nutrition and Supplement Facts Labels. Federal Register website. https://www.regulations.gov/document?D=FDA-2012-N-1210-0875 . Accessed 19 October 2022.

In addition, it is not possible to separate the benefits provided by fibre in epidemiological studies since surveys are not designed to perceive these differences. Finally, the authors in Reynolds et. al (2019) [5] state that: *"The large body of literature that contributed to this Article and other systematic reviews and meta-analyses relate principally to fibre-rich foods as most of the studies were undertaken before synthetic and extracted fibre were widely used."* Considering that among the 185 studies chosen, the oldest is from 2008 and the others are from after 2013, it is quite unlikely that processed foods with added fibre are not among the products consumed, since these are technologies that have existed for well over the 14 years period considered in the scientific review.

Fruit juices

As regards fruit juices, FoodDrinkEurope would like WHO to reconsider the recommendation that fruit juices should be consumed sparingly. We acknowledge the reference to the WHO recommendations on free sugars intake.

However, we would like to highlight that in some jurisdictions sugars present in fruit juices are solely naturally occurring sugars. For instance, in the EU, Directive 2012/12/EU amending Council Directive 2001/112/EC relating to fruit juices and certain similar products intended for human consumption forbids to add any sugars or sweeteners to 100% fruit juices. This also creates a clear distinction with fruit syrups, which cannot be added to fruit juices either, and with dried fruits. The latter are not used for fruit juice production. Thus, the description of fruit juices as a "concentrated source of sugar" is not accurate.

Moreover, in the GRADE subgroup analysis in the draft guideline (cf. pages 61 and 62), there is an inverse correlation between all-cause mortality, stroke, and coronary heart disease, which means that fruit juices are associated with a lower risk of these diseases. Therefore, the analysis on which WHO bases its recommendation does not support its own conclusion.

Missing points in the draft guideline

FoodDrinkEurope believes that the following points have not been addressed in the draft guideline:

- The recommendations for fruits and vegetables (and also other foods) include amount but not variety of different fruits and vegetables. However, there is a vast amount of research showing that eating a variety of fruits and vegetables is associated with decreased risk of chronic diseases [6, 7] as well as a more diverse gut microbiota [8]. We believe it is important to highlight the need for variety alongside amount of intake.
- In the recommendation on dietary fibre, solely the naturally occurring dietary fibre is recommended and not the extracted or synthetic fibres. However, these extracted or

[5] R Reynolds, A., Mann, J., Cummings, J., Winter, N., Mete, E., & Te Morenga, L. (2019). Carbohydrate quality and human health: a series of systematic reviews and meta-analyses. Lancet (London, England), 393(10170), 434–445. https://doi.org/10.1016/S0140-6736(18)31809-9

[6] Shilpa N Bhupathiraju, Katherine L Tucker, Greater variety in fruit and vegetable intake is associated with lower inflammation in Puerto Rican adults, The American Journal of Clinical Nutrition, Volume 93, Issue 1, January 2011, Pages 37–46, https://doi.org/10.3945/ajcn.2010.29913

[7] Conrad, Z., Raatz, S. & Jahns, L. Greater vegetable variety and amount are associated with lower prevalence of coronary heart disease: National Health and Nutrition Examination Survey, 1999–2014. Nutr J 17, 67 (2018). https://doi.org/10.1186/s12937-018-0376-

[8] McDonald, D., Hyde, E., Debelius, J.E. et al. (2018) American Gut: an open platform for citizen science microbiome research. mSystems, 3(3), e00031-18. https://doi.org/10.1128/mSystems.00031-18

synthetic fibres can also bring health benefits in general [9] or for the gut microbiota in particular [10] .

- In these recommendations preferably “minimally processed” foods are advocated, while e.g. vegetables in processed forms such as frozen vegetables or vegetables in soups, could also play an important role in health and consumer liking. In addition, there is also research showing that some ingredients from vegetables (such as the carotenoids) are better absorbed from processed foods than raw foods [11].

We trust that our comments will be duly considered in the revision of the draft guideline. We thank you for your kind consideration and remain at your disposal for any additional information or clarifications you may need.

***

[9] Armet, A. M., Deehan, E. C., Thöne, J. V., Hewko, S. J., & Walter, J. (2020). The Effect of Isolated and Synthetic Dietary Fibers on Markers of Metabolic Diseases in Human Intervention Studies: A Systematic Review. Advances in nutrition (Bethesda, Md.), 11(2), 420–438. https://doi.org/10.1093/advances/nmz074

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[11] van Het Hof, K. H., West, C. E., Weststrate, J. A., & Hautvast, J. G. (2000). Dietary factors that affect the bioavailability of carotenoids. The Journal of nutrition, 130(3), 503–506. https://doi.org/10.1093/jn/130.3.503.

Survey response 10

General information

Family/last name
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Organization/affiliation
Corn Refiners Association

Sector
Private sector

Country
United States of America

Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

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Corn Refiners Association (CRA) Comments on World Health Organization (WHO) Draft Guidelines on Carbohydrate Intake for Adults and Children

The Corn Refiners Association (CRA) is the national trade association representing the corn refining industry of the United States. CRA and its predecessors have served this important segment of American agribusiness since 1913. Corn refiners produce sweeteners, dietary fiber, starch, corn oil, feed products, ethanol, and bioproducts from corn components such as starch, oil, protein, and fiber. CRA is pleased to provide the following comments on the World Health Organization's (WHO) Draft Guideline on Carbohydrate Intake for Adults and Children.[1]

As a general comment, CRA acknowledges the burden of non-communicable diseases (NCDs) and applauds WHO's efforts to explore the role of carbohydrate quality as a potential modulator of NCD and obesity risk. As dietary fiber has been classified as a "nutrient of concern" by numerous scientific and regulatory agencies worldwide due to inadequate intake, we appreciate the inclusion of recommended levels of dietary fiber intake in the draft guidelines. However, as it is estimated that more than 90 percent of women and 97 percent of men in the United States do not meet recommended intakes for dietary fiber,[2] CRA believes that the distinction between "naturally-occurring" (i.e., intrinsic) and "isolated or synthetic" (i.e., extrinsic) dietary fibers in the draft recommendations is unnecessary and unsubstantiated by science. While we acknowledge fruits and vegetables, nuts and beans, and whole grains are good sources of dietary fiber, dietary fiber-enriched products expand consumer choice while offering similar health benefits. For example, a recent modeling study in the United Kingdom reported significant increases in dietary fiber intake and reductions in cardiovascular disease and type 2 diabetes risk following a dietary fiber fortification.[3] Through enrichment, manufacturers have been able to respond to the call for increased dietary fiber intake, which provides consumers with increased and good-tasting options. As WHO continues to develop and finalize additional guidance on various nutrition and health-related topics, CRA strongly urges the inclusion of dietary fiber-enriched products as a viable tool to assist in efforts to meet dietary recommendations.

The Health Benefits of Extrinsic Fibers Are Well-Established

Recommendation 1 of the draft guidelines notes that "carbohydrate intake should come primarily from whole grains, vegetables, fruits and pulses" (strong recommendation), while recommendations 4 and 5 restrict intake goals to "naturally-occurring dietary fiber".[1] Remarks in the guidelines cite "limited evidence for a reduction in total cholesterol with use of extracted or synthetic fiber", and the guidelines suggest "further research on disease outcomes associated with extracted or synthetic fiber is needed before conclusions on potential health benefits can be drawn".[1] However, there is substantial human clinical evidence demonstrating the health benefits of extrinsic dietary fibers, such as reductions in blood glucose, cholesterol levels, blood pressure and energy intake, as well as increases in mineral absorption and improved laxation.[4] In fact, much of this evidence has been utilized in setting regulatory standards. Upon defining "dietary fiber" as "…non-digestible soluble and insoluble carbohydrates (with 3 or more monomeric units), and lignin that are intrinsic and intact in plants; isolated or synthetic non-digestible carbohydrates (with 3 or more monomeric units) determined by FDA to have physiological effects that are beneficial to human health", the U.S. Food and Drug Administration (FDA) identified seven isolated or synthetic non-digestible carbohydrates as meeting this definition, including psyllium husk and beta-glucan soluble fiber among others.[5] Further, since the publication of its Final Rule related to dietary fiber, the FDA added eleven isolated or synthetic non-digestible carbohydrates to the existing

list that FDA intends to add to the definition of dietary fiber including inulin type-fructans, resistant starches/maltodextrins, polydextrose and others.[4, 6-8] Both Health Canada and European Food Safety Authority (EFSA) have reviewed the available scientific evidence on extrinsic dietary fibers as well and have found it sufficient for both dietary fiber classification and health claim authorization.[9-11]

Fiber-Enriched Products Should Be Recognized as a Tool to Help Improve Fiber Intake

As the disparity between recommended dietary fiber intake levels and actual consumption remains worldwide, there is an opportunity for the WHO Guidelines on Carbohydrate Intake to make science-based recommendations about the importance of a high-fiber diet that are inclusive of dietary fiber-rich sources that extend beyond cereals, grains, fruits, and vegetables. Continued advancements in food technology allow for dietary fiber enrichment of a variety of foods, including those that are inherently low in dietary fiber. Recommendations to consume dietary fiber from a variety of sources, including fiber-enriched products, using nutrition labeling schemes panel and ingredient lists as a guide are both substantiated by scientific evidence and warranted. The expansion of dietary fiber-rich options also plays an important role in helping to increase total dietary fiber intake with minimal impact on calories.[12-13] Research also indicates that prebiotic fibers alter the gut microbiome, as they are selectively fermented by the gut bacteria. Fermentation results in the production of various metabolites of which the most researched are short-chain fatty acids (SCFAs). They are linked to many benefits, including enhanced calcium absorption, thus influencing bone health at all ages. [14]

In closing, CRA appreciates the WHO's consideration of our comments on the Draft Guidelines for Carbohydrate Intake in Adults and Children. All dietary fibers, both intrinsic and extrinsic, remain important and beneficial healthy ingredients in helping consumers manage body weight and reduce the risk of cardiovascular and other non-communicable diseases. It is critical that the final guidelines reflect this understanding so as to offer regulators, clinicians, and consumers more practical options in meeting recommendations for dietary fiber intake.

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Survey response 11

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Sector
Government

Country
Nigeria

Comments on the draft guideline

Summary of evidence

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Recommendations and supporting information

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Survey response 12

General information

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Organization/affiliation
AIJN - European Fruit Juice Association

Sector
Other

Country
Belgium

Comments on the draft guideline

Summary of evidence

Evidence to recommendations

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Other comments

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AIJN comments on the draft WHO guideline on carbohydrate intake

AIJN – European Fruit Juice Association welcomes the opportunity to provide comments to the WHO online public consultation on the draft WHO Guideline on carbohydrate intake for adults and children.

AIJN's observations and recommendations

As regards fruit juices, AIJN would like WHO to reconsider the recommendation that fruit juices should be consumed sparingly. We acknowledge the reference to the WHO recommendations on free sugars intake. However, in the GRADE subgroup analysis in the draft guideline (cf. pages 61 and 62), there is an inverse correlation between all-cause mortality, stroke, and coronary heart disease, which means that fruit juices help protect against these diseases. Therefore, the analysis on which WHO bases its recommendation does not support its own recommendation.

Furthermore, we would like to address the following statement:

"*specific evidence for **dried fruits and fruit juices** in the systematic reviews is very limited and results inconsistent, however **both are concentrated sources of sugars, as are fruit concentrates and fruit sugars"** (i.e. sugars and syrups obtained from whole fruits). (*page 10 of the summary and page 46)

We would like to highlight that in some jurisdictions, sugars present in fruit juices are solely naturally occurring sugars. For instance, in the EU, Directive 2012/12/EU *amending Council Directive 2001/112/EC relating to fruit juices and certain similar products intended for human consumption* forbids to add any sugars or sweeteners to 100% fruit juices. This also creates a clear distinction with fruit syrups, which cannot be added to fruit juices either, and with dried fruits. The latter are not used for fruit juice production.

Thus, the description of fruit juices as a "concentrated source of sugars" is not accurate. Firstly, it does not take into account the nutritional benefits of fruit juices as a source of vitamins and minerals for example. Secondly, the WHO report itself admits that "specific evidence for […] fruit juices in the systematic reviews is very limited and results inconsistent".

Moreover, the draft mentions the following on page 11 of the summary and page 47:

*"The method of preparation and level of processing should be considered when consuming whole grains, vegetables, fruits and pulses, and should be compatible with other WHO macronutrients recommendations. For example, frying and addition of sauces or condiments significantly increases the amount of fat, sugars or salt. **Therefore, fresh foods or those otherwise minimally processed or modified without added fat, sugars or salt are preferred."***

Fruit juices, as defined in the Codex STD 247, are *"the unfermented but fermentable liquid obtained from the edible part of sound, appropriately mature and fresh fruit or of fruit maintained in sound condition by suitable means including post-harvest surface treatments applied in accordance with the applicable provisions of the Codex Alimentarius Commission. Some juices may be processed with pips, seeds and peel, which are not usually incorporated in the juice, but some parts or components of pips, seeds and peel, which cannot be removed by Good Manufacturing Practices (GMP) will be acceptable.* ***The juice is prepared by suitable processes, which maintain the essential physical, chemical, organoleptic and nutritional characteristics of the juices of the fruit from which it comes****."*

Thus, fruit juices are minimally-processed products that should be compatible with WHO micronutrient recommendations. To further support this argument, AIJN would like to highlight the following aspects:

Fruit juices have a comparable nutritional composition to the fruits from which they are derived, as they are undergoing processing that does not significantly alter the nutritional composition of fruits (except for fibres). As such, 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, in 2019, 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. The factsheet also reviews additional benefits of plant-based diets in reducing the environmental impacts, preventing biodiversity loss and reducing global land use for agricultural purposes.

Recent scientific research demonstrates the valuable nutritional composition of fruit and vegetable juices when it comes to nutrients relevant for human health. Fruit juices are a natural source of different vitamins, minerals, and bio-active compounds such as flavonoids (flavanols[i], Hesperidin[ii], anthocyanins and ellagitannins[iii], Phytonutrients[iv], etc.). This is why their nutritional composition should be looked at beyond their natural sugars content. Studies[v] show that the consumption of a glass of juice of 150-200 ml can be included in a healthy and balanced diet, contributing to reach the recommendation of 3 fruits per day provided that the other two portions are made of whole pieces. In fact, fruit and vegetable juices help to improve fruit/vegetables intake[vi] complementing fruit and vegetable consumption. The same studies show that fruit and vegetable juice consumers tend to eat more whole fruits and vegetables. Fruit and vegetable juice have a moderate glycaemic index (GI)[vii] and the polyphenols found in fruit juice[viii] even slow glucose absorption. Additionally, fruit juice intakes are strongly associated with higher blood levels of vitamin C and carotenoids, plus an overall 'composite biomarker score' associated with a lower risk of type 2 diabetes[ix]. Finally, there is consistent evidence that the regular consumption of fruit juice is associated with lower cardiovascular risk and significantly improves vascular function[x]. It is to be noted in this context that the average fruit juice intake in Europe is only 32ml per person per day[xi] (AIJN market data, 2018).

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Junichi R. Sakaki, Melissa M. Melough, Jing Li, Rulla M. Tamimi, Jorge E. Chavarro, Ming-Hui Chen y Ock K. Chun (2019). Associations between 100% Orange Juice Consumption and Dietary, Lifestyle and Anthropometric Characteristics in a Cross-Sectional Study of U.S. Children and Adolescents. Nutrients 2019, 11(11), 2687

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Caswell H. The role of fruit juice in the diet: an overview. Br Nutr Found Nutr Bull. 2009;34:273–288.

Junichi R. Sakaki, Melissa M. Melough, Jing Li, Rulla M. Tamimi, Jorge E. Chavarro, Ming-Hui Chen y Ock K. Chun (2019). Associations between 100% Orange Juice Consumption and Dietary, Lifestyle and Anthropometric Characteristics in a Cross-Sectional Study of U.S. Children and Adolescents. Nutrients 2019, 11(11), 2687

Matthieu Maillot1, Florent Vieux1, Colin Rehm2 and Adam Drewnowski3 (2020) Consumption of 100% Orange Juice in Relation to Flavonoid Intakes and Diet Quality Among US Children and Adults: Analyses of NHANES 2013–16 Data. Frontiers in Nutrition.

[vii] GI classification is based on how a food or beverage impacts on blood glucose levels in healthy people compared with a reference food: Atkinson RD et al. (2008) Diabetes Care 31: 2281-2283.

Saltaouras G et al. (2019) Glycaemic index, glycaemic load and dietary fibre characteristics of two commercially available fruit smoothies. Int J Food Sci Nutr 70: 116-123.

[viii] Kerimi A et al. (2019) Effect of the flavonoid hesperidin on glucose and fructose transport, sucrase activity and glycaemic response to orange juice in a crossover trial on healthy volunteers. Br J Nutr. 121: 782-792.

Kerimi A et al. (2017) Pomegranate juice, but not an extract, confers a lower glycemic response on a high-glycemic index food: randomized, crossover, controlled trials in healthy subjects. Am J Clin Nutr 106: 1384-1393.

[ix] Ju-Sheng Zheng, Stephen J Sharp, Fumiaki Imamura et all., BMJ 2020;370:m2194 | doi: 10.1136/bmj.m2194

[x] 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 that this is probably due to the potassium content, as well as polyphenols (e.g. D'Elia 2020).

[xi] 2018 | AIJN - European Fruit Juice Association

Survey response 13

General information

Family/last name
Esturo

Given/first name
Aintzane

Organization/affiliation
International Fruit and Vegetable Juice Association IFU

Sector
Non-governmental agency

Country
France

Comments on the draft guideline

Summary of evidence
As regards fruit juices, IFU would like WHO to reconsider the recommendation that fruit juices should be consumed sparingly. We acknowledge the reference to the WHO recommendations on free sugars intake. However, in the GRADE subgroup analysis in the draft guideline (cf. pages 61 and 62), there is an inverse correlation between all-cause mortality, stroke, and coronary heart disease, which means that fruit juices protect against these diseases. Therefore, the analysis on which WHO bases its recommendation does not support its own recommendation. Fruit juices are not a “concentrate source of sugars” as mentioned in the draft on page 10 of the summary and page 46: specific evidence for dried fruits and fruit juices in the systematic reviews is very limited and results inconsistent, however both are concentrated sources of sugars, as are fruit concentrates and fruit sugars (i.e. sugars and syrups obtained from whole fruits). The Directive 2012/12/EU of the European Parliament relating to fruit juices intended for human consumption, is aligned with the international Codex Standard for fruit juices and nectars (Codex Stan 247-2005) and has a clear definition of juices, the prohibition to add sugar to fruit juices, and indicates that fruit juices must have the same Brix as the fruits used in their production. Hence, the sugar content of fruit juice is the same as for fruit.

Evidence to recommendations
Fruit juices, as defined in the Codex STD 247, are “the unfermented but fermentable liquid obtained from the edible part of sound, appropriately mature and fresh fruit or of fruit maintained in sound condition by suitable means including post-harvest surface treatments applied in accordance with the applicable provisions of the Codex Alimentarius Commission. Some juices may be processed with pips, seeds and peel, which are not usually incorporated in the juice, but some parts or components of pips, seeds and peel, which cannot be removed by Good Manufacturing Practices (GMP) will be acceptable. The juice is prepared by suitable processes, which maintain the essential physical, chemical, organoleptic and nutritional characteristics of the juices of the fruit used in its production.” Moreover, IFU would like to highlight the following aspects: 1.- Based on high quality evidence from observational studies which have focussed on 100% fruit juices, there is no evidence of association of health issues or mortality linked to fruit juice consumption. On the contrary, there is evidence of neutrality (no harm), including for risk of type 2 diabetes, insulin resistance, glycemic control, body weight and body fatness. In randomised, controlled trials of daily fruit juice consumption ranging from 200-750ml per day, no significant adverse effects on markers of disease have been found, including for uric acid (gout risk marker), serum glucose, serum insulin, HOMA_IR and CRP (inflammatory marker). On the contrary, in some of these trials, significant positive effects were seen for vascular health (increased FMD, reduced blood pressure), lower triglycerides, lower inflammation (CRP) and improved gut microbiota balance. Therefore, there is no scientific justification to recommend decreasing the consumption of fruit juice. 2.- The diet quality (vitamins, minerals, fibre) is higher for regular consumers of fruit juice versus non-fruit juice drinkers for both children and adults. Consumers with a higher consumption of fruit juice incorporate significantly more fruits and vegetables in their diets, hence fruit juice is not replacing whole fruits. 3.- Fruit juices contain vitamins, minerals, and bioactives in the same amount as in fruits. Indeed, there is evidence that the bioavailability of certain polyphenols and carotenoids is better from commercially-produced fruit juices compared with home-prepared juices or whole fruits as a consequence of the efficient extraction of nutrients and reduced impact of known inhibitors of bioavailability. 4.- The consumption of fruit and vegetable juices, with a high polyphenol content, are helpful for gut health. Many juices contain fibres and pectin which have a positive impact on gut microbiota, according to intervention studies, has the potential to support gut health.

Recommendations and supporting information
IFU would like WHO to reconsider the recommendation that fruit juices should be consumed sparingly. Instead, the evidence suggests clearly that fruit juice can be a useful part of a healthy, balanced diet and may support vascular health. Supporting scientific publications are: Auerbach BJ, Wolf FM, Hikida A, Vallila-Buchman P, Littman A, Thompson D, Louden D, Taber DR, Krieger J. Fruit Juice and Change in BMI: A Meta-analysis. Pediatrics. 2017 Apr;139(4):e20162454. doi: 10.1542/peds.2016-2454. Epub 2017 Mar 23. PMID: 28336576; PMCID: PMC5369671. https://pubmed.ncbi.nlm.nih.gov/28336576/ Ayoub-Charette S, Chiavaroli L, Liu Q, Khan TA, Zurbau A, Au-Yeung F, Cheung A, Ahmed A, Lee D, Choo VL, Blanco Mejia S, de Souza RJ, Wolever TM, Leiter LA, Kendall CW, Jenkins DJ, Sievenpiper JL. Different Food Sources of Fructose-Containing Sugars and Fasting Blood Uric Acid Levels: A Systematic Review and Meta-Analysis of Controlled Feeding Trials. J Nutr. 2021 Aug 7;151(8):2409-2421. https://pubmed.ncbi.nlm.nih.gov/34087940/ Bei Pan, Long Ge, Honghao Lai, Qi Wang, Qi Wang, Qian Zhang, Min Yin, Sheng Li, Jinhui Tian, Kehu Yang & Jiancheng Wang (2021) Association of soft drink and 100% fruit juice consumption with all-cause mortality, cardiovascular diseases mortality, and cancer mortality: A systematic review and dose-response meta-analysis of prospective cohort studies, Critical Reviews in Food Science and Nutrition, DOI: 10.1080/10408398.2021.1937040 D'Elia L, Dinu M, Sofi F, Volpe M, Strazzullo P; SINU Working Group, Endorsed by SIPREC. 100% Fruit juice intake and cardiovascular risk: a systematic review and meta-analysis of prospective and randomised controlled studies. Eur J Nutr. 2021 Aug;60(5):2449-2467. https://pubmed.ncbi.nlm.nih.gov/33150530/ Fidélix M, Milenkovic D, Sivieri K Cesar T. Microbiota modulation and effects on metabolic biomarkers by orange juice: a controlled clinical trial. Food Funct., 2020, 11, 1599 DOI: 10.1039/c9fo02623a rsc.li/food-function https://pubmed.ncbi.nlm.nih.gov/32016250/ Liu XM, Liu YJ, Huang Y, Yu HJ, Yuan S, Tang BW, et al. Dietary total flavonoids intake and risk of mortality from all causes and cardiovascular disease in the general population: a systematic review and meta-analysis of cohort studies. Mol Nutr Food Res. 2017;61:6. https://doi.org/10.1002/mnfr.201601003 Ma G, Chen Y. Polyphenol supplementation benefits human health via gut microbiota: A systematic review via meta-analysis. Journal of Functional Foods 2020 March. 103829. Doi: 10.1016/j.jff.2020.103829 Naomi ND, Brouwer-Brolsma EM, Buso MEC, Soedamah-Muthu SS, Harrold JA, Halford JCG, Raben A, Geleijnse JM, Feskens EJM. Association of sweetened beverages consumption with all-cause mortality risk among Dutch adults: the Lifelines Cohort Study (the SWEET project). Eur J Nutr. 2022 Oct 21:1–10. doi: 10.1007/s00394-022-03023-6. Epub ahead of print. https://pubmed.ncbi.nlm.nih.gov/36271197/ Rossi I, Mignogna C, Mena P. Health effects of fruit and vegetable juices: evidence for human intervention studies. In press. IFU Nutrition Paper by UNIPR_v2_merged by Dominique Vasseur - Flipsnack Ruxton CHS, Myers M. Fruit Juices: Are They Helpful or Harmful? An Evidence Review. Nutrients. 2021 May 27;13(6):1815. doi: 10.3390/nu13061815. PMID: 34071760; PMCID: PMC8228760. https://www.mdpi.com/2072-6643/13/6/1815/htm Ruxton, C.H.S., Derbyshire, E. & Sievenpiper, J.L. (2021) Pure 100% fruit juices – more than just a source of free sugars? A review of the evidence of their effect on risk of cardiovascular disease, type 2 diabetes and obesity. Nutrition Bulletin, 46, 415–431. https://doi.org/10.1111/nbu.12526 Santos KGD, Yoshinaga MY, Glezer I, Chaves-Filho AB, Santana AA, Kovacs C, Magnoni CD, Lajolo FM, Miyamoto S, Aymoto Hassimotto NM. Orange juice intake by obese and insulin-resistant subjects lowers specific plasma triglycerides: A randomized clinical trial. Clin Nutr ESPEN. 2022 Oct;51:336-344. https://pubmed.ncbi.nlm.nih.gov/36184225/ Scheffers FR, Boer JMA, Verschuren WMM, et al. Pure fruit juice and fruit consumption and the risk of CVD: the European Prospective Investigation Into Cancer and Nutrition-Netherlands (EPIC-NL) study. Br J Nutr. 2019;121(3):351-359. doi:10.1017/S0007114518003380PubMedGoogle ScholarCrossref Scheffers, F.R., Boer, J.M.A. Sugar intake and all-cause mortality-differences between sugar-sweetened beverages, artificially sweetened beverages, and pure fruit juices. BMC Med 18, 112 (2020). https://doi.org/10.1186/s12916-020-01579-w Qi X, Chiavaroli L, Lee D, Ayoub-Charette S, Khan TA, Au-Yeung F, Ahmed A, Cheung A, Liu Q, Blanco Mejia S, Choo VL, de Souza RJ, Wolever TMS, Leiter LA, Kendall CWC, Jenkins DJA, Sievenpiper JL. Effect of Important Food Sources of Fructose-Containing Sugars on Inflammatory Biomarkers: A Systematic Review and Meta-Analysis of Controlled Feeding Trials. Nutrients. 2022 Sep 26;14(19):3986. https://pubmed.ncbi.nlm.nih.gov/36235639/ Wan, L., Jakkilinki, P.D., Singer, M.R. et al. A longitudinal study of fruit juice consumption during preschool years and subsequent diet quality and BMI. BMC Nutr 6, 25 (2020). https://doi.org/10.1186/s40795-020-00347-6 Zurbau A, Au-Yeung F, Blanco Mejia S, Khan TA, Vuksan V, Jovanovski E, Leiter LA, Kendall CWC, Jenkins DJA, Sievenpiper JL. Relation of Different Fruit and Vegetable Sources With Incident Cardiovascular Outcomes: A Systematic Review and Meta-Analysis of Prospective Cohort Studies. J Am Heart Assoc. 2020 Oct 20;9(19):e017728. https://pubmed.ncbi.nlm.nih.gov/33000670/ IFU would like WHO to reconsider the recommendation that fruit juices should be consumed sparingly.

Other comments
The International Fruit and Vegetable Juice Association (IFU) has been for over seventy years the only representative of the worldwide fruit and vegetable juice and nectar industry and a registered NGO observer at Codex Alimentarius and many other international organisations. The members of IFU are producers of juices and related products, associations, traders, machinery and packaging producers, public and private scientific institutions from around the world.

Upload comments
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Survey response 14

General information

Family/last name
Olie

Given/first name
Andries

Organization/affiliation
Cosun Nutrition Center

Sector
Private sector

Country
Netherlands

Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

Upload comments
[{ "title":"Cosun Nutrition Center Comments on WHO draft guideline Carbohydrate intake for adults and children","comment":"Our comment is also on behalf of and fully endorsed by our Scientific Advisory Board, consisting of the following experts: Prof.dr. Frans Kok, emeritus professor Nutrition & Health, Wageningen University (the Netherlands), Prof.dr. Wim Saris, emeritus professor Human Nutrition, Maastricht University (the Netherlands), Prof.dr. Wim Verbeke, professor, Agro-food Marketing and Consumer Behaviour, Ghent University (Belgium), Prof.dr. Hans Verhagen, visiting professor Ulster University (Northern-Ireland) and Technical University Denmark (DTU, Denmark), Prof.dr. Kees de Graaf, emeritus professor of Sensory Science and Eating Behavior, Wageningen University (the Netherlands) and Prof.dr. Lisbeth Mathus-Vliegen, gastro-enterologist and emeritus professor Clinical Nutrition, Amsterdam University Medical Centers (the Netherlands) ","size":"307.0205078125","name":"Cosun%20Nutrition%20Center%20Comments%20on%20WHO%20draft%20guideline%20Carbohydrate%20intake%20for%20adults%20and%20children.pdf","filename":"fu_wuww598jv8x8ajp","ext":"pdf" }]

Cosun Nutrition Center - Comments on draft WHO guideline on carbohydrate intake for adults and children

Cosun Nutrition Center appreciates the effort of the WHO to develop evidence-based guidelines on Carbohydrate intake for adults and children and welcomes the opportunity to provide comments on this draft Guideline on Carbohydrate intake.

Our six comments, including references, are stated below and are also on behalf of and fully endorsed by our Scientific Advisory Board, consisting of the following experts:

Prof.dr. Frans Kok, emeritus professor Nutrition & Health, Wageningen University (the Netherlands)
Prof.dr. Wim Saris, emeritus professor Human Nutrition, Maastricht University (the Netherlands)
Prof.dr. Wim Verbeke, professor, Agro-food Marketing and Consumer Behaviour, Ghent University (Belgium)
Prof.dr. Hans Verhagen, visiting professor Ulster University (Northern-Ireland) and Technical University Denmark (DTU, Denmark)
Prof.dr. Kees de Graaf, emeritus professor of Sensory Science and Eating Behavior, Wageningen University (the Netherlands)
Prof.dr. Lisbeth Mathus-Vliegen, gastro-enterologist and emeritus professor Clinical Nutrition, Amsterdam University Medical Centers (the Netherlands)

Editorial error

Page 11: ***"...****been shown to have heath benefit unrelated...".*
Page 36: *"...also been shown to have heath benefit unrelated to their..."*

Substantive comments

Page 5: *"4. In adults, WHO recommends an intake of at least 25 grams per day of naturally-occurring dietary fibre as consumed in foods (strong recommendation)"*
"5. In children and adolescents, WHO suggests the following intakes of naturally-occurring dietary fibre as consumed in foods: (conditional recommendation)"

Page 9: *"The source of dietary fibre as assessed in the prospective cohort studies included in the systematic reviews and upon which the recommendations are largely based, is fibre naturally occurring in foods and not extracted or synthetic fibre added to foods or consumed on its own (e.g. fibre supplements, capsules, powders, etc.). Although there was limited evidence for a reduction in total cholesterol with use of extracted or synthetic fibre, further*

research on disease outcomes associated with extracted or synthetic fibre is needed before conclusions on potential health benefits can be drawn. Therefore, the recommendations specifically cover dietary fibre naturally-occurring in foods."

<u>Comment 1:</u> WHO should not exclude "extracted" or "synthetic" fibres in their recommendations on dietary fibre.

Rationale:

- 1) There is no molecular / physiological difference between "naturally-occurring", "extracted" or "synthetic" fibres.

- 2) Current (inter)national definitions of dietary fibre include "naturally-occurring", "extracted" and "synthetic" fibres.

The global CODEX definition (1), as well as the European Union (2), include both "naturally-occuring", as well as "extracted" and "synthetic" fibres in their definitions. The United States Food and Drug Administration (FDA) identified several isolated or synthetic non-digestible carbohydrates meeting their dietary fibre definition: Beta-glucan soluble fibre, Psyllium husk, Cellulose, Guar gum, Pectin, Locust bean gum and Hydroxypropylmethylcellulose. Based on FDA's review of the science, they propose to add the following to the definition of dietary fibre: Mixed plant cell wall fibres (a broad category that includes fibres like sugar cane fibre and apple fibre, among many others), Arabinoxylan, Alginate, Inulin and inulin-type fructans, High amylose starch (resistant starch 2), Galactooligosaccharide, Polydextrose, Resistant maltodextrin/dextrin, Cross linked phosphorylated RS4, Glucomannan and Acacia (gum arabic) (3). The FDA is exercising enforcement discretion for declaring these proposed fibres in the amount of dietary fibre declared in Nutrition Facts and Supplement Facts labels, until they can complete their rulemaking regarding amending their regulations at 21 CFR § 101.9(c)(6)(i) to include the additional dietary fibres. In other words: the mentioned proposed fibres to be reviewed by the FDA are currently already labeled as dietary fibre in the United States (4).

References:

1) Codex Alimentarius – International Food Standards. WHO and FAO. Adopted in 1985. Revision: 1993 and 2011. Amendment: 2003, 2006, 2009, 2010, 2012, 2013, 2015 and 2016.
2) REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011. Annex 1.
3) Questions and Answers on Dietary Fiber | FDA - What isolated or synthetic fibers has FDA included in its dietary fiber definition?
4) U.S. Department of Health and Human Services Food and Drug Administration Center for Food Safety and Applied Nutrition June 2018. The Declaration of Certain Isolated or Synthetic Non-Digestible Carbohydrates as Dietary Fiber on Nutrition and Supplement Facts Labels: Guidance for Industry.

- 3) There are many authorized health claims in the EU and several systematic reviews and meta-analyses on extracted and/or synthetic fibres, supporting beneficial health effects of "extracted" and "synthetic" fibres.

These authorized health claims are based on a thorough scientific assessment by the competent EU authority – European Food Safety Authority (EFSA) and well documented in

the complementary scientific opinions. This confirms beneficial physiological effects of these fibres to human health. The following health claims related to specific “extracted” and/or “synthetic fibres” are authorized under their respective conditions of use:

- Arabinoxylan produced from wheat endosperm and reduction of post-prandial glycaemic responses (1);
- Barley grain fibre and increase in faecal bulk (2);
- Beta-glucans and maintenance of normal blood cholesterol concentrations (3);
- Beta-glucans from oats and barley and reduction of post-prandial glycaemic responses (3);
- Glucomannan (konjac mannan) and maintenance of normal blood cholesterol concentrations (4);
- Glucomannan (konjac mannan) and reduction of body weight (4);
- Guar gum and maintenance of normal blood cholesterol concentrations (5);
- Hydroxypropyl methylcellulose and reduction of post-prandial glycaemic responses (6);
- Hydroxypropyl methylcellulose and maintenance of normal blood cholesterol concentrations (6);
- Chicory inulin contributes to normal bowel function by increasing stool frequency (7);
- Oat grain fibre and increase in faecal bulk (8);
- Pectins and reduction of post-prandial glycaemic responses (9);
- Pectins and maintenance of normal blood cholesterol concentrations (9);
- Rye fibre and changes in bowel function (10);
- Sugar beet fibre and increase in faecal bulk (11);
- Wheat bran fibre and reduction in intestinal transit time (12);
- Wheat bran fibre and increase in faecal bulk (12).

In addition to these authorized health claims on extracted and/or synthetic fibres, we would like to bring the following conclusions from systematic reviews and meta-analyses under the attention of WHO:

De Vries *et al.* 2019: “*This systematic review and meta-analysis indicates that short-chain β-fructan supplementation has a positive effect on bowel function by significantly increasing the frequency of bowel movements.”* (13)

Nagy *et al.* 2022: *“Significant beneficial effects on bowel function parameters were observed in healthy subjects. Chicory-derived inulin-type fructans may have significant bifidogenic effects and may beneficially influence bowel function in healthy individuals.”* (14)

Wang *et al.* 2019: *“Our analyses confirmed that these four main glycemic indicators were significantly reduced by inulin-type fructans (ITF) supplementation, particularly in the prediabetes and T2DM population. Evidence supports that reasonable administration of ITF supplementation may have potential clinical value as an adjuvant therapy for prediabetes and T2DM management.”* (15)

Zhang *et al.* 2020: “*We concluded that inulin supplementation can significantly improve fasting plasma glucose”* (16)

Armet *et al.* 2020*: "In conclusion, interventions with isolated and synthetic DFs resulted mainly in improved cholesterol concentrations and an attenuation of insulin resistance, whereas markers of dysglycemia and inflammation were largely unaffected."* (17)

References:

1) Scientific Opinion on the substantiation of health claims related to arabinoxylan produced from wheat endosperm and reduction of post-prandial glycaemic responses (ID 830) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2011.2205
2) Scientific Opinion on the substantiation of health claims related to oat and barley grain fibre and increase in faecal bulk (ID 819, 822) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2011.2249
3) Scientific Opinion on the substantiation of health claims related to beta-glucans from oats and barley and maintenance of normal blood LDL-cholesterol concentrations (ID 1236, 1299), increase in satiety leading to a reduction in energy intake (ID 851, 852), reduction of post-prandial glycaemic responses (ID 821, 824), and "digestive function" (ID 850)pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI:https://doi.org/10.2903/j.efsa.2011.2207
4) Scientific Opinion on the substantiation of health claims related to konjac mannan (glucomannan) and reduction of body weight (ID 854, 1556, 3725), reduction of post-prandial glycaemic responses (ID 1559), maintenance of normal blood glucose concentrations (ID 835, 3724), maintenance of normal (fasting) blood concentrations of triglycerides (ID 3217), maintenance of normal blood cholesterol concentrations (ID 3100, 3217), maintenance of normal bowel function (ID 834, 1557, 3901) and decreasing potentially pathogenic gastro-intestinal microorganisms (ID 1558) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2010.1798
5) Scientific Opinion on the substantiation of health claims related to guar gum and maintenance of normal blood glucose concentrations (ID 794), increase in satiety (ID 795) and maintenance of normal blood cholesterol concentrations (ID 808) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2010.1464
6) Scientific Opinion on the substantiation of health claims related to hydroxypropyl methylcellulose (HPMC) and maintenance of normal bowel function (ID 812), reduction of post-prandial glycaemic responses (ID 814), maintenance of normal blood cholesterol concentrations (ID 815) and increase in satiety leading to a reduction in energy intake (ID 2933) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2010.1739
7) Scientific Opinion on the substantiation of a health claim related to "native chicory inulin" and maintenance of normal defecation by increasing stool frequency pursuant to Article 13.5 of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2015.3951
8) Scientific Opinion on the substantiation of health claims related to oat and barley grain fibre and increase in faecal bulk (ID 819, 822) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2011.2249
9) Scientific Opinion on the substantiation of health claims related to pectins and reduction of post-prandial glycaemic responses (ID 786), maintenance of normal blood cholesterol concentrations (ID 818) and increase in satiety leading to a reduction in energy intake (ID 4692) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2010.1747
10) Scientific Opinion on the substantiation of health claims related to rye fibre and changes in bowel function (ID 825), reduction of post prandial glycaemic responses (ID 826) and maintenance of normal blood LDL-cholesterol concentrations (ID 827) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2011.2258
11) Scientific Opinion on the substantiation of a health claim related to sugar beet fibre and increasing faecal bulk pursuant to Article 13(5) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2011.2468
12) Scientific Opinion on the substantiation of health claims related to wheat bran fibre and increase in faecal bulk (ID 3066), reduction in intestinal transit time (ID 828, 839, 3067, 4699) and contribution to the maintenance or achievement of a normal body weight (ID 829) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. DOI: https://doi.org/10.2903/j.efsa.2010.1817
13) De Vries, J., Le Bourgot, C., Calame, W. and Respondek, F., 2019. Effects of β-fructans fiber on bowel function: a systematic review and meta-analysis. Nutrients, 11(1), p.91.

https://doi.org/10.3390/nu11010091
14) Nagy, D.U., Sándor-Bajusz, K.A., Bódy, B., Decsi, T., Van Harsselaar, J., Theis, S. and Lohner, S., 2022. Effect of chicory-derived inulin-type fructans on abundance of Bifidobacterium and on bowel function: a systematic review with meta-analyses. Critical Reviews in Food Science and Nutrition, pp.1-18. https://doi.org/10.1080/10408398.2022.2098246
15) Wang, L., Yang, H., Huang, H., Zhang, C., Zuo, H.X., Xu, P., Niu, Y.M. and Wu, S.S., 2019. Inulin-type fructans supplementation improves glycemic control for the prediabetes and type 2 diabetes populations: results from a GRADE-assessed systematic review and dose–response meta-analysis of 33 randomized controlled trials. Journal of translational medicine, 17(1), pp.1-19.
16) Zhang, Wenyue, Yao Tang, Juan Huang, Yixuan Yang, Qinbing Yang, and Huaidong Hu. "Efficacy of inulin supplementation in improving insulin control, HbA1c and HOMA-IR in patients with type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials." Journal of clinical biochemistry and nutrition (2020): 19-103. https://doi.org/10.3164/jcbn.19-103
17) Anissa M Armet, Edward C Deehan, Julia V Thöne, Sarah J Hewko, and Jens Walter. The Effect of Isolated and Synthetic Dietary Fibers on Markers of Metabolic Diseases in Human Intervention Studies: A Systematic Review. Adv Nutr 2020;11:420–438; doi: https://doi.org/10.1093/advances/nmz074

- 4) Fibre content in foods, including extracted or synthetic fibres, is considered by scientific committees to be positive and to contribute favorably for scores on Front of Pack nutrition labels, such as Nutri-Score and Keyhole.

Front of Pack Nutrition labels help consumers in comparing the nutritional quality of foods across a range of products and to make healthier choices in the shopping environment. Moreover, they stimulate food producers to reformulate their products and improve the nutrient composition, in order to achieve a better score. Keyhole serves as a Nordic nutrition label for food. Sweden, Denmark, Norway and Iceland jointly established the criteria. Keyhole focuses on five areas proven to be of "*great importance for health*". More fibre is one of these areas (1) and the used definition of fibre (2) includes naturally occurring, as well as extracted and synthetic fibre (3). The same applies for Nutri-Score, a Front of Pack label that is used in for example France, Belgium, Germany and Spain. Fibre content is part of the Nutri-Score algorithm as a favourable component. According to the Scientific Committee of the Nutri-Score, *"higher fibre consumption has been shown to have various health benefits."* (4). The Nutri-Score does not differentiate between naturally-occurring, extracted or synthetic fibre content.

References:

1) The Keyhole - Design Manual
2) REGULATION (EU) No 1169/2011
3) The Swedish Food Agency's Code of Statutes. Regulations amending the Swedish Food Agency's regulations (SLVFS 2005:9) on the use of the Keyhole symbol. ISSN 1651-3533.
4) Update of the Nutri-Score algorithm - Yearly report from the Scientific Committee of the Nutri-Score. 2021. The 2021 yearly report of the Scientific Committee of the Nutri-Score was voted on January 24, 2022 and approved unanimously by the members of the ScC.

- 5) Exclusion of extracted and synthetic fibre in WHO guidelines could be counter-productive for weight management and assuring sufficient fibre intake.

As stated in the current draft WHO guideline: Carbohydrate intake for adults and children, in 2016, more than 1.9 billion adults aged 18 years and older were overweight and of these, more than 600 million were obese. And, in Western societies, average intake of dietary fibre is significantly lower than current recommendations (1, 2).

Dietary fibres, whether naturally occurring, extracted or synthetic have a relatively low caloric value (~2 kilocalories per gram) (3). Therefore, replacement of digestible carbohydrates (4 kilocalories per gram) and/or fats (9 kilocalories per gram) by extracted or synthetic fibres in foods reduces the caloric content, which contributes to weight management. Besides increasing the intake of whole grains, vegetables, fruits and pulses, adding dietary fibres (irrespective of their origin) to foods could help consumers in increasing their dietary fibre intake levels.

References:
1) Stephen *et al.* Dietary fibre in Europe: Current state of knowledge on definitions, sources, recommendations, intakes and relationships to health. Nutr. Res. Rev. 2017;30:149–190.
2) U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2020-2025. 9th Edition. December 2020. Available at DietaryGuidelines.gov.
3) REGULATION (EU) No 1169/2011

Page 4: *"Among other dietary factors, the quality of carbohydrates (e.g. proportion of sugars, nature of polysaccharides, and amount of dietary fibre) in the diet have been extensively explored as a potential modulator of NCD and obesity risk."*

Page 12: "*The concept of carbohydrate "quality" refers to the nature and composition of carbohydrates including proportion of sugars, how quickly polysaccharides (i.e. starch) are metabolized and release glucose into the body (i.e. digestibility), and amount of dietary fibre."*

- **<u>Comment 2:</u> The term "quality of carbohydrates" is incorrect / inaccurate. Carbohydrates in itself cannot be classified or divided with regard to quality. A more accurate description would be "type, amount and source of carbohydrates".**

Rationale:

- 1) Proportion of sugars in itself does not reflect "quality of carbohydrates". For example; fruit is generally rich in sugars and daily intake is recommended (1, 2). When fruit is juiced, the sugar type and content remains the same, but due to the source (liquid vs. solid), rather than the sugars itself, WHO recommends limitation of intake of fruit juice (3).
- 2) The <u>source</u> of carbohydrates is important, also due to other nutrients than carbohydrates. Fruit is a source of sugars, fibre, vitamins, minerals and antioxidants (4, 5). Intake of fruit and vegetables is recommended by various health organizations, regardless of their carbohydrate composition.
- 3) Pastries, cookies and cakes, for example, contain added sugars which are identical as the sugars present in fruit. The human body metabolizes these sugars in the same way. Differentiation in "quality" is therefore inaccurate. Pastries, cookies and cakes also contain (saturated) fat and are relatively low in micronutrients. Therefore, intake of pastries, cookies and cakes should be limited.
- 4) Refined grains are low in sugars and rich in polysaccharides, but are generally not recommended by health organizations. Whole grains contain more fibre, but also more iron and B-vitamins than refined grains.

- 5) In this (draft) guideline itself recommendations are given on carbohydrate sources (whole grains, vegetables, fruits and pulses) rather than on the different carbohydrates themselves.

References:
1) USDA. US Department of Agriculture. https://www.myplate.gov/eat-healthy/fruits
2) Health Council of the Netherlands. Dutch dietary guidelines 2015.
3) World Health Organization – 2015. Guideline: sugars intake for adults and children.
4) NEVO-online. National Institute for Public Health and the Environment, Ministry of Health, Welfare and Sport – The Netherlands.
5) Carlsen *et al.* Nutr J. 2010; 9: 3.The total antioxidant content of more than 3100 foods, beverages, spices, herbs and supplements used worldwide.

Page 10: *"The scope of this guideline did not include an update to the previously published range of carbohydrate intake as a percentage of total energy intake, which was determined largely by what remained after defining amounts of dietary fat and protein intake, and consequently this guideline does not include recommendations on the amount of carbohydrate that should be consumed. Results from a 2018 meta-analysis suggest that a range of total carbohydrate intake appears to be compatible with a healthy diet, with intakes of approximately 40–70% of total energy intake associated with reduced risk of mortality compared with lower (<40%) or higher (>70%) intakes. This is largely consistent with the range of carbohydrates resulting from current WHO guidance on protein intake and recently updated guidance on total fat intake."*

Comment 3: A recommendation on a range of total carbohydrate intake compatible with a healthy diet should be included in the WHO report. Ample evidence supports recommendation of total carbohydrate intake of 40–70% of total energy intake.

Rationale

- 1) The WHO guideline on sugars 2015 also recommends on percentage of intake (1):
  - In both adults and children, WHO recommends reducing the intake of free sugars to less than 10% of total energy intake (strong recommendation);
  - WHO suggests a further reduction of the intake of free sugars to below 5% of total energy intake (conditional recommendation).
  - Complementary to the quantitative free sugars guidelines, WHO should include a recommendation on a range compatible with a healthy diet of total carbohydrate.
- 2) Low carbohydrate diets are popular (f.e. keto, paleo, Atkins etc.) (2) and many misconceptions exist about a healthy amount of carbohydrates in the diet. Clear recommendations on a range compatible with a healthy diet of total carbohydrate intake of WHO would help to clarify this.
- 3) WHO itself refers to results from a 2018 meta-analysis, suggesting that a range of total carbohydrate intake appears to be compatible with a healthy diet, with intakes of approximately 40–70% of total energy associated with reduced risk of mortality compared with lower (<40%) or higher (>70%) intakes (3, 4). It is also mentioned that this is largely

consistent with the range of carbohydrates resulting from current WHO guidance on protein intake and recently updated guidance on total fat intake (4).

- 4) As the report itself is named “WHO guideline: Carbohydrate intake for adults and children”, inclusion of such a range in the report seems appropriate.

References:
1) WHO 2015. Guideline: sugars intake for adults and children.
2) For example: https://www.healthline.com/nutrition/8-popular-ways-to-do-low-carb and https://www.everydayhealth.com/diet-nutrition/diet/low-carb-diets-keto-low-carb-paleo-atkins-more/
3) Seidelmann SB, Claggett B, Cheng S, Henglin M, Shah A, Steffen LM, et al. Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis. The Lancet Public health. 2018;3(9):e419-e28.
4) WHO draft guideline: Carbohydrate intake for adults and children. 2022.

Page 10: *“However, an increased risk for all-cause mortality and cardiovascular diseases was observed for tinned fruits in a small number of studies, presumably because of the free sugars added to the syrups in which many tinned fruits are packaged.”*

Comment 4: Presuming is speculating, which should not be permitted in an evidence-based guideline. There is no evidence that free sugars added to the syrups of tinned fruits are the cause off an observed risk for all-cause mortality and cardiovascular diseases.

Rationale
There is no scientific evidence supporting a causal effect of free sugars added to syrups and all-cause mortality and cardiovascular diseases. Presuming such insufficiently substantiated relationship is unscientific. The original publication of Aune *et al.* does not justify such a presumption (1).

Reference:
1) Dagfinn Aune, Edward Giovannucci, Paolo Boffetta, Lars T Fadnes, NaNa Keum, Teresa Norat, Darren C Greenwood, Elio Riboli, Lars J Vatten and Serena Tonstad. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality - a systematic review and dose response meta-analysis of prospective studies. International Journal of Epidemiology, 2017, 1029–1056. doi: 10.1093/ije/dyw319

Page 11: *“A high level of free sugars intake, for example, can lead to spikes in blood glucose and insulin, and contributes to the overall energy density of diets.”*

Comment 5: This statement should be rephrased or excluded from the report, because:
1) It is a misconception that free sugars have on average greater influence on the rise of blood glucose levels than other digestible carbohydrates.
2) Percentage of fat (9 kilocalories per gram) in diets, and not free sugars (4 kilocalories per gram), contributes most to the overall energy density of diets. Free sugars have the same caloric value as other digestible carbohydrates and proteins.

Rationale:
1) It is a misconception that free sugars have on average greater influence on the rise of blood glucose levels than other carbohydrates, as determined by the Glycemic Index (GI). High GI foods are those with a GI value of ≥70, medium GI foods are those with a GI of 56-69 and low GI foods are those with a GI value ≤55 (1). In fact, pure sucrose has an average glycemic index (GI) of 68 (medium GI) and fructose has an average glycemic index of 19 (low GI). Regular, sugar sweetened, cola has an average GI of 58 (medium GI) and apple juice has an average GI of 40 (low) (2). All of these examples are or contain significant amounts of free sugars. Atkinson *et al.* published a summary table of mean GI values for food categories and percentages of low, medium and high GI foods (2). They state in their article: "*The highest average values were found among potatoes (71 ± 15; 58% of the entries categorized as high-GI foods); rice (67 ± 17; 38% high-GI entries); vegetables other than potatoes, including sweet potatoes (66 ± 19; 52% high-GI entries); and Asian-Indian regional foods (65 ± 13; 37% high-GI entries).*" In other words, the highest average values are from food sources with no or very low amounts of free sugars.

2) Overall energy density of diets depends on the energy content of the separate constituents, especially water (0 kilocalories per gram) and fat (9 kilocalories per gram) (4). The caloric value of all digestible carbohydrates, including free sugars, is 4 kilocalories per gram, the same as protein. Only fat has a high energy density compared to carbohydrates, including free sugars, and protein (4, 5).

References:
1) ISO 26642:2010. Food products — Determination of the glycaemic index (GI) and recommendation for food classification.
2) Kaye Foster-Powell, Susanna HA Holt, and Janette C Brand-Miller. International table of glycemic index and glycemic load values: 2002. Am J Clin Nutr 2002;76:5–56.
3) Fiona S Atkinson, Jennie C Brand-Miller, Kaye Foster-Powell, Anette E Buyken, and Janina Goletzke. International tables of glycemic index and glycemic load values 2021: a systematic review. Am J Clin Nutr 2021;114:1625–1632.
4) B. J. Rolls. Nutr Bull. 2017 September; 42(3): 246–253. Dietary energy density: Applying behavioural science to weight management. doi:10.1111/nbu.12280
5) REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011.

General remark

In the draft report, no recommendation(s) on potato intake is/are given in the draft report.

<u>Comment 6:</u> Recommendations on potato intake in the WHO guideline report Carbohydrate intake for adults and children would be welcomed.

Rationale

- 1) Recommendations are given on (whole) grains, vegetables, fruits and pulses, but not on potato.
- 2) The potato tuber follows only rice and wheat in world importance as a food crop for human consumption and potatoes are grown in 160 countries (1).

- 3) The potato is a nutrient-rich food, contains ~19 grams of carbohydrates per 100 gram and contains little fat. Potato protein content is fairly low but has an excellent biological value of 90-100 (1, 2, 3). Potatoes are high in vitamin C and are a good source of potassium and several B vitamins. Potato skins provide a substantial amount of dietary fibre (1, 2).
- 4) Potatoes contribute to antioxidant activity and intake (1). Liu (2013): *"The total antioxidant activity of 150 g fresh weight potato was estimated to be equivalent to that of 124.5 mg of vitamin C; this is much higher than the total antioxidant activity of the 14.4 of mg of vitamin C in 150 g fresh weight potato, suggesting that the additive and/or synergistic mechanism of phytochemicals in potatoes may contribute to their antioxidant activities." (4, 5)*
- 5) In the USDA Dietary Guidelines for Americans 2020-2025, consumption of a variety of vegetables is recommended, including sweet potato (subgroup - Red and Orange Vegetables) and white potato (subgroup - Starchy Vegetables) (6).

References:

1) NEVO-online. National Institute for Public Health and the Environment, Ministry of Health, Welfare and Sport – The Netherlands.
2) Camire *et al.* 2009. Potatoes and Human Health. Critical Reviews in Food Science and Nutrition, 49:823–840.
3) Pinckaers *et al.* 2022. Potato Protein Ingestion Increases Muscle Protein Synthesis Rates at Rest and during Recovery from Exercise in Humans. Med Sci Sports Exerc. 2022 Sep 1;54(9):1572-1581.
4) Rui Hai Liu. (2013). Health-Promoting Components of Fruits and Vegetables in the Diet. Adv Nutr. 2013 May; 4(3): 384S–392S. doi: 10.3945/an.112.003517
5) Chu Y-F, Sun J, Wu X, Liu RH. Antioxidant and antiproliferative activities of vegetables. J Agric Food Chem. 2002;50:6910–6.
6) U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2020-2025. 9th Edition. December 2020. Available at DietaryGuidelines.gov.

We thank you for considering our comments.

Cosun Nutrition Center - Comments on draft WHO guideline on carbohydrate intake for adults and children

Cosun Nutrition Center appreciates the effort of the WHO to develop evidence-based guidelines on Carbohydrate intake for adults and children and welcomes the opportunity to provide comments on this draft Guideline on Carbohydrate intake.

Our six comments, including references, are stated below and are also on behalf of and fully endorsed by our Scientific Advisory Board, consisting of the following experts:

Prof.dr. Frans Kok, emeritus professor Nutrition & Health, Wageningen University (the Netherlands)
Prof.dr. Wim Saris, emeritus professor Human Nutrition, Maastricht University (the Netherlands)
Prof.dr. Wim Verbeke, professor, Agro-food Marketing and Consumer Behaviour, Ghent University (Belgium)
Prof.dr. Hans Verhagen, visiting professor Ulster University (Northern-Ireland) and Technical University Denmark (DTU, Denmark)
Prof.dr. Kees de Graaf, emeritus professor of Sensory Science and Eating Behavior, Wageningen University (the Netherlands)
Prof.dr. Lisbeth Mathus-Vliegen, gastro-enterologist and emeritus professor Clinical Nutrition, Amsterdam University Medical Centers (the Netherlands)

General remark

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• 5) In the USDA Dietary Guidelines for Americans 2020-2025, consumption of a variety of vegetables is recommended, including sweet potato (subgroup - Red and Orange Vegetables) and white potato (subgroup - Starchy Vegetables) (6).

References:

1) NEVO-online. National Institute for Public Health and the Environment, Ministry of Health, Welfare and Sport – The Netherlands.
2) Camire *et al.* 2009. Potatoes and Human Health. Critical Reviews in Food Science and Nutrition, 49:823–840.
3) Pinckaers *et al.* 2022. Potato Protein Ingestion Increases Muscle Protein Synthesis Rates at Rest and during Recovery from Exercise in Humans. Med Sci Sports Exerc. 2022 Sep 1;54(9):1572-1581.
4) Rui Hai Liu. (2013). Health-Promoting Components of Fruits and Vegetables in the Diet. Adv Nutr. 2013 May; 4(3): 384S–392S. doi: 10.3945/an.112.003517
5) Chu Y-F, Sun J, Wu X, Liu RH. Antioxidant and antiproliferative activities of vegetables. J Agric Food Chem. 2002;50:6910–6.
6) U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2020-2025. 9th Edition. December 2020. Available at DietaryGuidelines.gov.

Survey response 15

General information

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Organization/affiliation
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Sector
Private sector

Country
Belgium

Comments on the draft guideline

Summary of evidence
Please see the attached comments.

Evidence to recommendations
Please see the attached comments.

Recommendations and supporting information
Please see the attached comments.

Other comments
Please see the attached comments.

Upload comments
[{ "title":"EU Specialty Food Ingredients' Comments on the WHO draft guideline: Carbohydrate intake for adults and children","comment":"","size":"404.4150390625","name":"EUSpecialtyFoodIngredients_comments_draft%20WHO%20guidance_carbohydrate%20intake.pdf","filename":"fu_w3nnchp95sb3tps","ext":"pdf" }]

Comments on the WHO draft guideline: Carbohydrate intake for adults and children

EU Specialty Food ingredients would like to submit the following comments on the WHO draft guideline: Carbohydrate intake for adults and children:

We have noted that WHO in its draft guideline recommends only the consumption of naturally-occurring dietary fibre as consumed in foods. The explanation of the overall exclusion of "extracted or synthetic fibre" added to foods or consumed on its own is stated under remarks on page 9 of the draft guidance as follows: "*The source of dietary fibre as assessed in the prospective cohort studies included in the systematic reviews and upon which the recommendations are largely based, is fibre naturally occurring in foods and not extracted or synthetic fibre added to foods or consumed on its own (e.g. fibre supplements, capsules, powders, etc.). Although there was limited evidence for a reduction in total cholesterol with use of extracted or synthetic fibre, further research on disease outcomes associated with extracted or synthetic fibre is needed before conclusions on potential health benefits can be drawn. Therefore, the recommendations specifically cover dietary fibre naturally-occurring in foods.*"

We would like to respectfully bring to the WHO's attention the following convincing scientific evidence demonstrating the numerous health benefits of "extracted or synthetic fibre", which are even transferred accordingly into regulatory reality. As well please note that in most jurisdictions over the world, disease prevention claims are not allowed for foods or need to be substantiated through the effect on a specific surrogate marker that is predictive of disease occurrence, not the disease itself. The notion of surrogate marker has been included in the search strategy but unfortunately the search strategy did not include terms related to "extracted or synthetic fibre" that would have permitted to back the benefits of such ingredients.

European Union

There is a number of authorized EU Health Claims related to specific fibre ingredients falling under "extracted or synthetic fibre". These approvals are based on a thorough scientific assessment by the competent EU authority – European Food Safety Authority (EFSA) and well documented in the relating scientific opinions confirming the beneficial physiological effect to human health. In the Annex to these comments, we list the authorized EU Health Claims for dietary fibre ingredients including the official claim wording and the legal references.

The following health claims related to specific fibres ("extracted or synthetic fibre") are permitted under their respective conditions of use:

- Arabinoxylan produced from wheat endosperm and reduction of post-prandial glycaemic responses;
- Barley grain fibre and increase in faecal bulk;

- Glucomannan (konjac mannan) and maintenance of normal blood cholesterol concentrations;
- Glucomannan (konjac mannan) and reduction of body weight;
- Guar gum and maintenance of normal blood cholesterol concentrations;
- Hydroxypropyl methylcellulose and reduction of post-prandial glycaemic responses;
- Hydroxypropyl methylcellulose and maintenance of normal blood cholesterol concentrations;
- Chicory inulin contributes to normal bowel function by increasing stool frequency;
- Oat grain fibre and increase in faecal bulk;
- Pectins and reduction of post-prandial glycaemic responses;
- Pectins and maintenance of normal blood cholesterol concentrations;
- Rye fibre and changes in bowel function;
- Sugar beet fibre and increase in faecal bulk;
- Wheat bran fibre and reduction in intestinal transit time;
- Wheat bran fibre and increase in faecal bulk;
- Beta-glucans and maintenance of normal blood cholesterol concentrations;
- Beta-glucans from oats and barley and reduction of post-prandial glycaemic responses;
- Beta-glucans from oats and barley and lowering/ reduction of blood cholesterol.

USA

US FDA Dietary Fibre status and health claims for extracted and synthetic dietary fibre are also based on convincing scientific evidence. The US FDA introduced in May 2016 with the publication of the Final Rule "Food Labeling: Revision of the Nutrition and Supplement Facts Labels" (FR 33979) for the first time a definition of "dietary fiber". The dietary fibre definition is laid down as follows: "[…] non-digestible soluble and insoluble carbohydrates (with 3 or more monomeric units), and lignin that are intrinsic and intact in plants; isolated or synthetic non-digestible carbohydrates (with 3 or more monomeric units) determined by FDA to have physiological effects that are beneficial to human health." [1]

At that time, FDA identified seven isolated or synthetic non-digestible carbohydrates as meeting the dietary fibre definition:

- Beta-glucan soluble fibre (cereal source)
- Psyllium husk
- Cellulose
- Guar gum
- Pectin
- Locust bean gum
- Hydroxypropylmethylcellulose

For other isolated or synthetic non-digestible carbohydrates (with 3 or more monomeric units) FDA required scientific data to show that the substances have physiological effects that are beneficial to human health. Since publication of the Final Rule, FDA added eleven isolated or

[1] U.S. Food and Drug Administration (2016). Food Labeling: Revision of the Nutrition and Supplement Facts Labels. https://www.federalregister.gov/documents/2016/05/27/2016-11867/food-labeling-revision-of-the-nutrition-and-supplement-facts-labels

synthetic non-digestible carbohydrates to the existing list that FDA intends to propose to be added to the definition of dietary fibre: [2] [3] [4] [5]

- Mixed plant cell wall fibres (a broad category that includes fibres like sugar cane fibre and apple fibre, among many others)
- Arabinoxylan
- Alginate
- Inulin and inulin-type fructans
- High amylose starch (resistant starch 2)
- Galactooligosaccharide
- Polydextrose
- Resistant maltodextrin/dextrin
- Cross linked phosphorylated RS4
- Glucomannan
- Acacia (gum arabic)

This in our opinion impressively shows, that for all isolated or synthetic non-digestible carbohydrates that FDA determined as meeting the definition of dietary fibre, there is convincing scientific evidence showing that the substances have physiological effects that are beneficial to human health.

In addition, there is even an US FDA approved health claim for isolated dietary fibre:

- Soluble fiber from certain foods and risk of coronary heart disease (CHD) (21 CFR Part 101.81)

For such health claim we may recall that FDA requires a level of significant scientific agreement (SSA), among qualified experts that the claim (health benefit) is supported by the totality of publicly available scientific evidence for a substance / disease relationship, etc. Hence, also in this context it is proven that there is enough science to substantiate the health benefit of the relating "extracted or synthetic fibre" to human health.

Canada

Health Canada has published a List of Dietary Fibres Reviewed and Accepted by Health Canada's Food Directorate.[6] Although there is no regulatory requirement for a premarket assessment of novel fibre sources by Health Canada, novel fibre sources must be safe for human consumption and have at least one recognized physiological effect. The list provided by Health Canada provides these recognized effects for "novel fibres" in the column "Reason for acceptance."

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[2] U.S. Food and Drug Administration (2018). Review of the Scientific Evidence on the Physiological Effects of Certain Non-Digestible Carbohydrates. https://www.fda.gov/food/food-labeling-nutrition/review-scientific-evidence-physiological-effects-certain-non-digestible-carbohydrates

[3] U.S. Food and Drug Administration (2019). FDA Grants Citizen Petition on Cross-Linked Phosphorylated RS4 as a Dietary Fiber. https://www.fda.gov/food/cfsan-constituent-updates/fda-grants-citizen-petition-cross-linked-phosphorylated-rs4-dietary-fiber

[4] U.S. Food and Drug Administration (2020). FDA Grants Citizen Petition on Glucomannan as a Dietary Fiber. https://www.fda.gov/food/cfsan-constituent-updates/fda-grants-citizen-petition-glucomannan-dietary-fiber

[5] U.S. Food and Drug Administration (2021). FDA Grants Citizen Petition on Acacia (Gum Arabic) as a Dietary Fiber. https://www.fda.gov/food/cfsan-constituent-updates/fda-grants-citizen-petition-acacia-gum-arabic-dietary-fiber

[6] https://www.canada.ca/en/health-canada/services/publications/food-nutrition/list-reviewed-accepted-dietary-fibres.html (Last updated on June 2021)

According the Health Canada the "four recognized physiological effects of dietary fibres are:

- improving laxation or regularity by increasing stool bulk;
- reducing blood total and/or low-density lipoprotein cholesterol levels;
- reducing post-prandial blood glucose and/or insulin levels, or increasing sensitivity to insulin;
- providing energy-yielding metabolites through colonic fermentation."

There are more than 20 types of "extracted or synthetic fibre" that are accepted as dietary fibres in Canada based on at least one of these recognized beneficial physiological effects to human health, by the Canadian authority.

In addition, Health Canada has reviewed and accepted some health claims for extracted dietary fibres (available at: Health Claim Assessments - Canada.ca).

- Polysaccharide Complex (Glucomannan, Xanthan Gum, Sodium Alginate) and a Reduction of the Post-Prandial Blood Glucose Response (2016)
- Polysaccharide Complex (Glucomannan, Xanthan Gum, Sodium Alginate) and Cholesterol Lowering (2016)

Similar as in the US, for such health claims appearing on food labelling and advertising in Canada, convincing scientific evidence was required by the Canadian authority to substantiate the claims in a systematic, comprehensive and transparent manner.

Dietary fibre definition and national fibre intake recommendations

We would like to stress that the Codex Alimentarius definition of dietary fibre includes "extracted or synthetic fibre" and requires that the synthetic carbohydrate polymers included in the fibre definition shall have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities.[7]

We would like to also point out that the national fibre intake recommendations do not distinct between "extracted or synthetic fibre" and "naturally-occurring dietary fibre". The same logic is followed in the EFSA Scientific Opinion on Dietary Reference Values for carbohydrates and dietary fibre[8], which also does not make any distinction between "naturally-occurring dietary fibre" and "extracted or synthetic fibre": "*The role of dietary fibre in bowel function was considered the most suitable criterion for establishing an adequate intake. Based on the available evidence on bowel function, the Panel considers dietary fibre intakes of 25 g per day to be adequate for normal laxation in adults. There is limited evidence to set adequate intakes for children. The Panel considers that the Adequate Intake (AI) for dietary fibre for children should be based on that for adults with appropriate adjustment for energy intake. A fibre intake of 2 g per MJ is considered adequate for normal laxation in children from the age of one year.*

The Panel notes that in adults there is evidence of benefit to health associated with consumption of diets rich in fibre-containing foods at dietary fibre intakes greater than 25 g per day, e.g., reduced risk of coronary heart disease and type 2 diabetes and improved weight

[7] https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCXG%2B2-1985%252FCXG_002e.pdf

[8] https://www.efsa.europa.eu/en/efsajournal/pub/1462

maintenance. Such evidence should be considered when developing food-based dietary guidelines."

Furthermore, the content of fibre in foods, including extracted or synthetic fibres, is considered by scientific committees to be positive for scores developed for Front of Pack nutrition labels adopted in several European countries, such as Nutri-Score and Keyhole.

Nutri-Score is a Front of Pack nutrition label that is used in for example France, Belgium, Germany, Spain, and other countries. Nutri-Score helps consumers to compare the nutritional quality of foods across a range of products and to make healthier choices. Moreover, it stimulates food producers to reformulate their products and improve the nutrition composition, in order to achieve a better score. Fibre content is part of the Nutri-Score algorithm as a favourable component. According to the Scientific Committee of the Nutri-Score, "higher fibre consumption has been shown to have various health benefits.".[9] The Nutri-Score does not differentiate between the naturally-occurring and extracted or synthetic fibre.

The same applies for Keyhole, which serves as a Nordic nutrition label for food, and for which Sweden, Denmark, Norway, and Iceland jointly established the criteria. Keyhole focuses on five areas proven to be of "great importance for health." More fibre is one of these areas[10] and the used definition of fibre[11] includes naturally occurring, as well as extracted and synthetic fibre[12].

Specific scientific evidence for fibre ingredients

We would like to bring to the WHO's attention the following scientific evidence substantiating the beneficial effect of fibre food ingredients which we believe should be taken into account in the guideline and for the recommendation of dietary fibre intake:

Various Non-Digestible Carbohydrates:

- Review of the Scientific Evidence on the Physiological Effects of Certain Non-Digestible Carbohydrates, Office of Nutrition and Food Labeling, Center for Food Safety and Applied Nutrition, Food and Drug Administration, U.S. Department of Health and Human Services, June 2018. https://www.fda.gov/files/food/published/Review-of-the-Scientific-Evidence-on-the-Physiological-Effects-of-Certain-Non-Digestible-Carbohydrates-PDF.pdf
- Armet AM, Deehan EC, Thöne JV, Hewko SJ, Walter J. The Effect of Isolated and Synthetic Dietary Fibers on Markers of Metabolic Diseases in Human Intervention Studies: A Systematic Review. Adv Nutr. 2020 Mar 1;11(2):420-438. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7442353/pdf/nmz074.pdf

[9] Update of the Nutri-Score algorithm - Yearly report from the Scientific Committee of the Nutri-Score. 2021. The 2021 yearly report of the Scientific Committee of the Nutri-Score was voted on January 24, 2022 and approved unanimously by the members of the ScC.

[10] The Keyhole – Design Manual: https://www.livsmedelsverket.se/globalassets/foretag-regler-kontroll/livsmedelsinformation-markning-halsopastaenden/nyckelhalet/designmanual-the-keyhole.pdf

[11] Regulation (EU) No 1169/2011 on the provision of food information to consumers: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32011R1169

[12] The Swedish Food Agency's Code of Statutes. Regulations amending the Swedish Food Agency's regulations (SLVFS 2005:9) on the use of the Keyhole symbol. ISSN 1651-3533.

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Chicory inulin and oligofructose:

Health benefit	Available (systematic) reviews and meta-analyses
Support of normal bowel function by increasing stool frequency per week	Collado Yurrita et al. 2014[3]
Increase of calcium absorption for the support of bone health	Capriles and Arêas 2012[2]; Costa et al. 2020[1]
Support of blood sugar management	Kellow et al. 2014[3]; [3]; O'Connor et al. 2017[1]; Zhang et al. 2020[3]
Support of inner defence	Lohner et al. 2014[3]
Support of satiety, energy intake and body weight management	Kellow et al. 2014[3]; O'Connor et al. 2017[1]
Improvement of blood lipid parameters	Guo et al. 2012[3]; Beserra et al. 2015[3]; Liu et al. 2017[3]; O'Connor et al. 2017[1]
Improvement of stool consistency in infants	Skórka et al. 2018[2]

[1] literature review, [2] systematic review, [3] systematic review and meta-analysis

- Beserra BTS, Fernandes R, do Rosario, Vinicius A, Mocellin MC, Kuntz MGF, Trindade E (2015) A systematic review and meta-analysis of the prebiotics and synbiotics effects on glycaemia, insulin concentrations and lipid parameters in adult patients with overweight or obesity. Clin Nutr 34(5):845–858. https://www.ncbi.nlm.nih.gov/pubmed/25456608
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Acacia gum:

- Akeo K, Kojima M, Uzuhashi Y. Physiological functions of gum Arabic. *Food Chemicals Monthly* 2002; 6:85-89.
- Campbell JM, Fahey GC, Demichele SJ et al. Metabolic characteristics of healthy adult males as affected by ingestion of a liquid nutritional formula containing fish oil, oligosaccharides, gum Arabic and antioxidant vitamins. *Food and Chemical Toxicology* 1997; 35:1165-1176.
- Larson R, Nelson C, Korczak R et al. Acacia gum is well tolerated while increasing satiety and lowering peak blood glucose response in healthy human subjects. *Nutrients* 2021; 13:618.
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- Torres N, Palacios-Gonzalez B, Noriega-Lopez L et al. Glycaemic index, insulinemic index and glycaemic load of soy beverages with a low and high content of carbohydrates. *Revista de Investigacion Clinica [Clinical Research Journal*] 2006; 58:487-497

Prebiotic effect of some fibres

In addition, some dietary fibres on the market have prebiotic properties. Prebiotics are defined as substrates that are selectively utilized by host microorganisms conferring a health benefit. The main health benefits of prebiotic fibres are: 1/ Improve digestive function (bowel regularity); 2/ Support the body's natural defenses; 3/ Improve mineral absorption; 4/ Help regulate your desire to eat, energy balance, and glucose metabolism (ISAPP definition[13]). Some prebiotics like oligofructose and inulin can be found naturally in foods (onions, garlic, bananas, chicory root, Jerusalem artichokes…), but typically are present at low levels. To increase the daily intake, one solution is to include prebiotic supplements or foods with added prebiotic fibres either extracted and isolated or synthetized and manufactured, as part of the diet, to benefit from their health effects.

Conclusion

We believe that the above provided evidence of the beneficial physiological effects of "extracted or synthetic fibre", well justifies that these types of fibres can play their role in filling the general gap in dietary fibre intake, and therefore should not be excluded from the WHO's recommendations.

The draft recommendations 4 and 5, as currently formulated, encourage the exclusion of fibres not naturally-occurring in foods like extracted, isolated, synthetized and manufactured dietary fibres. As these dietary fibres shall have a proven health benefit as shown above, we believe that they need to be taken into consideration, as they are already present in the diet, and represent an alternative strategy for increasing the fibre intake which is still considerably insufficient in the general population.

Current intakes of dietary fibres from whole grains, vegetables, fruits and pulses are generally below recommended intakes due to three common issues (as mentioned page 38 of the draft guidance): supply, access and availability, and individual behaviours and preferences.

To increase the daily intake and counteract issues, one solution is to include dietary fibre supplements or foods with added fibres either extracted and isolated or synthetized and manufactured, as part of the diet. There are a multitude of dietary fibres on the market that can be easily added in diverse food formulations to obtain products source or rich in fibres.

[13] Gibson GR, Hutkins R, Sanders ME, Prescott SL, Reimer RA, Salminen SJ, Scott K, Stanton C, Swanson KS, Cani PD, Verbeke K, Reid G (2017) Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. Nat Rev Gastroenterol Hepatol 14(8):491–502. https://www.nature.com/articles/nrgastro.2017.75

These products may allow to reach dietary fibre recommendations and should be included in the recommendations as the definition of fibre requires all substances considered to be fibre to have a beneficial physiological effect.

We believe that the following amended wording of recommendations 4 and 5 would reflect our comments raised above:

4. In adults, WHO recommends an intake of at least 25 grams per day of dietary fibre, preferentially naturally-occurring dietary fibre as consumed in foods (strong recommendation)

5. In children and adolescents, WHO suggests the following intakes of dietary fibre, preferentially naturally-occurring dietary fibre as consumed in foods: (conditional recommendation)
• 2-5 years old, at least 15 grams per day
• 6-9 years old, at least 21 grams per day
• 10 years or older, at least 25 grams per day

We thank you for considering our comments.

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EU Specialty Food Ingredients represents a united voice for the specialty food ingredients industry on scientific, technical and regulatory issues relating to food products in Europe. It is our aim to ensure that all stakeholders - from manufacturers and retailers to regulatory authorities and consumers - are correctly informed of the use, safety and benefits of specialty food ingredients. In total, more than 200 international and national food ingredients companies are currently involved in the Federation's activities through direct membership or an association. 3-8% of EU specialty food ingredients manufacturers' turnover is dedicated to research and development.
Identification number in the EU Transparency Register: 6160532422-38
For more information, please contact:
Secretariat – Tel. +32 (0)2 736 53 54 – Email: info@specialtyfoodingredients.eu
Website: www.specialtyfoodingredients.eu

Annex - Overview on authorized EU Health Claims on fibre ingredients

Fibre ingredient	Health relationship	Official claim wording	EFSA Opinion reference	Commission Regulation authorising the Health Claim
Authorised health claims applicable to fibres according to article 13(1) and 13(5) of Regulation (EC) No 1924/2006				
non-digestible carbohydrates		Consumption of foods/drinks containing <name of all used non-digestible carbohydrates> instead of sugars induces a lower blood glucose rise after their consumption compared to sugar-containing foods/drinks.	2014;12(1):3513, 2014;12(10):3838, 2014;12(10):3839	Commission Regulation (EU) 2016/854 of 30/05/2016
Authorised health claims related to specific fibres according to article 13(1) and 13(5) of Regulation (EC) No 1924/2006				
Arabinoxylan produced from wheat endosperm	reduction of post-prandial glycaemic responses;	Consumption of arabinoxylan as part of a meal contributes to a reduction of the blood glucose rise after that meal	2011;9(6):2205	Commission Regulation (EU) 432/2012 of 16/05/2012
Hydroxypropyl methylcellulose (HPMC)	reduction of post-prandial glycaemic responses	Consumption of Hydroxypropyl methylcellulose with a meal contributes to a reduction in the blood glucose rise after that meal	2010;8(10):1739	Commission Regulation (EU) 432/2012 of 16/05/2012
Pectins	reduction of post-prandial glycaemic responses	Consumption of pectins with a meal contributes to the reduction of the blood glucose rise after that meal	2010;8(10):1747	Commission Regulation (EU) 432/2012 of 16/05/2012
Beta-glucans from oats and barley	reduction of post-prandial glycaemic responses	Consumption of beta-glucans from oats or barley as part of a meal contributes to the reduction of the blood glucose rise after that meal	2011;9(6):2207	Commission Regulation (EU) 432/2012 of 16/05/2012
Barley grain fibre	increase in faecal bulk	Barley grain fibre contributes to an increase in faecal bulk	2011;9(6):2249	Commission Regulation (EU) 432/2012 of 16/05/2012

Fibre ingredient	Health relationship	Official claim wording	EFSA Opinion reference	Commission Regulation authorising the Health Claim
Oat grain fibre	increase in faecal bulk	Oat grain fibre contributes to an increase in faecal bulk	2011;9(6):2249	Commission Regulation (EU) 432/2012 of 16/05/2012
Sugar beet fibre	increase in faecal bulk	Sugar beet fibre contributes to an increase in faecal bulk	2011;9(12):2468	Commission Regulation (EU) No 40/2014 of 17/01/2014
Wheat bran fibre	increase in faecal bulk	Wheat bran fibre contributes to an increase in faecal bulk	2010;8(10):1817	Commission Regulation (EU) 432/2012 of 16/05/2012
Glucomannan (konjac mannan)	maintenance of normal blood cholesterol concentrations	Glucomannan contributes to the maintenance of normal blood cholesterol levels	2009;7(9):1258, 2010;8(10):1798, 2010;8(10):1798	Commission Regulation (EU) 432/2012 of 16/05/2012
Guar gum	maintenance of normal blood cholesterol concentrations	Guar gum contributes to the maintenance of normal blood cholesterol levels	2010;8(2):1464	Commission Regulation (EU) 432/2012 of 16/05/2012
Hydroxypropyl methylcellulose (HPMC)	maintenance of normal blood cholesterol concentrations	Hydroxypropyl methylcellulose contributes to the maintenance of normal blood cholesterol levels	2010;8(10):1739	Commission Regulation (EU) 432/2012 of 16/05/2012
Pectins	maintenance of normal blood	Pectins contribute to the maintenance of normal blood cholesterol levels	2010;8(10):1747, 2011;9(6):2203	Commission Regulation

Fibre ingredient	Health relationship	Official claim wording	EFSA Opinion reference	Commission Regulation authorising the Health Claim
	cholesterol concentrations			(EU) 432/2012 of 16/05/2012
Beta-glucans	maintenance of normal blood cholesterol concentrations;	Beta-glucans contribute to the maintenance of normal blood cholesterol levels	2009;7(9):1254, 2011;9(6):2207	Commission Regulation (EU) 432/2012 of 16/05/2012
Glucomannan (konjac mannan)	reduction of body weight	Glucomannan in the context of an energy restricted diet contributes to weight loss	2010;8(10):1798	Commission Regulation (EU) 432/2012 of 16/05/2012
Native chicory inulin		Chicory inulin contributes to normal bowel function by increasing stool frequency	2015;13(1):3951	Commission Regulation (EU) 2015/2314 of 07/12/2015
Rye fibre	changes in bowel function	Rye fibre contributes to normal bowel function	2011;9(6):2258	Commission Regulation (EU) 432/2012 of 16/05/2012
Wheat bran fibre	reduction in intestinal transit time	Wheat bran fibre contributes to an acceleration of intestinal transit	2010;8(10):1817	Commission Regulation (EU) 432/2012 of 16/05/2012
Authorised risk reduction claims of specific fibres according to Art 14(1)(a) of Regulation (EC) No 1924/2006				
Barley beta-glucans		Barley beta-glucans has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease.	2011;9(12):2470	Commission Regulation (EU)

Fibre ingredient	Health relationship	Official claim wording	EFSA Opinion reference	Commission Regulation authorising the Health Claim
				1048/2012 of 08/11/2012
Barley beta-glucans		Barley beta-glucans has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease	2011;9(12):2471	Commission Regulation (EU) 1048/2012 of 08/11/2012
Oat beta-glucan		Oat beta-glucan has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease	2010;8(12):1885	Commission Regulation (EU) 1160/2011 of 14/11/2011

Reference:

COMMISSION REGULATION (EU) No 432/2012 of 16 May 2012 establishing a list of permitted health claims made on foods, other than those referring to the reduction of disease risk and to children's development and health, as amended last on 17 May 2021, accessed 17.10.2022 https://eur-lex.europa.eu/eli/reg/2012/432

EU Register of nutrition and health claims made on foods: https://ec.europa.eu/food/safety/labelling_nutrition/claims/register/public/?event=register.home

REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods, as amended last on 13 December 2014, accessed 17.10.2022 https://eur-lex.europa.eu/eli/reg/2006/1924

Survey response 16

General information

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Given/first name
Veronika

Organization/affiliation
International Association for Cereal Science and Technology

Sector
Non-governmental agency

Country
Austria

Comments on the draft guideline

Summary of evidence
Please note the attached file

Evidence to recommendations
Please note the attached file

Recommendations and supporting information
Please note the attached file

Other comments

Upload comments
[{ "title":"","comment":"","size":"241.9267578125","name":"WGI%20comments%20to%20WHO%20on%20carbohydrates%20202022%20Final_upload.pdf","filename":"fu_ccms8hf66ce4h25","ext":"pdf" }]

INTERNATIONAL ASSOCIATION FOR CEREAL SCIENCE AND TECHNOLOGY

WHOLE GRAIN INITIATIVE

Dear WHO:

The Whole Grain Initiative[1] (WGI) is a global interdisciplinary working group within the International Association of Cereal Science and Technology (ICC). Members are a collaboration of scientists and dietitians driven by principles of engagement, transparency, inclusivity, and the sharing of knowledge, information, and resources, with the goal of increasing consumption of whole grains to promote public health. The Whole Grain Initiative arose from the 6th International Whole Grain Summit 2017 in Vienna and members have since published definitions of Whole Grain as a Food Ingredient[2] and also Whole Grain Food[3] to improve consistency in research and communication with consumers.

The Whole Grain Initiative is appreciative of the opportunity to provide feedback on the WHO Draft Guideline: Carbohydrate intake for adults and children. Grains are consumed in every country and make up a large portion of most diets, therefore they represent a significant source of energy, fiber, protein, and even micronutrients.

The Whole Grain Initiative submits the following comments with the intention that WHO will consider when developing the final recommendations on whole grain. We urge the World Health Organization (WHO) to consider the unintended consequences of guidelines that may limit intake of whole grain.

Whole Grain Intake Recommendation

The WGI is appreciative of WHO's prioritization of whole grain as a source of carbohydrates in the diet, along with vegetables, fruits, and pulses. The population-level evidence has been clear and consistent on the role of whole grains, and foods made from whole grain, on reducing risk of disease and promoting positive health outcomes. The 2019 Global Burden of Disease study reported diets low in whole grains were the second leading diet-related cause of death behind high sodium, and noticeably in front of dietary fiber which are only ranked as #7 among the dietary risk factors.[4] As a result, steps are necessary to improve whole grain intake. As for the recommendations on fruits and vegetables, a quantitative recommendation for whole grain intake would be a positive step in communicating with healthcare professionals and the public.

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[1] The Whole Grain Initiative. https://www.wholegraininitiative.org/

[2] . Whole Grain Initiative's Definition of Whole Grain as a Food Ingredient https://www.wholegraininitiative.org/media/attachments/2022/01/21/adapted-2021-03-17-definition-of-whole-grain-as-food-ingredient-proposed-by-global-working-group_update2022.pdf

[3] . Whole Grain Initiative's Definition of Whole Grain Food. https://www.wholegraininitiative.org/media/attachments/2021/04/15/whole-grain-food-definition_v-2020-11-8.pdf

[4] Christopher J L Murray, Aleksandr Aravkin, Peng Zheng, (ordered authors) and Michael Brauer, Ashkan Afshin, and Stephen S Lim, Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019, The Lancet, Volume 396, Issue 10258, p.1223-1249, 2020, DOI:https://doi.org/10.1016/S0140-6736(20)30752-2.

As part of the Draft Guideline, WHO presented quantitative intake recommendations for fruits, vegetables, and fiber. However, no whole grain intake recommendation was offered. The same report used to develop the fiber recommendation also included whole grain, and it would appear adequate data was available to make a quantitative whole grain recommendation. On page 33 of the Draft Guideline, it was stated that a dose-response relationship was observed between consumption of whole grains and several outcomes with favorable results. Unfortunately, quantitative recommendations for whole grains were believed to be more challenging to implement than those for dietary fiber, fruits, and vegetables. The Draft Guideline describes, "unlike vegetables and fruits, whole grains are often not consumed directly but as part of prepared foods such as bread or pasta, and unlike dietary fiber, whole grains are generally not included on nutrient declaration and labels on packaged foods". However, many whole grains, fruits, and vegetables are ingredients in finished foods and contribute towards total intakes and in countries using QUID labeling, whole grain content is available on the ingredient deck with a quantitative declaration. In other countries, manufacturers of finished food products may be encouraged to share quantitative amounts to better inform consumers, if this is supported by WHO. The Whole Grain Initiative has developed the definition of Whole Grain Foods[3] to help establish qualifications for use of language including 'Whole Grain [Food]' and 'Made with Whole Grain'. The aim of global definitions is to ensure communication is consistent for consumers to encourage intake of whole grains and to ensure foods labelled as 'whole grain' or containing whole grain make meaningful whole grain contributions and do not add to consumer confusion. The Whole Grain Initiative would be pleased to present the definitions and knowledge of the food industry to help WHO find support for a quantitative whole grain recommendation.

In the new year (2023), the Whole Grain Initiative will convene a new working group that includes leading experts in the field to evaluate the science and develop a whole grain intake recommendation. We would be pleased to either include scientists from WHO to participate or, at minimum, to present the recommendation and supporting evidence to WHO for consideration and adoption. Ideally, scientifically trained representatives from WHO would participate in the working group to ensure the recommendations being developed will 1) apply to a global population ensuring equity and 2) meet criteria necessary for WHO consideration and eventual adoption.

Whole Grain Processing

The WHO draft guideline states that the "method of preparation and level of processing should be considered when consuming whole grains, vegetables, fruits and pulses." The WGI would like to point out that processing does not impact the nutritive value of whole grains. As identified in the WGI's definition of Whole Grain as a Food Ingredient, dry and wet methods including milling, sprouting, malting, and fermenting are processes necessary to make cereal grains safe, edible, palatable, and more

nutritious.[5] Processing steps outlined above may change the characteristic of ingredients, such as digestibility, but not nutrition. In following the WGI's definition, there is assurance that the primary characteristics and quantities of components are largely unaltered, and therefore effects on health outcomes are unchanged.

WHO summary of whole grains identified evidence suggesting that the naturally occurring structure of intact whole grains contributes to its observed health effects and therefore minimally processed whole grains are preferred. Minimally processed is undefined and ignores that processing, as outlined above, are shown to increase the nutritional value of grains. Grain processing (e.g., milling, etc) disrupts the grain's matrix and can liberate phytochemicals bound to lignin, cellulose, and hemicellulose, including antioxidant phenolic compounds. The preponderance of the evidence from whole grain concluded that whole grain foods, regardless of processing, are beneficial to health. In addition, whole grains are a food group, like fruits and vegetables, comprised of a large variety of cereal grains (e.g., wheat, oats, rye, rice, corn) with individual compositions, including different types and amounts of fibers (e.g., soluble and insoluble, viscous and non-viscous), different micronutrients (i.e., vitamins and minerals), and different phytonutrients (e.g., phenolics). Previous research has even shown cereal fiber from whole grains are associated with a greater reduction in the risk of type-2 diabetes than fruit fiber thus emphasizing the need to promote whole grain intake.[2]

Whole Grains and Diabetes

The WHO's Draft Guidelines included systematic reviews that concluded there was moderate level of evidence for whole grains, including reduced risk of type-2 diabetes. The studies in these reviews included all whole grain foods (any level of processing) and results indicated reduced risk of diabetes. The few papers that investigated the different physiological or metabolic responses to processing of whole grains were conducted in limited populations (some in individuals with diabetes using medication to control their diabetes), evaluated only small number of grain foods and focused on glycemic response. There is no question that finer milling of grains increases the availability of starch resulting in more rapid digestion that increases glycemia. Those papers are therefore relevant to populations actively managing diabetes, but evidence is lacking as to whether glycemic response to grain foods outweighs their other contributions to the general population.

The evaluation of carbohydrate quality by its glycemic response, as quantified/measured by glycemic index and/or glycemic load, may be an appropriate characteristic of an ingredient, but quality of a food should be determined by the food's nutrient density. Individuals actively managing their blood glucose may acknowledge the utility of a food's glycemic response, but when applied to a broader, healthy population it may unintentionally discourage whole grain intake. Avoiding whole grain foods as a result

[5] Whole Grain Initiative's Definition of Whole Grain as a Food Ingredient
https://www.wholegraininitiative.org/media/attachments/2022/01/21/adapted-2021-03-17-definition-of-whole-grain-as-food-ingredient-proposed-by-global-working-group_update2022.pdf

of glycemic response could deny the general population a variety of reported health benefits including lower risk of type 2 diabetes, of cardiovascular and coronary heart disease, certain cancers, and obesity.

Sincerely,

The Whole Grain Initiative

Survey response 17

General information

Family/last name
kendall

Given/first name
Karima A. Kendall

Organization/affiliation
Calorie Control Council

Sector
Non-governmental agency

Country
United States of America

Comments on the draft guideline

Summary of evidence

Evidence to recommendations
The Calorie Control Council (CCC) is an international association representing manufacturers and end-users of low-calorie foods and beverages, including manufacturers and suppliers of dietary fiber, polyols, rare sugars and low- and no-calorie sweeteners (also referred to as “non-sugar sweeteners”). CCC promotes open dialogue among its members, scientific and governmental organizations, health professionals and consumer groups on the benefits and appropriate use of these important products. CCC is pleased to provide the following comments on the WHO Draft Guideline on Carbohydrate Intake for Adults and Children. 1 As a general comment, CCC acknowledges the burden of non-communicable diseases (NCDs) and applauds WHO’s efforts to explore the role of carbohydrate quality as a potential modulator of NCD and obesity risk. As fiber has been classified as a “nutrient of concern” by numerous scientific and regulatory agencies worldwide due to inadequate intake (i.e., The Fiber Gap), we appreciate the inclusion of recommended levels of dietary fiber intake in the draft guideline. However, as it is estimated that more than 90 percent of women and 97 percent of men in the United States do not meet recommended intakes for dietary fiber, 2 CCC believes that the distinction between “naturally-occurring” (i.e., intrinsic) and “extracted or synthetic” (i.e., extrinsic) fibers in the draft recommendations is unnecessary and unsubstantiated by science. While we acknowledge fruits and vegetables, nuts and beans, and whole grains as good sources of dietary fiber, fiber-enriched products expand consumer choice while offering similar health benefits. For example, a recent modeling study in the UK reported significant increases in fiber intake and reductions in body weight and cardiovascular disease and type 2 diabetes risk following a fiber fortification intervention. 3 Through enrichment, manufacturers have been able to respond to the call for increased fiber intake, which provides consumers with increased and good-tasting options. As WHO continues to develop and finalize additional guidance on various nutrition and health-related topics, CCC strongly urges the inclusion of fiber-enriched products as a viable tool to assist in efforts to meet dietary recommendations. 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Recommendations and supporting information
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CCC Comments on WHO Draft Guideline on Carbohydrate Intake for Adults and Children

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Survey response 19

General information

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Sector
Academic/research

Country
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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

Upload comments
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Quadram Institute response to the World Health Organization public consultation on draft carbohydrate intake guidelines, 6 November 2022

Other comments

The Quadram Institute (a United Kingdom Research and Innovation strategically funded national capability based on the Norwich Research Park) welcomes these WHO draft guidelines and we note that, so far as they are comparable, they are consistent with the UK recommendations made by SACN in 2015.

1. The draft guidelines acknowledge dietary fibre is "defined in various ways" but then go on to make quantitative recommendations for fibre consumption without providing an analytical definition of fibre to which they refer. For the sake of clarity, it would be helpful to provide an explicit definition of dietary fibre used as the basis for these recommendations, such as, for example, that provided by Codex Alimentarius (2010).

In **Recommendation 4**, it would be useful to outline examples of foods that contain naturally occurring dietary fibre (e.g., whole plant foods such as whole seeds and pulses, fruits, and vegetables). Conversely, it is helpful to outline which foods do not contain naturally occurring dietary fibre.

Furthermore, the rationale for dietary fibre being 'naturally-occurring' is based on preservation of grain tissue and cell structures. This is not the same as 'minimally processed', as many foods within the NOVA definition of 'minimally processed' do not retain such structures. A more precise definition could be included, as suggested below:

"Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects, minimally processed whole grains (particularly those that preserve plant cell and/or tissue intactness) are preferred."

2. The tables in Annex 6 (GRADE evidence profiles) contain figures for both relative and absolute effect sizes for the various health outcomes. Presumably the estimates of absolute effect are intended to be generalised to the population level. This is very informative, but it would be helpful to include a brief comment on the population(s) to which they refer, and/or the method used to calculate these estimates.

3. In terms of **"Research gaps and future initiatives**" food manufacturers also face challenges with regards to improving the provision of foods containing higher amounts of dietary fibre. We would suggest that future research/initiatives ought to include opportunities for the food industry to increase naturally occurring dietary fibre within processed foods.

Survey response 20

General information

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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

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Dear World Health Organization,

Cereals & Grains Association is a global, non-profit association of nearly 2,000 scientists and food industry professionals working to advance the understanding and knowledge of grain science and its product development applications through research, leadership, education, technical service, and advocacy.

The Cereals & Grains Association appreciates this opportunity to participate in the public comment and consultation of the WHO on recommendations for quality of carbohydrates in the diet.

The quality of carbohydrates has been extensively explored as a potential moderator of dietary risk. The systematic reviews in the WHO statements provide valuable information and guidance for highly developed western-style food diets.

In addition, we note that in the current proposal, the studies have focused on diets for people with existing health issues and the value of the quality of carbohydrates in their diet. Similar studies in normal populations are not supported as well.

With respect to carbohydrate quality, we agree with the value of the inclusion of vegetables, fruits, and dietary fibre in the discussions. However, whole cereal grains are missing; specifically, studies to measure the value of including raw whole grains and processed whole grains in healthy diets.

There also appears to be a gap in the proposed WHO discussion to recommend diets in order to prevent diseases in those countries where grain/legume storage can be problematic unless partially processed.

We would strongly recommend that future work include encouragement/comparison of healthy people to select diets with more quality carbohydrates, whole grain studies and that future studies are included to elaborate these definitions and discussions. Characterizations of fiber, lipid and polyphenolic content and quality using standard methods in all research would provide rich content for understanding of the nutrient value in overall population nutrition.

Messages for healthy eating in the general global population could benefit from broader WHO guidelines, that can be translated into country specific advice for the general populations. Country/regional messaging including familiar staple foods with readily available grains would also likely support regional acceptance of more whole grain foods.

Sincerely,

Dr. Deirdre Ortiz, President, Cereals & Grains Association

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Survey response 21

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Country
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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

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Overall, this set of guidelines is succinct and clearly written. Additionally, it was a positive outcome based on the shift from the previous approach of relying on a few experts opinion in the development of recommendations to the current which generates the synthesis of evidence from systematic reviews.

We have a few suggestions:

1. Recommendation 1 : WHO recommends that carbohydrate intake should come primarily from whole grains, vegetables, fruits and pulses (strong recommendation)

In relation to Recommendation 1, what about legumes? In some cultures, it is common to eat the other parts of the legume plant in addition to the pulses and it seems a little restrictive to use “pulses” instead of legumes.

2. We note the comments in the draft which has explained why the current set of guidelines did not include any recommendations on the percentage of total energy intake which should come from carbohydrates However, we think this is rather limited and this should be addressed given the recent scientific literature/debate around low carbohydrates diets.

3. The current set of recommendation also did not provide any guidance on the types of sugars (e.g. fructose, sucrose) and their effects on human health outcomes.

4. While data from studies examining glycemic index is being considered, there is very limited information in the drafted guidelines on how cooking and preparation (e.g. frying, soaking, heating, fermenting) of different carbohydrates could subsequently affect their absorption and digestion.

Dr Mei-Yen Chan

On behalf of

International Organizations Consultative Group

NNEDPRO

Survey response 22

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Private sector

Country
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Comments on the draft guideline

Summary of evidence

Evidence to recommendations

Recommendations and supporting information

Other comments

Upload comments
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ENSA comments: draft WHO guideline on carbohydrate intake

ENSA welcomes the opportunity to provide comments to the WHO consultation on the draft WHO Guideline on carbohydrate intake. Please find below our remarks.

- **Level of processing**: The guideline recommends that the method of preparation and level of processing is considered when consuming vegetables and pulses, among other foods. Virtually all foods undergo some form of processing, either at home or as part of their manufacture, for example, to make them safe to eat (e.g. via pasteurisation). Processing foods is therefore both normal and traditional and it has a positive impact on factors like shelf life, food safety and quality through the elimination of microorganisms. Processing can also enhance the nutritional quality of foods; plant-based foods often undergo fortification, which is the addition of nutrients like vitamins and minerals, to ensure that all consumers have access to essential nutrients. In order to determine the healthiness of a diet, it is more important to consider the nutritional value of food and the frequency of its consumption. We would therefore recommend removing the reference to "level of processing" on page 10 and replace it with "nutritional composition".
- **Plant-based foods and nutrients' absorption**: The guideline document outlines that "those with nutritional deficiencies or who are at high risk for nutritional deficiencies" may need to adopt behaviours that minimise the ability of compounds contained in plant-based foods to "inhibit absorption of other nutrients". Studies show that while the absorption and availability of specific micronutrients (such as iron, vitamin A and zinc) may be rather low in plant-based foods, obtaining recommended levels of these micronutrients can still be achieved with an appropriately planned diet that includes a variety of different plant-based foods.
- **Plant-based alternatives as source of fibre**: As plant-based alternatives to diary and meat products are made of pulses, vegetables and nuts, they are a source of naturally occurring fibre. Plant-based alternatives are indeed a nutritious source of dietary fibre for those consumers who want to shift to a more plant-based diet without sacrificing taste preferences and convenience. We would therefore recommend including nutritious plant-based alternatives to meat and dairy foods as sources of dietary fibres in the draft WHO guidelines.

About ENSA

The European Plant-based Foods Association (ENSA) represents the interests of plant-based food manufacturers in Europe. ENSA is an association of internationally operating companies, ranging from large corporations to small, family-owned businesses with an annual turnover of around €1.8 billion. ENSA members produce high-quality plant-based alternatives to dairy and meat products. Since its establishment in 2003, ENSA has been raising awareness about the role of plant-based diet in moving towards more sustainable and healthier food consumption patterns.

ENSA – the European Plant-Based Foods Association asbl
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