codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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Agenda Item 3 **CX/NFSDU 07/29/3**

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON NUTRITION AND FOODS FOR SPECIAL DIETARY USES
29th Session

Bad Neuenahr-Ahrweiler, 12 - 16 November 2007

GUIDELINES FOR THE USE OF NUTRITION CLAIMS: DRAFT TABLE OF CONDITIONS FOR NUTRIENT CONTENTS (PART B CONTAINING PROVISION ON DIETARY FIBRE)

- ***Comments at Step 6 of the Procedure*** -

Comments from:

ARGENTINA
AUSTRALIA
COSTA RICA
DOMINICAN REPUBLIC
GUATEMALA
JAPAN
MEXICO
NEW ZEALAND
PHILIPPINES
UNITED STATES OF AMERICA

INFOODS - International Network of Food Data Systems

AAC - Association des amidonneries de céréales de l'UE
AIDGUM - International Association for the Development of Natural Gums
EDA - EUROPEAN DAIRY ASSOCIATION
IACST (ICC) - International Association for Cereal Science and Technology
IADSA - INTERNATIONAL ALLIANCE OF DIETARY/FOOD SUPPLEMENT ASSOCIATIONS
ICBA - International Council of Beverages Associations
ICGMA - International Council of Grocery Manufacturer Associations
IDF - International Dairy Federation
IFAC - International Food Additives Council
IFT - Institute of Food Technologists
ILSI - INTERNATIONAL LIFE SCIENCES INSTITUTE
IUNS - International Union of Nutritional Sciences

ARGENTINA

References

~~Text with strike-out~~: Proposal from Argentina for text to be eliminated
Text in italics: text cited from the original document

GUIDELINES FOR THE USE OF NUTRITIONAL DECLARATIONS:
DRAFT TABLE OF CONDITIONS FOR DIETARY FIBRE NUTRIENTS (PART B)

Argentina deems appropriate the elimination of phrases in the table that are presently in brackets: "[~~*10 % of the recommended intake*~~]" and "[~~*20 % of the recommended intake*~~]", since the serving size will be determined at the national level by the authorities of each country when taking into consideration its own characteristics, it is not necessary to incorporate this information into a general recommendation.

In relation to the "Basic Content" of the table, Argentina deems appropriate decreasing the value of 1.5 g/100ml to 1 g/100 ml, based on the biographical reference consulted[1]; taking into consideration also, the fibre content of products in the market that are supported by recognised international works.

Argentina agrees with the elimination of the brackets found in the phrase "High Content" of the table: ~~[~~(Liquid foods: 3 g per 100 ml)~~]~~

With regards to the new proposed definition of dietary fibre in document CRD 19 of FAO/WHO, Argentina manifests its support to what has been defined in the document Codex Alimentarius Apéndice III de Alinorm 06/29/26 [Codex Alimintarius Appendix III of Alinorm 06/29/26], since the concepts established therein have been under discussion for many years and reflect the knowledge and scientific development obtained to date. Likewise, Argentina agrees with the worldwide accepted perception of both scientists and national and international authorities alike about the subject matter.

AUSTRALIA

Australia does not support progression of these Guidelines because of the significant change of approach to the definition of dietary fibre as proposed by the FAO/WHO Scientific Update and presented as a Conference Room Document at the 28th Session of CCNFSDU.

The proposed definition presented by FAO/WHO has major implications for the formulation and labeling of foods, for example by excluding indigestible oligosaccharides from the definition of fibre. At the same time, Australia recognises that the current Codex definition and that proposed at Step 6 also have some limitations.

Australia considers that the process by which the revised FAO/WHO definition was prepared was not conducted in accordance with the FAO/WHO Framework for the provision of scientific advice and therefore does not provide a sound basis on which to consider the merits of the proposal. In particular, Australia has concerns about the process for selecting participants in the Scientific Update, that information has not yet been provided as to the identity of these participants, that the terms of reference of the Scientific Update have not been made available, background papers that informed the Update have not been identified and that there has been no published material related to this consultation.

[1] Archivos Latinoamericanos de Nutrición Vol. [Latin American Nutritional Archives Vol.] 50 N°1 ¨(2000) and Vol. 53 N° 4 (2003)- J.American Diet Association 1992 Feb.92829 175-86.

Therefore, Australia considers that we are not in a position to make a fully informed decision on CL 20073-NFSDU or on any other proposed changes to the definition of dietary fibre.

COSTA RICA

Regarding the definition proposed in the WHO request for dietary fibre, Costa Rica believes that it has remained in favour of fibre added to processed food, and has not adapted to current practice or to the declarations made in foods for dietary fibre. For this reason, we support the definition proposed by the Codex Committee on Nutrition and Foods for Special Diets, as it appears in the reference document.

Justification: It modifies the definition, which would mean additional cost for the national industry, and would require the implementation of new analysis and modification of product labels declaring their contents, as well as the properties of dietary fibre, whether occuring naturally in the food in question or added intentionally. Also, the values of dietary fibre reported in the databases and tables of food composition in Latin America, Brazil, and Costa Rica, among others, are analysed using the method of enzymatic gravimetry, which does not take into account the origin of the fibre. So a change to the definition would imply changes in the data available until now, and would also have a significant economic effect on developing countries who would have to assemble and validate a new analytic methodology. It would also mean a loss of scientific ground due to new requirements for the analysis of local foods for fibre and confusion would be created for users and analysts.

As for the conditions for the declarations of dietary fibre content, a correction is requested in the Spanish version for the translation of the terms listed under the column "declared property", so that instead of "basic content" the word "origin" is used. This will facilitate its interpretation. Also, we would like to append the phrase "good source" next to the term “high content”.

Furthermore, we suggest that the requirement to be a source of fibre is only 10% of the recommended intake per portion, and a high or good source is 20% of the recommended intake per portion. Of course, this means it would be necessary that a daily recommendation for dietary fibre exists, which would be determined in the Codex Committee on Nutrition as part of the work which is being implemented by means of the revision document on nutritional reference values. The size of the portion should be defined at national level.

Justification: The terms and values requested are adjusted to current practice for declaring properties with respect to the dietary fibre content. In addition, it should be considered that the application of percentages to the reference values facilitates the application of the conditions.

COMPONENT	PROPERTY DECLARED	CONDITIONS
B.		**NO LESS THAN**
Dietary fibre	**Source**	~~3 g per 100 g or 1.5 g per 100 kcal or [~~10% of the recommended intake~~]~~ per portion of food* ~~[(Liquid foods: 1.5 g per 100 ml)]~~
	High content **or good source**	~~6 g per 100 g or 3 g per 100 kcal or [~~20% of the recommended intake~~]~~ per portion of food* ~~[(Liquid foods: 3 g per 100 ml)]~~

* The size of the food portion ~~[~~and the recommended intake~~]~~ must be determined at national level

DOMINICAN REPUBLIC

Dietary fibre: These are polysaccharide (polymers of carbohydrates) components of the vegetable foods which cannot be broken down by human digestive enzymes and which are intrinsic parts of the cellular tissue of those foods.

Additional opinions: The non-polysaccharide components, which are attributed effects similar or identical to dietary fibre, are:

Lignin, alcohol of sugars (sorbital, manitol, and lactitol, among others) and polyphenolic compounds like: Soluble polyphenols and condensed tannins, among others, identified as "components with effects similar to dietary fibre"

CURRENT RECOMMENDATIONS

ADULTS
25-30 g /day or

10-13 g /1000 calories

CHILDREN
5 g – 10 g + age in years

Dietary fibre at adequate doses does not change mineral physiology.

To achieve prebiotic effects, 0.40 g / 100 ml are needed, or
400mg / 100ml.

GUATEMALA

Comments from Guatemala			**Justification**
Page	**Original text**	**Modifications**	
3	**Conditions:** no less than 3 g per 100 g or 1.5 g per 100 kcal or [10% of the recommended intake] per portion of food* [(Liquid foods: 1.5 g per 100 ml)] 6 g per 100 g or 3 g per 100 kcal or [20% of the recommended intake] per portion of food* [(Liquid foods: 3 g per 100 ml)] The size of the portion [and the recommended intake] must be determined at national level	Eliminate the brackets and approve what is between them	These values are found within the range of the daily fibre requirement for Guatemala.
3	DEFINITION: Dietary fibre means polymers of carbohydrates with a grade of	We suggest adding the following to the first part of the definition of dietary fibre:	Lignin and associated compounds must be included in the definition. The justification

	polymerisation (GP) no less than 3, which are not absorbed in the lower intestine. A grade of polymerisation no less than 3 is necessary to exclude the mono- and disaccharides. It is not intended to reflex the average GP of the mixture. Dietary fibre consists of one or more of the following polymers: • Edible polymers of carbohydrates which are naturally found in foods in the form in which they are consumed.	DEFINITION: Dietary fibre means polymers of carbohydrates with a grade of polymerisation (GP) no less than 3, which are not absorbed in the lower intestine. A grade of polymerisation no less than 3 is necessary to exclude the mono- and disaccharides. It is not intended to reflex the average GP of the mixture. Dietary fibre consists of one or more of the following polymers: • Edible polymers of carbohydrates that are naturally found in foods in the form in which they are consumed, **lignin and other associated components**	for this is found in footnote no. 1 on the same page.
3	**Properties:** Dietary fibre generally has one of the following properties:	**Properties:** Dietary fibre generally has **the following properties** :	For a more concrete translation of the English version.

JAPAN

The Government of Japan would like to support the current draft table and definition of dietary fibre with all the square brackets deleted. The definition and table, then, would be presented as follows;

DEFINITION:
Dietary fibre means carbohydrate polymers with a degree of polymerization (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of polymerization not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average DP of a mixture. Dietary fibre consists of one or more of:

- edible carbohydrate polymers naturally occurring in the food as consumed,
- carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means,
- synthetic carbohydrate polymers.

COMPONENT	CLAIM	CONDITIONS
B.		**NOT LESS THAN**
Dietary Fibre	Source	3 g per 100 g or 1.5 g per 100 kcal or 10 % of recommended intake per serving* (liquid foods: 1.5 g per 100 ml)
	High	6 g per 100 g or 3 g per 100 kcal

		or 20 % of recommended intake per serving* (liquid foods: 3 g per 100 ml)

*Serving size and recommended intake to be determined at national level.

Regarding the new definition of dietary fibre provided by FAO/WHO at the 28th Session of CCNFSDU (CRD 19), Japan does not support this proposal for the following reasons;

1. While there has been no international consensus regarding the definition of dietary fibre, the scientific scope of dietary fibre has been broadened, and the findings of its physiological effects have been increasing.

   Although the definition proposed by the FAO/WHO could be considered as one of the several opinions, it is totally different from the definition proposed and agreed at the current CCNSFDU. It has not given due consideration to the history of the research regarding physiological effects and/or the definition of dietary fibre.

□□ The definition of dietary fibre at the Codex should be used, in principle, for the purpose of nutrition labelling and claims for processed and prepackaged foods. If the definition of the FAO/WHO is applied, foods bearing dietary fibre labelling or claims would be limited to only fresh foods and a part of processed foods derived from vegetables and fruits, and many other processed foods which may contain fibre substances would be excluded. This situation would be inconsistent with the handling of other nutrients (e.g., vitamins and minerals) which does not specify the source of the nutrients.

MEXICO

In light of the arguments brought forward by the WHO and the presentations by various members during the discussions of the committee, Mexico proposes the following definition:
"Dietary fibre consists of polysaccharides from the cellular tissue of vegetables"
Elimination of the term ***"intrinsic"*** does not limit the fibre to natural origin and includes synthetics, given that both have the same physiological function and their application has the same objective. It is important to take into account that even if food from natural sources is preferred, technological processing also supports the intake of fibre through its processes and development.
Furthermore, it is important to consider that the definition will be used for the correct use of nutritional declarations, which will be used in the labelling of processed foods in particular.

NEW ZEALAND

New Zealand has continued to be an active member of the Committee regarding discussions on dietary fibre.

We find it difficult to provide specific comment on the WHO document at this time as it was our understanding that the Committee would be sent the additional information and background papers that were part of the assessment in reaching the proposed WHO definition.

The implications of a change in definition for dietary fibre are significant and New Zealand believes that there would be benefit in the Committee reconsidering the mandate for the review of the definition of dietary fibre. The current definition of dietary fibre for the purposes of labelling is:

Dietary fibre means edible plant and animal material not hydrolysed by the endogenous enzymes of the human digestive tract as determined by the agreed upon method.

New Zealand recommends that if the Committee is considering the proposed WHO definition for use in nutrition labelling, it needs to understand why it was requested to reconsider the current definition and what the purported inadequacies with the current definition are. Such inadequacies with the definition would need to be part of any consideration of the proposed WHO definition.

We look forward to specific discussions once the full documentation is available.

PHILIPPINES

The Philippines proposes to delete the square brackets under the heading "conditions" and in the footnote in order to include the statements contained. Thus, shows the following:

Component **B.**	Claim	Conditions **Not less than**
Dietary Fibre	Source	3 g per 100 g or 1,5 g per 100 kcal or 10 % of recommended intake per serving (liquid foods: 1,5 g per 100 ml)
	High	6 g per 100 g or 3 g per 100 kcal or 20 % of recommended intake per serving* (liquid foods: 3 g per 100 ml)

* Serving size and recommended intake to be determined at national level.

Rationale: The inclusion of % recommended intake on a per serving basis will provide an additional basis for making "source" an "high" claims for dietary fiber. This additional basis will show how a food fits into the overall daily diet on a per serving basis. Further, the inclusion of said statement is also consistent with Codex general guidelines for use of nutrition and health claims which include % recommended intake on a per serving basis as an alternative way of making "source" and "high" claims for protein, vitamins and minerals.

UNITED STATES OF AMERICA

The United States offers the following preliminary partial comments in response to CL 2007/3-NFSDU. We anticipate having additional comments at the next Committee Session.

FAO/WHO Scientific Update on Carbohydrates in Human Nutrition (CRD 19)

The United States awaits further information on the background and objectives of this scientific update and review of all published papers related to the proposed definition of dietary fiber in Conference Room Document (CRD) 19 before commenting more specifically.

Definition(s) and Methods of Analysis for Dietary Fiber

The United States notes the divergent views expressed by delegations and observers at the last CCNFSDU session with regard to the draft definition of dietary fiber in ALINORM 06/29/26 (Appendix III), and the proposed FAO/WHO definition in CRD 19 (ALINORM 07/30/26, para 17 and 18). In addition, some delegations drew the attention of the Committee to the necessity to study methodological problems of the determination of dietary fiber in more detail (ALINORM 07/30/26, para 19). Specifically, the U.S. notes that currently there is no single AOAC method to measure total fiber content based on the proposed definitions. Moreover, for the draft definition in Appendix III,

there currently is no validated procedure to combine methods to estimate total fiber that would be consistent with this definition. For example, AOAC method 985.29 generally excludes small molecular weight compounds and some resistant starches, while other methods are specific to a fraction or certain food matrices. Thus, the Committee may wish to consider the implications of not having an agreed upon validated method or a validated procedure for combining methods for the proposed definitions in determining whether, when, and how the current Codex definition should be revised.

The Committee may also wish to further consider the implications of including physiological effects (and requirements for their testing) in nutrient definitions for purposes of nutrition labeling and nutrition claims rather than through health claims. Existing definitions of nutrients (i.e., sugars, dietary fibre, and polyunsaturated fatty acids) in the Definitions section of the Codex Guidelines on Nutrition Labelling are primarily chemical definitions. The U.S. further notes the lack of established methods to test all identified physiological effects. While the U.S. supports consideration of beneficial physiological effects in criteria for health claims, clarification was provided at the 26th (2004) CCNFSDU Session that consideration of health claims falls outside the scope of the charge to CCNFSDU which was to establish conditions for dietary fiber nutrition claims (ALINORM 05/28/26, para 18).

Based on the above considerations---including receipt of only partial information from the FAO/WHO scientific update, divergent Codex member views on how dietary fiber should be defined, and unresolved scientific and methodological issues---the U.S. believes it may be premature to reach consensus on a revised definition at the next session.

Draft Table of Conditions for Dietary Fibre Content Claims

Basis for Dietary Fiber Content Claims

The United States continues to support inclusion of serving size as a basis for expressing dietary fiber content claims, and emphasizes the importance that the criteria be based on scientific recommendations for daily dietary fiber intake.

Accordingly, we propose that the Committee consider expressing conditions for dietary fiber claims in a similar manner as the 2001 amendments to the Table of Conditions of Nutrient Contents in the *Guidelines for Use of Nutrition and Health Claims* which specifies conditions for "source" and "high" claims for protein, vitamins and minerals as a percentage of a daily reference value for food labelling purposes (CAC/GL 23-1997, Rev. 2-2004). Specifically, these guidelines express the conditions as a specified percentage of the Nutrient Reference Value (NRV) per 100 g, per 100 ml, per 100 kcal, or per serving. This would not only promote consistency with recent approaches, but might also promote transparency in identifying the relationship between the criteria and recommendations for daily dietary fiber intake. In addition, it should obviate the need to update this table if a Nutrient Reference Value for dietary fiber is established or subsequently updated.

Accordingly, we propose that the Committee consider the option of revising the table in Appendix III as follows:

COMPONENT	**CLAIM**	**CONDITIONS**
B.		**NOT LESS THAN**
Dietary Fibre	Source	[__% of daily reference value[1] per 100 g (solids) ___% of daily reference value per 100 ml (liquids) or ___% of daily reference value per 100 kcal or 10% of daily reference value per serving[2]]

	High	2 times the value for "source"

[1] A daily reference value may be either a Codex Nutrient Reference Value for food labelling purposes (to be determined) or a labelling reference value determined at the national level based on science-based recommended daily intakes taking into account additional factors specific to a country or region.

[2] Serving size to be determined at the national level.

Moreover, the United States notes the relevance of establishing an NRV for dietary fiber to a proposed action for implementing the Global Strategy. Specifically, the Committee agreed at its last meeting to consider new work to establish NRVs for nutrients associated with increased and decreased risk of non-communicable diseases if the Codex Committee on Food Labelling supported such work (ALINORM 07/30/26, para 150).

INFOODS - International Network of Food Data Systems

Consolidation of comments, so far...

INFOODS agrees with the Codex definition at Step 6, and disagrees with the definition proposed from the "Scientific Update."

However, INFOODS believes that the Englyst and Cummings (1988), and subsequent Englyst et al. (1994, 1996) methods for measuring non-starch polysaccharides should be included on the approved methods list for Codex definition at Step 6.

Englyst H. N., Cummings J. H. *Improved method for measurement of dietary fiber as non-starch polysaccharides in plant foods*. J. Assoc. Off. Anal. Chem. 1988; 71:808-814

Englyst H N, Quigley M E, Hudson G J, (1994) *Determination of Dietary Fiber as Non-starch Polysaccharides with Gas–Liquid Chromatographic, High-performance Liquid Chromatographic or Spectrophotometric Measurement of Constituent Sugars*, Analyst, 119, 1497–1509.

Englyst, H.N., Quigley, M.E., Englyst, K.N., Bravo, L. & Hudson, G.J. (1996). *Dietary Fibre. Measurement by the Englyst NSP procedure. Measurement by the AOAC procedure. Explanation of the differences.* Journal of the Association of Public Analysts, 32, 1-52.

INFOODS disagrees with the new definition, *'Dietary fibre consists of intrinsic plant cell wall polysaccharides'* and the rationale presented. Specific objections relate to the words "intrinsic," and the restrictiveness of "plant cell wall polysaccharides."

Some examples follow:

1. "...epidemiological support for the health benefits of dietary fibre is based on diets that contain fruits, vegetables and wholegrain cereal foods, which have the characteristic of containing plant cell walls."

Epidemiological support is based on fibre data mostly from fibre methods other than the non-starch polysaccharide method. These foods also have the characteristic of containing lignin, and other components, in addition to plant cell wall polysaccharide.

2. "...by determining this characteristic component it is possible to indicate the presence of other beneficial substances, such as micronutrients and phytochemicals that are present in the plant."

Here, a food-based dietary guideline is being confused with a nutrient definition. The food itself indicates the presence of micronutrients, etc., not the fibre.

3. "Intrinsic non-starch polysaccharides provide a consistent indicator of plant rich diets..."

This statement is the reversal of a sensible statement about the relationship between foods and food components. Plant rich diets provide an consistent indicator of dietary fibre, by any definition. Consumers will not look at the fibre content of an intact plant food to see if it is a plant food. The new definition and its rationale confuse two separate issues: nutrients (and their definitions and methods of analysis) with dietary guidelines and goals.

4. "Other carbohydrates share the feature of resisting digestion in the small intestine, but these do not provide a consistent indicator of plant rich diets..."

Foods should be the indicator of nutrients, not vice versa. The consistent indicator of plant rich diets are the plants.

5. "...the current epidemiological evidence base for dietary fibre rich foods cannot be extrapolated to diets containing such preparations. To include them within a dietary fibre definition would clearly represent a conflict with reference intake values and health claims, which are derived mainly from these population studies."

With the same argument, we cannot extrapolate to non-starch polysaccharide as the dietary fibre evidence, since nearly all the dietary fibre data used in epidemiological studies are from Prosky and similar methods.

6. "...the AOAC gravimetric procedure does not measure a specified food component it does not provide the precise and informative data required for nutrition research. Neither does the procedure provide any details of what has been measured."

All food components at the level of "proximates" are mixtures of different chemical entities that are in some way related. Dietary fibre is a "proximate" [although it was originally identified as "crude fibre"]. Dietary fat is analogous to dietary fibre: it is a mixture of lipid classes, fatty acids of all isomeric types, fat soluble vitamins, cholesterol and other sterols, etc. It is nonetheless a useful measure, just as dietary fibre by the Prosky and related methods is. Finer analyses are used to identify and quantify the individual components.

7. "Nutrition research is better served by detailed information on specific food components."

Agreed, but this does not mean the proximate level is not useful. Non-starch polysaccharide, in fact, is not particularly detailed information either. There are marked differences in the performance *in vivo* of cellulose, hemicellulose, pectins, etc., which are components of the aggregate intrinsic plant cell wall.

8. There are many inaccuracies and tautological arguments in the table comparing methods.

In summary, the newly proposed definition should be rejected, and the definition at step 6 should be adopted, with the non-starch polysaccharide method added to the list of accepted methods.

AAC - Association des amidonneries de céréales de l'UE

The AAC on behalf of the European Starch Industry is generally supporting the introduction of a definition of dietary fibre in the Draft Table of Conditions for Nutrient Contents of the Codex Guidelines for the Use of Nutrition Claims to inform adequately the consumer on nutritional benefits and properties of this category of innovative food ingredient.

The AAC would like to express its concern regarding the definition of dietary fibre as proposed by the World Health Organization that would lead to restrict the definition of Dietary Fibre to "intrinsic plant cell wall polysaccharides". This definition is similar to the very first definition of dietary fibre introduced some thirty years ago and ignores scientific developments on other indigestible carbohydrates and would hamper communication to consumers on these dietary components. In that regard, the AAC would like to draw the attention of Codex members to the recent scientific monograph[2] published by ILSI Europe on the current understanding about dietary fibre based on physiological properties, in line with the consensus on a definition of dietary fibre reached at the 2005 CCNFSDU 27th meeting.

The AAC would like to continue to capitalize on the work done by the CCNFSDU in the recent years and therefore only propose some amendments of the current draft definition along the lines of the following wording:

"DEFINITION OF DIETARY FIBRE

Dietary fibre means carbohydrate polymers, which are neither digested nor absorbed in the small intestine and with a degree of polymerisation (DP) generally not lower than 3.
Dietary fibre consist of one or more of:

- Edible carbohydrate polymers naturally occurring in the food as consumed;
- Carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means; or,
- Synthetic carbohydrate polymers.

EXPLANATORY NOTES TO THE DEFINITION OF DIETARY FIBRE

A degree of polymerisation not lower than 3 is intended to exclude mono- and disaccharides. However, when scientifically substantiated, some disaccharides might be considered as dietary fibre. Furthermore, it is not intended to reflect the average DP of a mixture.

PROPERTIES OF DIETARY FIBRE

Dietary fibre generally has properties such as:
• Decrease intestinal transit time and/or increase stools bulk;
• Fermentable by colonic microflora;
• Reduce blood total and/or LDL cholesterol levels; and,
• Reduce post-prandial blood glucose and /or insulin levels.

With the exception of non-digestible edible carbohydrate polymers naturally occurring in foods as consumed where a declaration or claim is made with respect to dietary fibre, a physiological effect should be scientifically demonstrated by clinical studies and other studies as appropriate."

[2] ILSI (2006) – *Dietary Fibre, Definition, Analysis & Health*. **ILSI Europe Concise Monograph Series**, 35 pages.

AAC POSITION ON METHODS OF ANALYSIS FOR DIETARY FIBRE

In addition to the above proposal on the definition, the AAC would like to raise the important issue of the methods of analysis to be used to quantify dietary fibre.

The AAC does not consider, contrary to the WHO document, that the methods of analysis are a secondary issue. They are of utmost importance to ensure truthful information of consumers in making the link between the physiological activities of dietary fibre and the level achieved in foodstuffs.

The AAC believes that Dietary Fibre in foods should be analysed by one or a combination of appropriate methods, gathered in the more recent edition of AOAC catalogue of official methods of analysis (Cf. Table 1) or, if no AOAC methods are available or appropriate, by other reliable and appropriate analytical procedures.

Name	Quantify compounds	Reference	Type	Chapter
AOAC 991.43	Soluble+Insoluble polysaccharides (including RS3)+ lignin	Lee and al.	Enzymatic-gravimatic	31.1.17
AOAC 985.29	Soluble+Insoluble polysaccharides (including RS3)+ lignin	Prosky and al. 1992	Enzymatic-gravimatic	45.4.07
AOAC 994.13	Soluble+Insoluble polysaccharides (including RS3)+ lignin	Theander and al.	Enzymatic-gravimatic	45.4.11
AOAC 995.16	Beta-glucans	Mc Clearly and Codd, 1991	Enzymatic	32
AOAC 2002.02	Resistant starch and algal fibre	Mc Cleary and Monaghan, 2002	Enzymatic	45.4.15
AOAC 999.03	Fructans (oligofructans, inulin derivatives, fructooligosaccharides)	Mc Cleary and Blakeney, 1999 Mc Cleary and al. 2000	Enzymatic and Colorimetric	45.4.06B
AOAC 997.08	Fructans (oligofructans, inulin derivatives, fructooligosaccharides)	Hoebregs, 1997	Enzymatic and HPAEC	45.4.06A
AOAC 2001.02	Trans-galacto-oligosaccharides	De Slegte	HPAEC-PAD	45.4.12
AOAC 2001.03	Total dietary fibre in food containing resistant maltodextrins		Enzymatic Gravimetric and Liquid Chromatography	45.4.13
AOAC 2000.11	Polydextrose	Craig and al. 2001	HPAEC	45.6.06C

Tab. 1. Methods of analysis for dietary fibre

Source: CX/NFSDU 04/3-Add.1 (July 2004) - ftp://ftp.fao.org/codex/ccnfsdu26/nf2603ae.pdf

The AOAC 985.29 and 991.43 are the methods traditionally used for measuring the total amount of dietary fibre in most foods. The other methods, which have been introduced more recently, should be used i) for complementary assessment of fibre components/fractions not measured by the general methods, e.g. due to their solubility in ethanol, or ii) for analysis in certain food matrices for which the standard methods are less suitable.

Indeed, the methods AOAC 985.29 and 991.43 for total dietary fibre (soluble and insoluble) give satisfactory results only for the foods that do not contain added non-digestible oligosaccharides and only for some resistant starch fractions. As regards to the Prosky method, it should be noted that the method does not allow to quantify oligosaccharides fractions, which have been recognized to have dietary fibre properties.

For those resistant starch fractions not measured by the AOAC 985.29 and 991.43 methods the alternative method AOAC 2002.02 is available. The Englyst method, which was first introduced in the early eighties and modified in 1988, remains complicated and long to perform and is therefore not suitable for routine analysis. This method is directly linked with the definition of dietary fibre proposed by WHO since it covers only Non Starch Polysaccharides. Nowadays, only a very limited number of countries still base dietary fibre analysis on the Englyst method.

AIDGUM - ASSOCIATION FOR THE DEVELOPMENT OF NATURAL GUMS

The Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) has been elaborating a definition of dietary fibre, with discussions of this topic at several recent sessions.

In its discussions on dietary fibre, the CCNFSDU has taken into account the need for basing Codex work on standards, guidelines, recommendations and definitions on sound scientific analysis and evidence as elaborated in the Codex Procedural Manual (page 159 English versions, 15th edition). The CCNFSDU has also been aware that Codex work must be applicable in all 172 member countries, and one member organization (the European Community). Discussions must take into account differing dietary patterns and food habits, different foods and food ingredients, and the need for diets that meet all basic nutritional needs in all countries.

Assembling appropriate and consensus-based scientific evidence require the participation of a wide range of scientific disciplines. With regard to dietary fibre, a basic knowledge of botany, chemistry, food science, food technology, agriculture, and toxicology is needed to properly collect, analyze and evaluate scientific data related to foods and food ingredients that contain insoluble and/or soluble fibre. In considering the effect of fibre in human food consumption, the above disciplines must be included, along with physiology, medicine and nutrition. In carrying out this process at the international Codex level, transparent operations are needed to assure the best possible access to and consideration of all appropriate scientific evidence, and the full participation of all concerned.

During the 28th session of the CCNFSDU in Chiang Mai, Thailand, further consideration was scheduled of the dietary fibre definition considered and amended by previous CCNFSDU sessions. At the time of the session, and with no prior communication with Codex members, WHO introduced a Conference Room Document (Number 19) concerning a non-transparent WHO and FAO scientific review on carbohydrates in human nutrition. The WHO Conference Room Document submitted a new draft definition for dietary fibre that excluded many foods and food ingredients that are recognized as dietary fibre. Codex has now requested comments on the current draft Codex definition of dietary fibre discussed as several recent Codex CCNFSDU meetings, along with the proposed WHO/FAO definition, and these comments will be discussed at the November 2007 CCNFSDU meeting in Germany.

It appears that the proposed WHO/FAO definition resulted from a so-called scientific review of carbohydrates commissioned in secret by the WHO and FAO Secretariats in 2005/6. This “review” commissioned authors to prepare papers on various aspects on carbohydrates in human nutrition, but the names of the authors, the subject of the commissioned papers and any related information has not been released to Codex or the WHO and FAO Member Countries. This process is in complete conflict to the FAO and WHO rules for transparency in it work, and may lead to problems for both organizations.

With regard to Dietary fibre, the CCNFSDU WHO/FAO Conference Room Document 19 cited an FAO/WHO Expert Consultation report on Diet, Nutrition and Chronic Diseases that has been heavily criticized, and has not accepted by FAO Member Countries. The FAO Member Countries in their deliberations in FAO Governing Bodies stated that the report was not based on sound science, did not take into account differing dietary patterns and cultural difference in various parts of the world, and contained non-science based recommendations that could cause serious disruption to current good agricultural practices and food production, and needlessly harm small farmers and national economies.

Despite the FAO non-acceptance of the FAO/WHO report on Diet, Nutrition and Chronic Diseases, FAO and WHO apparently utilized its recommendations to link its proposed definition to fruits, vegetables and wholegrain cereals, and to promote increased consumption of these foods.

While there is general agreement that fruits, vegetables and whole grain cereals are desirable foods and that their consumption should be increased, if possible and affordable, it is also clear that the proposed WHO/FAO definition excludes many other sources of dietary fibre that are currently present in many foods. Linking the WHO/FAO definition to a goal of increasing consumption of fruits, vegetables and whole grain cereals also ignores a wide range of other foods and processed food ingredients that contain soluble and insoluble fibre such as roots and tubers, nuts, gums, F.O.S. and polysaccharides.

AIDGUM is an association of national acacia gum producer organizations in Africa. Acacia gum is produced from acacia trees across the entire arid Sahel region south of the Sahara Desert. Acacia gum is an essential part of the livelihood of millions of people in Africa, and the national economies of the producing countries, which are among the poorest countries in the world.

Acacia gum is a native and organic product that is harvested from acacia trees as an exudate from the tree branches, it also consists of intrinsic plant cell wall polysaccharide. It is a highly soluble fibre, and has many uses in food products, as an emulsifier, thickening agent, encapsulating agent. Acacia gum is not digested in the stomach or small intestine, and therefore - is an unavailable carbohydrate - but is fermented by bifido bacteria and lactic acid forming bacteria (referred to as friendly bacteria) in the large intestine, and helps to improve bowel function. It has a very high degree of polymerization, and has been found to be a safe food ingredient by JECFA and Codex.

Current recommendations for fibre intake range from about 25 to 40 grams per day. It is highly unlikely that individuals can meet this level of fibre intake with diets that are high in fruits, vegetables and whole grain cereals. In addition, the WHO/FAO proposed definition does not take into account actual dietary consumption patterns, cultural factors, or applicable scientific information.

Therefore, the WHO/FAO proposed definition must be rejected as non-science based, and in conflict with Codex rules. In addition, the WHO/FAO definition is harmful to the entire system of agriculture and food production that provides nutritious foods to over 6 billion people on a daily basis. The CCNFSDU should make every effort to complete its work on the proposed Codex definition that was before the 27th CCNFSDU session, so that it can be adopted by the Codex Alimentarius Commission.

EDA - EUROPEAN DAIRY ASSOCIATION

EDA wishes - fully supporting the International Dairy Federation (IDF) (see page 22) to suggest the use of indigestibility, i.e. resistance to digestion and absorption, in the human small intestine as the key elements when defining dietary fibre, such as has (recently) been done in the scientific community (see IDF document). This approach includes - in addition to the FAO/WHO proposal that states that "Dietary fibre consists of intrinsic plant cell wall polysaccharides" - other sources that have been widely recognized as dietary fibres in scientific literature, e.g. from animal sources.

Furthermore, EDA supports the removal of the terms "degree of polymerisation (DP)" and "polymers" from the currently proposed Codex definition as the suggested DP≥3 excludes indigestible

disaccharides (DP of 2), such as certain galacto-oligosaccharides, which can also be regarded as dietary fibres due to their resistance to digestion and absorption in the human small intestine.

EDA would like to point out that the question of the definition of dietary fibre at Codex level is of main importance. EDA supports the physiological approach using resistance to digestion and absorption in the human small intestine as the key element for the definition of dietary fibre (instead of the combination of degree of polymerisation and resistance to digestion and absorption in the small intestine) and kindly requests to consider the according changes to the proposed Codex definition (see IDF comment, page 22).

IACST (ICC) 1. - International Association for Cereal Science and Technology

1. To "Background"

ICC comments refer to the pages attached to the named letter.

2. To "Appendix III of ALINORM 06/29/26"

ICC (WG DF) agrees with and supports "Definition and properties".
The foot note "When derived from a plant origin …" is understood to include fungi (mycophyta, mushrooms), which are a separate part in newer systems of the biological organisms.
In some cases the methods of analysis for dietary fibre are known to reflect not the total amount of the listed compound (e.g. in case of resistant starch, NDO).

3. To "CRD 19"

The "definition of dietary fibre" and the "rationale…" are in contrast to "Appendix III", commented under point 2 (above). ICC does not support and refuses the content of these pages. The discussion on those opinions was closed more than ten years ago. There is no sense to renew such announcements. The idea of nutrition on the basis of original (plant) food may not be powered on the back of dietary fibre. We could not find out, how to differ between intrinsic fibres and thickeners, neither physiologically nor methodologically.

4. To "Appendix I, currently proposed definitions of dietary fibre"

According to the above given explanations, ICC favours the second definition "Dietary fibre means …" (Report 27th Session CCNFSDU). The first listed definition was found to be impracticable: "dietary fibre" and "added fibre" or "functional fibre" do not differ in physiology or methodology.

5. To "Additional Information from WHO"

The paragraphs referring to experts, scientific papers, publication, references relate to CRD 19, see point 3 of these comments (CRD 19 declared out of the ICC point of view).

6. To "Appendix II, Comparison of the NSP …"

The table contains a number of facts, which are different to our point of view. At present, there exists no method to detect the whole range of components belonging to dietary fibre. A method(ology) for the determination of the content of dietary fibre including resistant starch and non-digestible oligosaccharides is still under development.

ICC favours all matters of dietary fibre as described in "Dietary Fibre" by Juliet Gray, a monograph of the ILSI Europe. Other basics are the compilations of

- the EU project "The method specific certification …" (cited PENDLINGTON et al., see page 11 of the letter dated January 2007)
- the Dietary Fibre Conference 2000, Dublin (Blackwell Science2001)

- the Dietary Fibre Conference 2003, Nordwijkerhout (NL) (Wageningen Academic 2004)
- the Dietary Fibre Conference 2006, Helsinki (Wageningen Academic, in press)
- the AACC Definition of Dietary Fibre 2001 (Cereal Foods World **46**, 2001/3, 112-129)

Cereals are an important source of dietary fibre. Cereal scientists from all over the world expect useful guidelines from CCNFSDU. ICC is willing to further accompany the process of the completion of the guidelines.

IACST (ICC) 2. - International Association for Cereal Science and Technology

Comments by ICC, endorsed by HEALTHGRAIN
We are supporting the dietary fibre (DF) definition proposed by the Codex Committee (CCNFSDU) for the following reasons:
- The definition corresponds to the nutritionally/physiologically most relevant first division of total carbohydrates into digestible and non-digestible carbohydrates
- The definition corresponds to the EU definition of ´carbohydrates´ to mean ´metabolisable/digestible carbohydrates´
- Certified AOAC International methods are available for most components of DF according to this definition

The Codex definition corresponds with 3 of the 4 recent dietary fibre definitions (ILSI Europe, 2006):
- American Association of Cereal Chemists (AACC, 2001)
- Agence Française de Sécurité Sanitaire des Aliments (AFSSA, 2002)
- Health Council of The Netherlands (2006)

The 4th recent definition, of the US Institute of Medicine (2001), distinguishes between intrinsic, intact components of plant foods, dietary fibre, and functional fibre, summed as total fibre. This creates an analytically impossible distinction between fibres naturally present in plant cells and those extracted from plant sources or synthetically produced.

The following issues were raised by FAO/WHO Experts, introduced at the CCNFSDU meeting, Thailand, Nov.'06.
1) Dietary fibre consists of intrinsic plant cell wall polysaccharides only. It does not include carbohydrate polymers that have been obtained from plant products by physical, chemical or enzymic means. It also does not include non digestible oligosaccharides or resistant starch.
2) Any reference to specific physiological properties within the Codex definition is neither appropriate nor manageable. Non-digestibility cannot be measured in the laboratory.
3) Methods of analysis are stated as being a secondary issue. However, the Englyst non-starch polysaccharides (NSP) method is used as a base reference method.
4) The established epidemiological support for the health benefits of dietary fibre is based on diets that contain fruits, vegetables and wholegrain cereal foods; therefore dietary fibre should be defined as stated in 1)
These statements do not change our opinion as supporter of the Codex definition

Ad 1) A physiological basis for the definition of DF is necessary. If it were not for the physiological effects of DF, there would be little or no interest in the subject on the part of researchers, consumers, regulators, and manufacturers. Exclusion of carbohydrate polymers, depending on their means of formation, does not appear to be warranted on a scientific basis.

Ad 2) In response to the claim that non-digestibility cannot be measured, this may be true if related to the whole human digestive tract, but in the proposed Codex definitions, and the four other recent definitions, digestibility is related solely to the alimentary enzymes of humans. This, in fact can be simulated in in vitro laboratory experiments employing either pancreatic enzymes, or purified bacterial and/or fungal enzymes with very similar action patterns and specificities, and devoid of activities not

present in the human small intestine.

Ad 3) The Englyst NSP method does not assay food samples for DF, not even DF using the definition advocated by the WHO/FAO expert group. The method has been submitted on several occasions to AOAC International for adoption as an Official Method of AOAC. Said method was not adopted due to unanswered questions regarding the performance of the method and the fact the method does not measure a nutritionally relevant component of foods.
Ad 4) DF as well as other components contribute to the well recognised health benefits of fruits, vegetables and whole grain products. The promotion of consumption of these products should not be mixed up with the definition of DF, since this will result in a definition
- incompatible with established analytical methods
- not based on the physiological effects of fibres as defined by Codex

The way Codex handles the issue of DF naturally occurring in food and from other sources is to be preferred over FAO/WHO proposal." With the exception of non-digestible edible carbohydrate polymers naturally occurring in foods as consumed where a declaration or claim is made with respect to dietary fibre, a physiological effect should be scientifically demonstrated by clinical studies and other studies as appropriate. The establishment of criteria to quantify physiological effects is left to national authorities" (part of the Codex definition).

DF comprises a wide range of substances. In the case with fats, detailed analysis of the various fats/ fatty acids and studies of their impact on health has resulted in a growing insight of the role of specific fatty acids, and on mentioning these separately on labels. As is indicated by Codex, such research efforts are needed for various classes of fibres (e.g. resistant starches, fructans). In this context we recommend labelling of individual types of added fibre in addition to total fibre.

The proposed FAO/WHO Expert group definition restricting dietary fibre to "intrinsic plant cell wall polysaccharides", originates from an on-going FAO/WHO scientific update on carbohydrates in human nutrition. This procedure is non-transparent, as has been experienced by some HG scientists, and no background documents are available. The selection of experts to author draft documents is remarkable in view of the statement in Appendix 1, page 10: "The selection of these experts was undertaken based on their competency and expertise in each identified area of work, as well as their independence, i.e. not having any specific inclination nor position on the issues nor belonging to any specific school of thought."

References
Dietary Fibre, Definition, Analysis, Physiology & Health, Juliet Gray, ILSI Europe, Concise Monograph Series, November 2006 ISBN 90-78637-03-X 2006
Guideline for dietary fibre intake. Health Council of the Netherlands, 2006; publication no. 2006/03E ISBN-10: 90-5549-604-9

IADSA - INTERNATIONAL ALLIANCE OF DIETARY/FOOD SUPPLEMENT ASSOCIATIONS

IADSA supports the definition of dietary fibre at Step 6 of the Codex procedure that was proposed for final adoption at the 28th Session of the CCNFSDU in Thailand. This definition is consistent with the definition developed by the American Association of Cereal Chemists.

Whereas the Codex definition includes edible carbohydrate polymers naturally occurring in food as consumed, carbohydrate polymers which have been obtained from food by physical, enzymatic or chemical means and synthetic carbohydrate polymers, the proposed FAO/WHO definition which was tabled at the meeting in Thailand limits the definition of dietary fibre to intrinsic plant cell wall polysaccharides only. Thus it reverts to the original concept of dietary fibre and does not include innovative new ingredients and food components with positive nutritional and physiological effects.

Examples include inulin-type oligosaccarides such as fructooligosaccharides (FOS), polydextrose, resistant starch and resistant maltodextrin.

The research, consumer, regulatory and industrial manufacturing interests in dietary fibres focus on their physiological effects, such as decreases in intestinal transit time, increases in faecal bulk, reduction of blood cholesterol levels, fermentation by gut microflora (prebiotics) and reduction of post prandial blood glucose (low Glycaemic Index) and insulin levels.

The definitions and analysis of dietary fibres are closely linked and AOAC methods have been developed for many fibre components. These methods have been almost universally accepted as the most convenient ways to measure many dietary fibre components and have been used extensively for dietary fibre databases, nutrition research studies and for nutrition labelling purposes.

The Non Starch Polysaccharide (NSP) methodology advocated by FAO/WHO is complex and does not measure several of the nutritionally and physiologically important components of food. In conclusion, IADSA endorses the dietary fibre definition proposed by Codex and supports the use of the AOAC methodologies in the interests of international harmonisation. IADSA also supports further research on carbohydrate polymers which have physiological benefits to health, together with the development of analytical techniques for the identification and assay of these polymers in isolation, in foods and in food products.

ICBA - International Council of Beverages Associations

ICBA supports the adoption of the definition of dietary fibre that was proposed for adoption at the 28th Session of CCNFSDU in November 2006 (Appendix III of ALINORM 06/29/26). Further, we support removing the square brackets and maintaining a provision for liquid foods in the Table (conditions).

This definition of fibre has been under preparation by the committee since 1998. Over the years, a scientific consensus has been developed that the definition of dietary fibre should be based on the physiological properties of non-digestion and non-absorption in the small intestine, coupled with one or more desirable effects, and not solely on the physicochemical characteristics of food constituents (the "intrinsic" fibre of plant wall material). This consensus recognized scientific advances in the area of fibre technology, as well as opinions reached by many scientific bodies.[3] At the 28th Session, a representative of WHO offered a "new" definition (CRD 19) that had not been previously discussed by the Committee and that had not been scientifically peer-reviewed. The definition proposed by WHO would return dietary fibre to the intrinsic fibres of plant wall materials, only.

There is sound rationale for moving forward with the draft definition that has been developed by CCNFSDU:

- There is no sound scientific evidence demonstrating that "intrinsic" fibre has different effects from "added" dietary fibre in foods, with most associations supporting the proposed WHO approach derived from epidemiological, rather than experimental evidence.
- Reported fibre consumption in most countries falls below the recommended adult dietary intakes for total fibre. As such, adequate dietary fibre consumption is recognized as an important public health goal by many governments.
- The proposed new definition would exclude many science-based innovations that have provided new sources of fibre that have the physiological properties of polysaccharides. Examples include fructo-oligosaccharides, oligofructose, galacto-oligosaccharides, gluco-oligo-saccharides, xylo-oligosaccharides, polydextrose, resistant maltodextrins, β-cyclodextrins, resistant starches, gums, inulin, pectins and modified cellulose products.

[3] The US National Academy of Sciences' Institute of Medicine, the Agence Française de Sécurité Sanitaire des Aliments, the American Association of Cereal Chemists, the Health Council of the Netherlands and the Food Standards Australia New Zealand.

- Excluding these new sources of fibre from the diet would limit consumer choice and would work against public health goals on recommended daily intakes of fibre.

In summary, we urge avoiding a further delay in adopting the current definition and conditions for dietary fibre so that CCNFSDU can make progress in the matter. We note that Codex has an opportunity to readdress the matter in light of new scientific developments in a later stage. The current Codex draft definition meets the level of scientific consensus that is reflected by many national scientific evaluations and should be forwarded to the Commission for adoption.

ICGMA - International Council of Grocery Manufacturer Associations

Definition: Dietary fibre means carbohydrate polymers with a degree of polymerisation (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of polymerisation not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average DP of a mixture. Dietary fibre consists of one or more of:

- *Edible carbohydrate polymers naturally occurring in the food as consumed*
- *Carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means,*
- *Synthetic carbohydrate polymers*

Properties: Dietary Fibre generally has properties such as:

- *Decrease intestinal transit time and increase stools bulk*
- *Fermentable by colonic microflora*
- *Reduce blood total and/or LDL cholesterol levels*
- *Reduce post-prandial blood glucose and/or insulin levels.*

With the exception of nondigestible edible carbohydrate polymers naturally occurring in foods as consumed where a declaration or claim is made with respect to dietary fibre, a physiological effect should be scientifically demonstrated by clinical studies or other studies as appropriate. The establishment of criteria to quantify physiological effects is left to national authorities.

ICGMA does not support the definition presented by the representative of the World Health Organization (WHO) in Conference Room Document 19 (CRD 19) at the November 2006 CCNFSDU meeting.

Rationale for Support of CCNFSDU Definition of Dietary Fiber from ALINORM 06/29/26

The issue of a definition for dietary fiber has been under thorough discussion and debate by CCNFSDU for over a decade. Over this time, consensus has developed, based on clear scientific evidence, that the definition of dietary fiber should be based on the physiological properties of food constituents, not merely on their physicochemical characteristics. This consensus is reflected in the definition developed in CCNFSDU and numerous other definitions and is based on the physiological properties of non-digestion and non-absorption in the small intestine, coupled with one or more desirable properties.

Codex Procedure

The consideration of adoption of a definition of dietary fibre by CCNFSDU was interrupted by the last-minute introduction of CRD 19 by the representative of the WHO. This document was based on discussions in an expert consultation organized by both Codex parent bodies, WHO and FAO[4]. The Governing Bodies of the FAO have not accepted the conclusions of this consultation. The lack of endorsement of one of the two parent bodies was not noted to the CCNFSDU delegates. In addition, CRD 19 described the results of a meeting held in Geneva on 17-18 July 2006. At this meeting, an

[4] Diet, nutrition and the prevention of chronic diseases. Report of a Joint WHO /FAO Expert Consultation. WHO Technical Report Series 916, Geneva, WHO, 2003.

alternative definition of dietary fibre was proposed, but the WHO did not provide this information to the Committee until the time of its November 2006 session. CCNFSDU delegates were provided with few details of the meeting other than its conclusion and had no opportunity to review either the scientific evidence discussed at the meeting or the experts invited to participate in the meeting. The FAO/WHO process followed in carrying out their current work does not meet the rules of either UN body on transparency of their activities.

WHO has subsequently submitted information concerning references reviewed during this meeting, but has not disclosed the names of the experts invited. In addition, WHO has indicated that scientific papers on seven topics discussed at the meeting are under preparation and peer-review, but has not provided any information concerning the timing or place of publication of these papers. WHO did provide a list of scientific articles related to various definitional and analytical aspects of dietary fibre. However, only four references related to comparisons of the definition contained in CRD 19 and the CCNFSDU definition, and WHO provided no detail concerning the conclusions of the papers. CCNFSDU members have been asked to comment, within a short period, on the merits of these two different definitions and are hampered by the lack of information provided by the WHO.

Scientific Basis

While there may be theoretical grounds for believing that "intrinsic" fibre consisting of plant cell wall material may have different effects from "added" fibre, there currently is no sound scientific basis demonstrating that "intrinsic" dietary fibre has different effects from "added" dietary fibre in foods. The arguments advanced by the FAO/WHO consultation appear to be based on speculation from associations found in epidemiological studies rather than direct experimental evidence. The fact that the reported intake of foods naturally high in fibre is associated with a lower risk of several non-communicable diseases is not good enough evidence for the beneficial effect of "intrinsic" dietary fibre over added (extrinsic) fibre if studies addressing added fibre are not considered and because different patterns of food also reflect different lifestyle patterns (smoking, exercise, drinking habits, socioeconomic status) which are associated with health outcomes.

Furthermore, using the term "intrinsic" dietary fibre to try to encapsulate the concept of plant cell wall material influencing the bioaccessibility of carbohydrates fails to take into account how the food may be used and what happens to it during cooking or processing. How that differs from added fibre is far from clear.

Consumption

Recommended adult daily intakes for total fiber in countries which have developed guidelines range from 21 – 40 g/day, and WHO has recommended that total fiber intake be 25 g/day. However, estimates of actual total dietary fiber consumption range from a low of 14 g/day to a high of 29, with only a few countries reporting fiber consumption at or above the WHO recommendation, and with most reported values below either national or WHO recommendations[5]. While some countries have broken their intake recommendations into separate levels for non-starch polysaccharides and total dietary fiber, consumption from a combination of the two sources lags behind recommended levels.

Traditional sources of intrinsic dietary fiber have been fruits, vegetables, and grains. However, availability of dietary fiber from these sources alone can be limited by factors such as income, geography, food storage, transportation, and seasonality. In recent years food scientists and manufacturers have developed new food constituents that have the physiological properties of virtually all polysaccharides, but can be produced from materials that are widely available; well-suited to inclusion in the diet in a variety of forms; stable and storable and not subject to seasonal availability. Examples of these products include fructo-oligosaccharides, oligofructose, galacto-oligosaccharides, gluco-oligosaccharides, xylo-oligosaccharides, polydextrose, resistant maltodextrins, β-cyclodextrins, β-glucans, resistant starches, gums, inulin, pectins, and modified cellulose products. Codex Members may review the inclusion of additional specific carbohydrate components in the definition of "dietary fibre" if new generally accepted scientific data become available.

[5] Dietary Fibre : Definition, Analysis, Physiology & Health. ILSI Europe, Brussels, 2006. Tables 8 and 9.

Given this difference between actual and recommended fiber consumption, any definition which excludes products which exhibit the essential physiological properties of fiber would not only not meet the Codex principle of protecting public health, but would actually work to the detriment of public health by limiting the range of foods which consumers know they can choose to raise their total fiber consumption.

Physiological Effects

The main feature that distinguishes fiber ingredients from their non-fiber counterparts is their poor digestibility in the small intestine. Most digestible carbohydrates are polysaccharides with alpha 1-4 and 1-6 glycosidic linkages. Dietary fiber ingredients resist digestion by mammalian gastrointestinal enzymes because they are predominantly linked by alpha and beta 1-2, 1-3, 1-4, 1-6, 2-1 etc. linkages. These linkages are present in numerous carbohydrates, irrespective of whether they reside within fruits and vegetables, extracted fractions of fruits and vegetables, or synthetic polysaccharides. As a result of the poor digestibility of these materials, undigested matter enters the large intestine where it is partially or completely fermented. This fermentation gives rise to the beneficial physiological effects described below.

The wide variety of potential fiber ingredients all exhibit the main property of non-digestibility in the human small intestine and this is reflected in the CCNFSDU definition. Beyond these core criteria, each fiber ingredient may provide other physiological benefits at different levels based on the degree of fermentation by micoflora of the large intestine. These effects include, among others, improvement of large bowel function, lowering of blood cholesterol levels, moderation of post-prandial blood glucose and insulin levels.

Health Benefits of Fiber Consumption

The range of products meeting the CCNFSDU definition share the characteristic of being fully or partially fermented by microflora in the large intestine. The short-chain fatty acids produced during this fermentation have been shown to have a range of effects including absorption of procarcinogens; inhibition of growth of harmful yeast and bacteria; increasing mineral absorption; reducing food intolerance and allergy; stimulation of health intestinal flora; reduction of undesirable compounds and production of digestive enzymes and B vitamins[6]. In turn, these effects have been linked with health benefits including improved bowel function, reduction in colorectal cancer, reduction in coronary heart disease and diabetes management. While most epidemiological studies demonstrating these benefits have been based on association with consumption of whole grain products, the levels of important short chain fatty acids produced by carbohydrate polymers obtained by physical, enzymatic, chemical or synthetic means are similar to those obtained from products such as oat and wheat bran[7].

Conclusion

In summary, ICGMA believes that finalization of an international definition of dietary fibre is a high priority for Codex and will benefit industry and consumers. Such a definition should reflect a scientific consensus as much as possible.

The proposals put forth by the FAO/WHO Expert Working Group in CRD 19 do not consider consumer trends or understanding, market reality, or innovations in modern processing and developments in methods of analysis. Importantly they would reverse the long-debated consensus decision on the definition of dietary fibre attained at the 2005 CCNFSDU meeting in Bonn, setting the fibre debate back more than 10 years. Therefore, ICGMA supports adoption of the definition proposed for final adoption at the 28th session of CCNFSDU (ALINORM 06/29/26).

[6] ILSI, Box 4.

[7] ILSI, Table 10.

IDF - International Dairy Federation

SUMMARY

At the 27th CCNFSDU meeting in Bonn/Germany in November 2005, a definition for dietary fibre was adopted at Step 6 in the framework of the Codex Guidelines for the Use of Nutrition Claims. The proposed definition covers polymers with a degree of polymerisation (DP) not lower than 3. This proposal excludes indigestible disaccharides (DP of 2), which can also be regarded as dietary fibres. IDF is in favour of deleting the reference to the DP and the word "polymer", in order to have a definition that uses resistance to digestion and absorption in the human small intestine as the key element of dietary fibre.

At the 28th CCNFSDU meeting in Chiang Mai/Thailand in November 2006, a FAO/WHO proposal for a definition of dietary fibre was distributed with a conference room document CRD 19. The Committee agreed to return the Draft Table of Conditions for Nutrient Contents containing provisions on dietary fibre to step 6 and to issue a Circular Letter asking for comments and additional input on the definition and other provisions of dietary fibre.

The IDF supports the fact that intrinsic plant cell wall polysaccharides are regarded as an important source of dietary fibre as stated by FAO/WHO. However, more recent scientific knowledge demonstrates that other sources of dietary fibre have been widely recognized as dietary fibre as well (e.g., AACC, Health Council of the Netherlands, IOM). Therefore, IDF would like to resubmit its earlier proposal for a definition of dietary fibre, which is based on the latest science and reads as follows:

Dietary fibre means edible carbohydrates[1], which are neither digested nor absorbed in the human small intestine.

Dietary fibre consists of one or more of:
- Edible carbohydrates naturally occurring in the food as consumed,
- carbohydrates, which have been obtained from food raw material by physical, enzymatic or chemical means,
- synthetic carbohydrates.

1. When derived from plant origin, dietary fibre may include fractions of lignin and/or other compounds when … (continue current footnote in Appendix III of Alinorm 06/29/26).

This document consists of the following sections:

1. Currently proposed Codex definition of dietary fibre
2. Proposal for modifications
3. Explanation and justification for the proposed definition
4. FAO/WHO proposal
5. Conclusion
6. References

1. CURRENTLY PROPOSED CODEX DEFINITION OF DIETARY FIBRE

The currently proposed Codex definition of dietary fibre is as follows:

> Definition[8]
> Dietary fibre means carbohydrate polymers[9] with a degree of polymerisation (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of

[8] From: Report of the 27th session of the Codex Committee on Nutrition and Foods for Special Dietary Uses. Bonn, Germany, 21- 25 November 2005 (page 62) and Appendix III of Alinorm 06/29/26.

polymerisation not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average DP of a mixture. Dietary fibre consists of one or more of:

- Edible carbohydrate polymers naturally occurring in the food as consumed,
- carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means,
- synthetic carbohydrate polymers.

Dietary fibre generally has properties such as:

- Decrease intestinal transit time and increase stools bulk
- Fermentable by colonic micro flora
- Reduce blood total and/or LDL cholesterol levels
- Reduce post-prandial blood glucose and /or insulin levels.

2. PROPOSAL FOR MODIFICATIONS

The proposed Codex definition of dietary fibre includes carbohydrate polymers with a degree of polymerisation (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. The provision of DP not lower than 3 is intended to exclude mono- and disaccharides.

The IDF supports the physiological approach of the proposed Codex definition. We suggest therefore using resistance to digestion and absorption in the human small intestine as the key element of dietary fibre (instead of the combination of degree of polymerisation and resistance to digestion and absorption in the small intestine) for the following reasons:

- The proposed Codex definition would exclude indigestible disaccharides (DP of 2), which can also be regarded as dietary fibres. Examples of these disaccharides are found in preparations of galacto-oligosaccharides (GOS). These disaccharides cannot be broken down by the enzymes of the human small intestine. This means that they are neither digested nor absorbed in the human small intestine.
- Current scientific definitions of dietary fibre from authoritative bodies such as AACC, Health Council of the Netherlands and IOM, do not make any reference to the degree of polymerisation.
- Current scientific definitions of dietary fibre from these authoritative bodies contain as central important element of dietary fibre the indigestibility in the human small intestine.
- The digestible saccharides, such as the monosaccharides glucose and fructose (DP of 1), the disaccharides sucrose and lactose (DP of 2), and the oligo- and polysaccharides containing maltodextrins (DP > 3) are already excluded from the definition by the statement “which are neither digested nor absorbed in the human small intestine” (assuming that the definition relates to nutrition for healthy human beings). Therefore, in our opinion the use of the term degree of polymerisation is redundant.

Therefore, we propose the following definition:

[9] When derived from a plant origin, dietary fibre may include fractions of lignin and/or other compounds when associated with polysaccharides in the plant cell walls and if these compounds are quantified by the AOAC gravimetric analytical method for dietary fibre analysis: Fractions of lignin and the other compounds (proteic fractions, phenolic compounds, waxes, saponins, phytates, cutin, phytosterols, etc.) intimately “associated” with plant polysaccharides are often extracted with the polysaccharides in the AOAC 991.43 method. These substances are included in the definition of fibre insofar as they are actually associated with the poly- or oligosaccharidic fraction of fibre. However, when extracted or even re-introduced into a food containing non digestible polysaccharides, they cannot be defined as dietary fibre. When combined with polysaccharides, these associated substances may provide additional beneficial effects.

Dietary fibre means edible carbohydrates[1], which are neither digested nor absorbed in the human small intestine.

Dietary fibre consists of one or more of:

- Edible carbohydrates naturally occurring in the food as consumed,
- carbohydrates, which have been obtained from food raw material by physical, enzymatic or chemical means,
- synthetic carbohydrates.

[1)] When derived from a plant origin, dietary fibre may include fractions of lignin and/or other compounds when……(continue current footnote in Codex proposal, see footnote 2 of this document)

Depending on the type of dietary fibre, the following properties can be observed:

- Decrease transit time and increase stools bulk
- Fermentable by colonic microflora
- Reduce blood total and/or LDL cholesterol levels
- Reduce post-prandial blood glucose and/or insulin levels.

3. EXPLANATION AND JUSTIFICATION FOR THE PROPOSED DEFINITION

Carbohydrates and dietary fibers

Carbohydrates & Polymerisation

Carbohydrates consist of monosaccharides (or monomers) such as glucose, galactose and fructose. The type of monosaccharide and the number of monosaccharides differ for different carbohydrates as can be seen from Figure 1. A monosaccharide has just one ring, a disaccharide has two and a polysaccharide has many. The degree of polymerisation (DP) refers to the number of monosaccharides in a carbohydrate. For example, in figure 1 the disaccharide (sucrose) has a DP of 2 (one fructose unit linked to one glucose unit). If another fructose unit would be added, the DP would be 3.

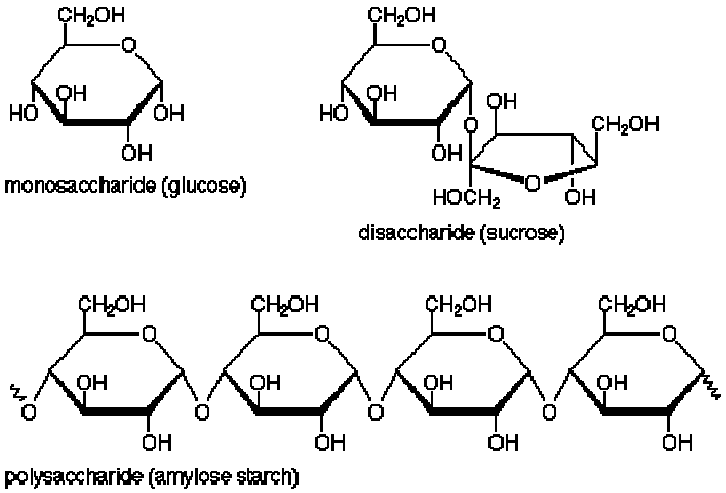

Figure 1. Examples of carbohydrates.

What makes a carbohydrate a dietary fibre?

Carbohydrates can be digestible as well as indigestible. Digestible carbohydrates will be broken down and absorbed in the first part of the human gastrointestinal tract. Digestion occurs mainly in the human small intestine through the action of a number of carbohydrate splitting enzymes (e.g. α-amylase and glucosidases). Examples of digestible carbohydrates are for instance sucrose and lactose with a DP of 2 and maltodextrins with a DP > 3.
Indigestible carbohydrates will not be broken down in the first part of the gastrointestinal tract, as the links between the monosaccharide molecules of indigestible carbohydrates are resistant to the carbohydrate splitting enzymes. Therefore they reach the large intestine (colon) intact. Examples of these indigestible carbohydrates are galacto-oligosaccharides with a DP of 2 to 8, and inulin with a DP of 3 to 60.
The indigestible carbohydrates can be regarded as dietary fibre. Small intestinal digestibility is the main feature in the distinction between carbohydrates and dietary fibre. Indigestibility can be measured by means of in-vitro as well as in-vivo methods.

Current definitions on dietary fibre

Various publications of respectable organisations have defined dietary fibre in a more broad perspective than the current Codex proposal for dietary fibre definition (AACC, 2001; Gray, 2006, Health Council of the Netherlands, 2006; IOM, 2002; Jones et al. 2004; Asp, 2004; Tungland and Meyer, 2002; De Vries, 2004) (see frame). The important central element in all these definitions is the indigestibility of dietary fibre in the human small intestine.

Current definitions of dietary fibre:

American Associations of Cereal Chemists (AACC, 2001):
"Dietary fibre is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Dietary fibre includes polysaccharides, oligosaccharides, lignin, and associated substances. Dietary fibres promote beneficial physiological effects including laxative effects and/or blood cholesterol attenuation, and/or blood glucose attenuation."
This definition of the AACC recently has been confirmed by the AOAC (De Vries, 2004)

Institute of Medicine of the National Academies (IOM, 2002):
"Dietary fibre consists of non digestible carbohydrates and lignin that are intrinsic and intact in plants. Functional fibre consists of isolated, non digestible carbohydrates and lignin that have beneficial physiological effects in humans. Total fibre is the sum of dietary fibre and functional fibre".

Health Council of the Netherlands (2006):
"Dietary fibre is the collective term for a group of substances that are not digested or absorbed in the human small intestines and which have the chemical character of carbohydrates, compounds analogous to carbohydrates, lignin, or substances related to lignin."

Superior Health Council Belgium(2006)
Dietary fibres are described as a group of very heterogenous nutrients as regards chemical structure, but which are characterised by their resistance to digestive enzymes secreted by or occurring in the human or animal gastrointestinal tract. Described examples of dietary fibres are e.g. pectins, oligosaccharides, resistant starch, cellulose and lignin.

Current Codex Alimentarius definition (CAC/GL 2-1985, Rev. 1 – 1993)
"Dietary fibre means edible plant and animal material not hydrolysed by the endogenous enzymes of the human digestive tract as determined by the agreed upon method."

All these definitions are concordant in the following ways:

1. They do not contain a reference to the degree of polymerisation (DP) such as in the current Codex proposal (DP≥3) for a definition of dietary fibre. Therefore, all these definitions include resistant oligosaccharides and also resistant starch and lignin. The current Codex proposal would exclude the indigestible disaccharides (DP = 2), which can also be regarded as dietary fibres.
2. In all these definitions the important, central element is the indigestibility of dietary fibre in the human small intestine. The indigestibility is the key feature in the distinction between carbohydrates and dietary fibre.

Furthermore, a number of these definitions require that components included are not only indigestible in the human small intestine, but also have beneficial physiological effects typical for dietary fibre. Based on the above definitions, we suggest the removal of the terms "degree of polymerisation" and "polymers" from the current proposed Codex definition and instead use "resistance to digestion" and "absorption in the human small intestine" as the key feature of dietary fibre (see our proposal in paragraph 2)

4. FAO/WHO PROPOSAL

The FAO/WHO proposed in CRD 19 at the CCNFSDU meeting 2006 the following definition for dietary fibre:
"Dietary fibre consists of intrinsic plant cell wall polysaccharides".

Other fibres
The IDF definitely agrees that the intrinsic plant cell wall polysaccharides in vegetables, fruit and cereals are an important source for dietary fibre consumption. However, recent science shows that other sources have also been widely recognized as dietary fibres, which have not been included in the proposed FAO/WHO definition. Examples of these other types of fibres are: galacto-oligosaccharides (GOS), resistant starch, fructo-oligosaccharides (FOS; oligofructose), polyfructose, gluco-oligosaccharides, xylo-oligosaccharides (XOS), beta-cyclodextrins, resistant maltodextrins and other maltodextrins, polydextrose and modified celluloses, such as methyl- and hydroxypropylmethyl celluloses (Gray, 2006).
These substances have been regarded as dietary fibres by several respectable organisations (e.g., AACC, Health Council of the Netherlands and IOM). These substances exhibit similar physiological effects (Sungsoo and Dreher, 2001), and contribute to adequate fibre consumption. To use the term "dietary fibre" exclusively as a marker of fruit, vegetables and grains intake would undervalue the intake of dietary fibre in the modern diet.

Furthermore, the current Codex definition of dietary fibre in the Codex Guidelines on Nutrition Labelling (CAC/GL 2-1985, paragraph 2.7) also includes other sources than plant material in the definition of dietary fibre. They have defined dietary fibre as "Edible plant and animal material not hydrolysed by the endogenous enzymes of the human digestive tract as determined by the agreed upon method."

Physiologically based and indigestibility
According to Gray (2006), there is a consensus that a physiologically based definition is necessary. The proposed definition by WHO/FAO is, however, not physiologically based. The physiological property "indigestibility" was already a key element in the definition of dietary fibre in the first definitions ever occurring, e.g., the definition of Hipsley in 1953 and Torwell and others in the early seventies (see Tungland & Meyer, 2002). Recently published scientific literature on the definition of dietary fibre shows that various respectable organisations use small intestinal digestibility as the main feature in the distinction between digestible carbohydrates and dietary fibre (see the definitions in the frame in section 3).

Analysis
We support the opinion that it is inappropriate to relate the definition to a particular analytical method. In order to validate labelling declarations and claims, different methods exist for measurement of the dietary fibre content in different foods.
The proposed Codex Alimentarius Commission definition of dietary fibre includes a specified list of AOAC analytical methods on the basis that this methodology is used worldwide for routine analysis. In addition to methods AOAC 985.29 and 991.43 for total dietary fibre in most foods, methods AOAC 995.16, 2002.02, 999.03, 997.08, 2001.02, 2001.03 and 2000.11 can be used for complementary measurement of dietary fibre currently in use (Gray, 2006).

5. CONCLUSION

The IDF would like to propose the following modification to the current proposed Codex definition:

> Dietary fibre means edible carbohydrates[3] ~~polymers[10] with a degree of polymerisation (DP) not lower than 3~~, which are neither digested nor absorbed in the human small intestine.
>
> Dietary fibre consists of one or more of:
> - Edible carbohydrates polymers naturally occurring in the food as consumed,
> - carbohydrates polymers, which have been obtained from food raw material by physical, enzymatic or chemical means,
> - synthetic carbohydrates polymers.

This definition will exclude the mono- and disaccharides because they are readily digestible in the small intestine, but will include the indigestible oligosaccharides and fibres from other origins than plant cell walls, which are also considered to be dietary fibres.

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[10] When derived from a plant origin, dietary fibre may include fractions of lignin and/or other compounds when associated with polysaccharides in the plant cell walls and if these compounds are quantified by the AOAC gravimetric analytical method for dietary fibre analysis: Fractions of lignin and the other compounds (proteic fractions, phenolic compounds, waxes, saponins, phytates, cutin, phytosterols, etc.) intimately "associated" with plant polysaccharides are often extracted with the polysaccharides in the AOAC 991.43 method. These substances are included in the definition of fibre insofar as they are actually associated with the poly- or oligosaccharidic fraction of fibre. However, when extracted or even re-introduced into a food containing non digestible polysaccharides, they cannot be defined as dietary fibre. When combined with polysaccharides, these associated substances may provide additional beneficial effects.

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IFAC - International Food Additives Council

IFAC supports adoption at the 29th Session of the Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) and by the Codex Alimentarius Commission (CAC) the definition of dietary fibre proposed for final adoption at the 28th Session of CCNSFDU in November 2006 (ALINORM 06/29/26): *Dietary fibre means carbohydrate polymers with a degree of polymerisation (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of polymerisation not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average DP of a mixture. Dietary fibre consists of one or more of edible carbohydrate polymers occurring in the food as consumed; carbohydrate polymers naturally occurring in the food as consumed, carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means; synthetic carbohydrate polymers.*

The issue of a definition for dietary fibre has been under thorough discussion and debate by CCNFSDU for almost a decade. Over this time, consensus has developed, based on clear scientific evidence, that the definition of dietary fibre should be based on the physiological properties of food constituents, not merely on their physiochemical characteristics. This consensus is reflected in the definition developed in CCNFSDU and numerous other definitions, including those of the National Academy of Sciences' Institute of Medicine, the Agence

Française de Sécurité Sanitaire des Aliments, the American Association of Cereal Chemists, the Health Council of the Netherlands and Food Standards Australia New Zealand. Each of these definitions is based on the physiological properties of non-digestion and non-absorption in the small intestine, coupled with one or more desirable health effects.

The proposals put forth by the FAO/WHO Expert Working Group in CRD 19 do not consider consumer trends or understanding, market reality, or innovations in modern processing and developments in methods of analysis. Importantly they would reverse the long-debated consensus decision on the definition of dietary fibre attained at the 2005 CCNFSDU meeting in Bonn, setting the fibre debate back more than 10 years.

While there may be theoretical grounds for believing that "intrinsic" fibre consisting of plant cell wall material may have different effects from "added" fibre, there currently is no sound scientific basis demonstrating that "intrinsic" dietary fibre has different effects from "added" dietary fibre in foods. The arguments advanced by the FAO/WHO consultation appear to be based on speculation from associations reported in epidemiological studies rather than direct experimental evidence. The fact that the reported intake of foods naturally high in fibre is associated with a lower risk of several non-communicable diseases is not good enough evidence for the beneficial effect of "intrinsic" dietary fibre over added (extrinsic) fibre if studies addressing added fibre are not considered and because different patterns of food intake also reflect different lifestyle patterns (smoking, exercise, drinking habits, socioeconomic status) which are associated with health outcomes.

Furthermore, using the term "intrinsic" dietary fibre to try to encapsulate the concept of plant cell wall material influencing the bioaccessibility of carbohydrates fails to take into account how the food may be used and what happens to it during cooking or processing. How that differs from added fibre is far from clear.

Consumption

Recommended adult daily intakes for total fibre in countries which have developed guidelines range from 21 – 40 g/day, and WHO has recommended a total fibre intake of 25 g/day. However, according to *Dietary Fibre: Definition, Analysis, Physiology & Health. ILSI Europe, Brussels, 2006, Tables 8 and 9*, estimates of actual total dietary fibre consumption range from a low of 14 g/day to a high of 29, with only a few countries reporting fibre consumption at or above the WHO recommendation, with most reporting values below either national or WHO recommendations. While some countries have broken their intake recommendations into separate levels for non-starch polysaccharides and total dietary fibre, consumption from a combination of the two sources lags behind recommended levels.

Traditional sources of dietary fibre have been polysaccharides found in fruits, vegetables, and grains. However, availability of dietary fibre from these sources can be limited by factors such as income, geography, food storage, transportation, and seasonality. In recent years food scientists and manufacturers have developed new food constituents that have the physiological properties of virtually all polysaccharides, but can be produced from materials that are widely available; well-suited to inclusion in the diet in a variety of forms; stable, storable and not subject to seasonal availability. Examples of these products include fructo-oligosaccharides, oligofructose, galacto-oligosaccharides, gluco-oligosaccharides, xylo-oligosaccharides, polydextrose, resistant maltodextrins, β-cyclodextrins, resistant starches, gums, inulin, pectins and modified cellulose products. Codex members may review the inclusion of additional specific carbohydrate components in the definition of "dietary fibre" if new generally accepted scientific data become available.

Given this difference between actual and recommended fibre consumption, any definition which excludes products which exhibit the essential physiological properties of fibre would not only not meet the Codex principle of protecting public health, but would actually work to the detriment of public health by limiting the range of foods which consumers know they can choose to raise their total fibre consumption.

Physiological Effects

The wide variety of potential fibre ingredients all exhibit the main property of non-digestibility in the human small intestine and this is reflected in the CCNFSDU definition. Beyond these core criteria, each fibre ingredient may provide other physiological benefits at different levels based on the degree of fermentation by microflora of the large intestine. These effects include, among others, improvement of large bowel function, lowering of blood cholesterol levels, lowering of post-prandial blood glucose and insulin levels.

The main feature that distinguishes fibre ingredients from their non-fibre counterparts is their poor digestibility in the small intestine. Most digestible carbohydrates are polysaccharides with alpha 1-4

and 1-6 glycosidic linkages. Dietary fibre ingredients resist digestion by mammalian gastrointestinal enzymes because they are predominantly linked by alpha and beta 1-2, 1-3, 1-4, 1-6, 2-1 etc. linkages. These linkages are present in numerous carbohydrates, irrespective of whether they reside within fruits and vegetables, are extracted fractions of fruits and vegetables, or are synthetic polysaccharides. As a result of the poor digestibility of these materials, undigested matter enters the large intestine where it is partially or completely fermented. This fermentation gives rise to the beneficial physiological effects described below.

Health Benefits of Fibre Consumption

The range of products meeting the CCNFSDU definition share the characteristic of being fully or partially fermented by microflora in the large intestine. The short-chain fatty acids produced during this fermentation have been shown to have a range of effects including absorption of procarcinogens; inhibition of growth of harmful yeast and bacteria; increasing mineral absorption; reducing food intolerance and allergy; stimulation of health intestinal flora; reduction of undesirable compounds and production of digestive enzymes and B group vitamins (*ILSI, Box 4*). In turn, these effects have been linked with health benefits including improved bowel function, reduction in colorectal cancer, reduction in coronary heart disease and diabetes management. While most epidemiological studies demonstrating these benefits have been based on association with consumption of whole grain products, the levels of important short chain fatty acids produced by carbohydrate polymers obtained by physical, enzymatic, chemical or synthetic means are similar to those obtained from products such as oat and wheat bran (*ILSI, Table 10*).

Transparency in the Codex Process

The consideration of adoption of a definition of dietary fibre by CCNFSDU was interrupted by the last-minute introduction of CRD 19 by the representative of the WHO. This document was based on discussions in an expert consultation organized by both Codex parent bodies, WHO and FAO (*Diet, Nutrition and the Prevention of Chronic Diseases – Report of a Joint WHO/FAO Expert consultation – WHO Technical Report Series 916, Geneva, WHO, 2003*). The Governing Bodies of the FAO have not accepted the conclusions of this consultation. The lack of endorsement of one of the two parent bodies was not noted to the CCNFSDU delegates. In addition, the CRD presented the results of a meeting held in Geneva on 17-18 July 2006 at which, according to the CRD, an alternative definition of dietary fibre was proposed, but the WHO did not provide this information to the Committee until the time of the meeting. CCNFSDU delegates were provided with few details of the consultation other than its conclusion and had no opportunity to review either the scientific evidence discussed at the consultation or the experts invited to participate in the consultation. The FAO/WHO process followed in carrying out their current work does not meet the rules of either UN body on transparency of their activities.

WHO has subsequently submitted information concerning references reviewed during this consultation, but has not disclosed the names of the experts invited. In addition, WHO has indicated that scientific papers on seven topics discussed at the meeting are under preparation and peer-review, but has not provided any information concerning the timing or place of publication of these papers. WHO did provide a list of scientific articles related to various definitional and analytical aspects of dietary fibre. However, only four references related to comparisons of the definition contained in CRD 19 and the CCNFSDU definition, and WHO provided no detail concerning the conclusions of the papers. CCNFSDU members have been
asked to comment, within a short period, on the merits of these two different definitions and are hampered by the lack of information provided by the WHO.

Again, IFAC supports adoption of the definition of dietary fibre presented for discussion at the 28th CCNSFDU session (ALINORM 06/29/26) and urges its adoption at the 29th CCNSFDU and by the CAC.

IFT - Institute of Food Technologists

CX 5/20 CL 2007/3-NFSDU requests comments on the definition for dietary fibre that was under consideration by CCNFSDU and the definition proposed in Conference Room Document (CRD) 19 entitled "FAO/WHO Scientific update on carbohydrates in human nutrition," that was issued by the 28th Session of the CCNFSDU. CRD 19 put forth a substantially different definition of dietary fibre and specified a single method of analysis differing from those that were developed by CCNFSDU during its deliberations. The definition and related provisions for dietary fibre developed by CCNFSDU advanced to Step 7 prior to presentation of the CRD. In essence, the position presented in CRD 19 adopted a much more restrictive viewpoint of what constitutes dietary fibre. The stated rational for the viewpoint was to more closely link dietary fibre to fruits, vegetables, and whole grains.

IFT's Position

In IFT's viewpoint, the proposals presented in CRD 19 ignore the substantial progress in scientific understanding of the role of fibre in human nutrition and the mechanisms of its actions and are, therefore, scientifically unfounded and will not substantially improve health messages related to the consumption of fruits, vegetables and wholegrain foods. In addition, adoption of the proposals in CRD 19 will unnecessarily increase the time, labor and costs to individual countries wishing to trade food products internationally as well as those of food producers that may need to maintain two methods of analysis to comply with national and CODEX labeling specifications. Detailed comments follow to support IFT's position.

Definition of Dietary Fibre

The definition of dietary fibre proposed in CRD 19 is most similar to that of Crude Fibre put forth by Trowell (Trowell 1972b; Trowell 1972a) some 35 years ago in connection with historical and cross-cultural comparisons that suggested that high dietary fibre intakes may be associated with risk reduction for ischemic heart disease. Trowell himself (Trowell 1976; Trowell, et al. 1976) recognized the inadequacy of the definition with regard to chemical composition of dietary fibre and presented a modified definition that included the key linking feature of non-digestibility by alimentary enzymes in 1976. In 1995, noting the need for a common definition of dietary fibre and development of methods to support (not define) that definition for regulatory purposes, Lee and Prosky (Lee and Prosky 1995) sent out a survey designed to collect opinions of an international group of dietary fibre experts from which a consensus definition of dietary fibre could be developed. The authors sent out 220 surveys, and collected opinions from 147 experts identified by name and affiliation. The results of that survey showed considerable expert agreement in several key elements contained in most modern definitions of dietary fibre, including the one currently proposed by CCNFSDU, that are in contrast to the definition proposed in CRD 19. The majority of experts (70.3%) had concluded that dietary fibre should be defined from both physiological and chemical perspectives, while only 9 persons (6%) believed dietary fibre was exclusively non-starch polysaccharides (NSP), and only 5 persons (3%) supported the definition of dietary fibre as plant cell wall materials. Indeed, the overwhelming majority (79%) agreed that the chemical entity of dietary fibre is not limited to NSP from plant cell wall origin as described in Englyst et al. (1994) and Southgate (1992) (citations in Lee and Prosky 1995). A recent large-scale effort funded by the European Union Network for Excellence project on "European Food Information Resources (EuroFIR)" represents the first attempt to standardize nutrient databases (NDBs) across the 10 European countries participating in the European Investigation into Cancer and Nutrition (EPIC) study (Slimani, et al. 2007). Termed the EPIC NDB (or ENDB), this information resource is intended ultimately to harmonize and standardize nutrient information for the more than 20 EU countries. The methods selected for this project represent both nutritional and analytic consensus. ENDB adopted the (AOAC) gravimetric method for Total Dietary Fibre (FIBT or TDF), noting that AOAC TDF gives comparable values to NSP for fruits and vegetables (not potatoes and tubers, however) which are typically low in lignin and resistant starch, the material not measured by NSP analytical techniques (Englyst, et al. 1994). This publication noted that of the participating countries, only the UK and Greece used NSP as the method for dietary fibre determination.

Importantly, some of the associations noted in early broad comparisons have been upheld in subsequent well-designed epidemiological studies within individual countries using values for dietary fibre measured using the AOAC methods proposed in conjunction with the CCNFSDU's definition of dietary fibre (Medicine 2002; Gray 2006 and references therein). The AOAC methods currently employed in most well designed epidemiologic studies have also proven to be capable of discrimination among several chronic diseases thought to be associated with reduced fibre intakes. For example, early predictions by Trowell (Trowell 1976) and Burkitt and colleagues (Burkitt, et al. 1972) regarding colorectal cancer risk and dietary fibre intakes using similarly broad cross-cultural and historic comparisons have not been as readily shown as those for cardiovascular disease. The discriminatory capacity of AOAC methods were shown in the outcomes of the largest publicly held deliberation of evidence-based scientific outcomes conducted to date. The Food and Nutrition Board of the Institute of Medicine charged the Panel on the Proposed Definition of Dietary Fibre (Medicine 2001) and the Panel on Dietary Reference Intakes for Macronutrients (Medicine 2002) to develop a definition for dietary fibre and establish recommended intake levels for fibre that would replace previously published Recommended Dietary Allowances (RDAs) and Recommended Nutrient Intakes (RNIs) in the United States and Canada, respectively (Medicine 2001, Medicine 2002). Experts deliberating in a public forum concluded that there was substantial evidence to support recommended intake levels designed to reduce risk of cardiovascular disease, and the co-morbid condition of insulin resistance, to reduce diverticular disease and to improve colonic health issues related to impaired laxation. They were unable to conclude overwhelming evidence existed for risk reduction in colorectal cancer and found inadequate data to make conclusions regarding obesity and weight control. The FAO/WHO 2003 Report on Diet, Nutrition and the Prevention of Chronic Diseases (FAO/WHO 2003) found sufficient data to conclude that high fibre intakes were protective against weight gain. That report noted that in the literature reviewed there was no difference between fibre type or between fibre consumed in food or as supplements in the case of weight control.

Adequacy of AOAC Methods for Nutritional Research and Independence of CRD 19 Experts

A study by Fuchs et al. (Fuchs, et al. 1999) contributed to the evidence base used by the DRI committee. This study was notable in two ways; firstly, it failed to find a relationship between dietary fibre intake and colorectal disease, and secondly, this study provoked a series of letters from readers – including CX 5/20 CL 2007/3-NFSDU identified expert Dr. Cummings – to which Fuchs et al. made effective rebuttals (Various 1999). Issues raised by readers centered on the validity of fibre measurements made per se, with Drs. Southgate and Cummings indicating that the method of Englyst (Englyst, et al. 1994) for NSP should have been used to evaluate the relationship between diet and colorectal disease. In the rebuttal, Fuchs et al. noted that they found strong inverse associations between dietary fibre intake as measured by their methodology and risk of symptomatic diverticular disease, coronary heart disease, hypertension and non-insulin-dependent diabetes. In a separate publication (Goodlad and Englyst 2001), another CX 5/20 CL 2007/3-NFSDU identified expert, Dr. H.N. Englyst, found inclusion of the concept of non-digestible carbohydrates in the definition of fibre "very worrying" and that the IOM's definition (Medicine 2002) "potentially a recipe for disaster." However, in a 1997 study of which Dr. Englyst is a co-author directly compared the relationship between fibre and colorectal cancer risk with fibre measured as Crude Fibre, Dietary Fibre and NSP. All three methods of fibre measurement found strong, dose-dependent inverse association between vegetable fibre intake and colorectal cancer risk (Le Marchand, et al. 1997). Both the studies of Fuchs et al. and Le Marchand et al. underscore the complex relationship between fibre consumption and colorectal cancer risk, and its dependence upon a number of factors other than the method of fibre measurement. It was noted (Willett and Hu 2006) in a recent Point/Counterpoint commentary, that "lack of support in large prospective studies for several favored diet-cancer hypotheses" often underlie methodological concerns for fully adequate techniques. The opinion that NSP as measured by the Englyst method is the only suitable method for dietary fibre measurement was expressed by the experts who prepared CRD19 as long ago as 1987 (Englyst, et al. 1987). The published comments of Cummings and Englyst indicate that while expert, these individuals do not meet the FAO/WHO criteria of independence "i.e., not having any specific inclination nor position on the issues nor belonging to any specific school of thought" specified in CRD 19.

Utility and Merit of the NSP Measurement

As noted earlier, the more restrictive viewpoint of dietary fibre definition presented in CRD 19 requires the use of the NSP method of analysis for fibre. This is the only method that excludes lignin from the analysis of dietary fibre in intact plant foods —see (Medicine 2001; Gray 2006; Kiriyama, et al. 2006), indeed, even Trowell et al. (Trowell, et al. 1976) included lignin in his 1976 definition. While lignin itself has poorly documented nutritional qualities, it is an intrinsic component of woody plants that arises from the same metabolic pathway that gives rise to phytochemical antioxidants such as flavonoids (Zabala, et al. 2006). A 2004 study (Begum, et al. 2004) found that dietary lignins are precursors to mammalian lignans, which have documented nutritional qualtities (Slavin 2004). Notably, the AOAC Method 994.13 entitled "Total Dietary Fibre Determined on Neutral Sugar Residues, Uronic Acid Residues and Klason Lignin" can be used to provide the NSP values deemed necessary by the experts.

The experts who developed the proposals contained in CRD19 assert that measurement of NSP alone can be used to "indicate the presence of other beneficial substances, such as micronutrients and phytochemicals that are present in the plant[11]." The experts provide no scientific references documenting the reliability of the approach to develop such inference on a qualitative basis, and rely on teleological arguments to support the claim that NSP measurements can accurately reflect the entire nutritional contribution of whole grain, fruit and vegetable consumption in relation to the health benefits provided by those food categories. Fruits, vegetables, and whole grains differ widely in the amount and composition of constituent fibres; secondary plant metabolites[12], vitamins and minerals. No studies on the possible systematic variation between these disparate plant components to the cellulose biosynthetic pathways or NSP measurements could be found in the peer-reviewed literature.

Interpretations of the 2003 WHO report on Diet Nutrition and the Prevention of Chronic Disease (FAO/WHO 2003) presented in CRD 19 are debatable. While the report uses the term NSP, it also noted that "the best definition of dietary fibre remains to be established, given the potential health benefits of resistant starch." This conclusion was followed with the further conclusion that "the recommended intake of fruits and vegetables (see below) and consumption of wholegrain foods is likely to provide > 20 g per day of NSP (>25 g per day of total dietary fibre)." This same report specifically listed fruits and vegetables as separate food categories noting that "the benefit of fruits and vegetables cannot be ascribed to a single or mix of nutrients and bioactive substances. Therefore, this food category was included rather than the nutrients themselves (FAO/WHO 2003)." Taken together, the report goes to lengths to clearly separate NSP from total dietary fibre, to limit NSP to one of many possible components of fruits, vegetables and whole grains to provide health benefit. It also maintains a clear separation between food category targets (Fruits, Vegetables and Whole grains) and food component (vitamins, minerals, protein, dietary fibre) targets that may be used for health and nutrition policy development within individual countries. This is the same position adopted by the Institute of Medicine (Medicine 2001; Medicine 2002). Epidemiological studies investigating links between consumption of specific food categories and health promotion (or more correctly disease risk reduction) look for correlations between specific food components within food categories to determine relative disease risks of specific dietary patterns (Hu 2003). This type of analysis can identify potentially fruitful areas to investigate mechanism of action, but cannot determine cause and effect relationships. Because epidemiological studies leave identified associations at a relatively obscure level of understanding, they are not used as the sole source of information in developing nutritional policy. This is particularly relevant to CODEX activities which engage a disparate group of nations whose populations consume culturally distinct foods. Mechanistic understanding and prediction for

11 CRD 19, page 6, lines 29-31.

12 Generally considered as nutritionally relevant phytochemicals, these compounds include flavonoids, isoflavones, isothiocyanates, monoterpenes, organosulfur compounds, saponins, capsaicinoids and phytosterols, and are estimated to constitute many thousands of individual molecules whose concentrations vary with plant type, plant part, cultivation and environmental exposures.

effective intervention to disparate populations requires direct testing, ultimately in the form of clinical intervention studies

The experts also assert that NSP measurements are "preferable to the determination of all the individual parts of plant cell wall material which is both impractical and would not add to the nutritional message that is provided by focusing on the polysaccharides of the plant cell wall." However, Larion et al (Lairon, et al. 2005), recently published a large scale epidemiologic study on the relationship between dietary fibre intake and risk factors for cardiovascular disease in French adults. This study used AOAC methods to update the French computerized CIQUAL NDB to specify separate values for Total, Soluble and Insoluble fibre in individual foods and provide information on food choices suitable for use by individuals to select a healthy diet. This study shows that component analysis is a practical approach that is readily implemented. Recall too that FAO/WHO (FAO/WHO 2003) found fibre-mediated weight control to not differ between fibre type or between fibre consumed in food or as supplements.

Within CRD 19[13] the experts present the argument that digestibility is an inappropriate feature for a definition of dietary fibre as "most nutrients and food components are defined and measured as chemical substances…and not by their alleged functions." Digestibility is not a function of a food but a physiological property. In vitamin nutrition, physiological properties are considered in definitions. For example, differential retention of tocopherol and tocotrienol isomers within the body despite similar ex vivo antioxidant properties has led to specification of RRR- α-tocopherol alone being defined as Vitamin E (Medicine 2000).

Several official Committees and Panels noted in their deliberations that NSP is considered a complex methodology (Medicine 2001; Gray 2006) not suited to routine analysis. The CCNFSDU noted this same concern in their deliberations. The costing analysis presented in CRD 19 ignores the fact that the NSP method most often uses a GC or an HPLC and so the equipment and technical personnel costs may be substantially underestimated. Concerns regarding reproducibility, ease of use and analysis time must be addressed through cooperative laboratory comparison tests such as are conducted by AOAC prior to exclusive adoption of this single assay. The AOAC requires demonstrable reproducibility within a laboratory and among eight different laboratories to grant First Approval, a 2-year interval for public comment on the method is imposed before approving Final Action. AOAC members participated in a collaborative study to evaluate the Englyst NSP method as well as several other methods subsequently granted AOAC final action approval over a 10 year period starting in 1988 (Gordon 2007). Because of a continued lack of reproducibility within and among the participating laboratories, these NSP methods could not be certified by AOAC at that time. On a very practical level, NSP generates numerically different values compared to AOAC methods and would require the vast majority of food analyses to be redone, and food tables and policy documents revised. All of these undertakings represent substantial new costs that are not considered in CRD 19. The definition of dietary fibre and NSP assay proposed in CRD 19 clearly move away from consensus and harmonization of definition and methods that have been developing from the efforts of a number of individual countries, agencies and consortia (Lee and Prosky 1995, Medicine 2001; Medicine 2002; Lairon, et al. 2005; Gray 2006; Kiriyama, et al. 2006; Slimani, et al. 2007) that support the current CCNFSDU definition and methods of analysis for dietary fibre.

In Summary
In summary, IFT supports the definition that was under consideration by CCNFSDU and shown in Appendix III of Alinorm 07/30/26. This definition recognizes the substantial progress in scientific understanding of the role of fibre in human nutrition and its mechanisms of action.

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[13] CRD 19, Page 7, lines 33 -35.

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KEY POINTS

The main point ILSI wishes to communicate in response to Codex Alimentaruis Commission's (CAC) request for comments is that **the CCNFSDU definition of fibre given in Appendix III of Alinorm 06/29/26 best expresses current scientific understanding**. Other key points are summarized below with supporting information provided in the subsequent sections.

1. The finalization of a globally accepted definition of dietary fibre is an important objective which will have positive implications for scientists working in the field, for consumers, and for food manufacturers responding to consumer demand.
2. The definition should be based on the best available scientific evidence.
3. The definition should enable consumers to benefit optimally from the available scientific data.
4. The draft definition of dietary fibre circulated at the 27th Session of the CCNFSDU in 2005[14] was derived following extensive consultation and deliberation among a wide range of experts in the field. This definition, given in Appendix III of Alinorm 06/29/26, is a clear, unambiguous physiological definition that can be supported by chemical analyses.
5. The draft definition is in accord with the physiological properties of fibre, again, as listed in Appendix III of Alinorm 06/29/26.
6. The physiological properties of fibre in turn relate to its health benefits, both putative and those widely accepted within the scientific community.
7. The necessary AOAC International Official Methods of Analysis exist for the measurement of dietary fibre components in foods as per the CCNFSDU 2005 (Appendix III of Alinorm 06/29/26) proposed definition (ref – DeVries JW, Rader JI . J AOACI 88:1349-1366, 2005).
8. Thus, the 2005 proposed definition fulfills the criteria listed under points 2 and 3 above.
9. Encouraging increased consumption of fruits, vegetables and whole grains is also a laudable objective - one which has received almost global coverage. However, to use fibre determination as a marker to promote fruit and vegetable intake is not a fibre labelling concept, but relates to food-based dietary guidelines.
10. The following reference is recommended as further background: Gray J (2006) Dietary Fibre: Definition, Analysis, Physiology & Health. ILSI Europe Concise Monograph ISBN 90-78637-03-X. This Monograph has been developed by ILSI Europe in collaboration with experts in the field of dietary fibre. For convenience, it can be downloaded from the following web link: http://europe.ilsi.org/publications/Monographs/DietaryFibreCM.htm.
11. This definition agrees in terms of principle and methods with the AACC International definition for Dietary Fiber adopted by the AACCI Board of Directors in June, 2000. The ILSI North America Carbohydrates Technical Committee participated in the development of the AACC International definition by assembling a workshop of key government, academic and industrial scientists.

THE ISSUE

The Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) has been developing a definition of dietary fibre since 1998. At the CCNFSDU meeting in November 2006 the Committee considered a definition to forward to the Codex Alimentarius for adoption at Step 8 at the

[14] Dietary fibre means carbohydrate polymers with a degree of polymerisation (DP) not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of polymerisation not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average DP of a mixture. Dietary fibre consists of one or more of:

- Edible carbohydrate polymers naturally occurring in the food as consumed
- Carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic or chemical means,
- Synthetic carbohydrate polymers.

2007 CAC meeting. During discussion the representative of the World Health Organization introduced an alternative concept (CRD19), a concept limiting dietary fibre to "intrinsic plant cell wall polysaccharides". In response the Committee chair delayed action on the definition and has requested comments on both the original CCNFSDU definition and the one proposed by WHO.

ILSI COMMENTS

The issue of a definition for dietary fibre has been thoroughly discussed and debated in the scientific community for many years. A consensus has developed, based on clear scientific evidence, that the definition of dietary fibre should be based on the physiological properties of food constituents, not merely on their physicochemical characteristics. This consensus is reflected in the original definition developed in CCNFSDU and numerous other definitions, including those of the US National Academy of Sciences Institute of Medicine, the Agence Française de Sécurité Sanitaire des Aliments, the American Association of Cereal Chemists and the Health Council of the Netherlands, among others. Each of these definitions is based on the physiological property of non-digestion and non-absorption in the small intestine, coupled with one or more desirable health effects.

The 'Intrinsic Cell Wall' (ICW) definition of CRD 19 has been proposed for over a quarter of a century. However, the ICW definition has not gained a common consensus in the scientific community, because it excludes non-digestible storage carbohydrates. The ICW definition has not been accepted for dietary fibre labelling purposes in the majority of the world's countries. In the UK, where the ICW approach was traditionally used, the Food Standards Agency in 2000 determined "The recommended reference procedure for analysis of dietary fibre is an AOAC International method, e.g. 991.43, 997.08," i.e. the methods applicable to the proposed CCFNSDU definition.

While there may be hypothetical grounds for believing that "intrinsic" fibre consisting of plant cell wall material may impart different effects compared to "extrinsic/added" fibre, there currently is no sound scientific basis demonstrating that "intrinsic" dietary fibre provide greater, or for that matter, different effects from "added" dietary fibre in foods. Studies using added fibre must also be considered in evaluating this question.

Support for the concept of "intrinsic" dietary fibre appears to be based on associations found in epidemiological studies rather than experimental evidence. The fact that the reported intake of foods naturally high in fibre is associated with a lower risk of several non-communicable diseases is not scientifically adequate to demonstrate that the beneficial effect of "intrinsic" dietary fibre outweighs those of added (extrinsic) fibre. In fact, the argument fails to recognize a large and growing body of scientific evidence on "added fibers' and/or "isolated non-digestible carbohydrates" derived from raw food materials by physical, chemical and enzymatic means or synthetic carbohydrate polymers that demonstrate similar physiological benefits to fibres from fruits, vegetables and grains. For example, isolated fibers

such as β-glucans, guar and psyllium show the same physiological and health benefits of their intact fibre counterparts[15].

Using the term "intrinsic" dietary fibre to try to encapsulate the concept of plant cell wall material influencing the bioaccessibility of carbohydrates fails to take into account how the food may be used and what happens to it on cooking or processing. How such effects differ from those generated by added fibre is far from clear.

ICW as dietary fiber is claimed to provide an ***indicator*** of the quantity of fruits, vegetables, and whole grains in the diet. The purpose of nutrition labelling on foods is to represent the ***content*** of nutrients in foods, dietary fiber being one. The Englyst method proposed is non specific and does not necessarily quantitate the level of cell wall components present, but rather any carbohydrate

polymer that is not digestible by amylase[16]. Further, there is no relationship between ICW and the quantity of fruits, vegetables, and whole grains in a food or diet since the quantity of cell wall material varies from one fruit, vegetable or whole grain to the next. The content of phytonutrients and micronutrients in foods and/or diets should be determined by specific and valid methods specific to the nutrient in question. Nutrition labelling is not intended to indicate the source of nutrients, but rather the content of the nutrient in a food.

RECOMMENDED INTAKE VERSUS ACTUAL FIBRE CONSUMPTION

Recommended adult daily intakes for total fibre consumption in countries which have developed guidelines range from 21 – 40 g/day, and WHO has recommended that total fibre intake be 25 g/day. However, estimates of actual total dietary fibre consumption range from a low of 14 g/day to a high of 29, with only a few countries reporting fibre consumption at or above the WHO recommendation, and with most reported values below either national or WHO recommendations[17]. Even for countries that have subdivided their intake recommendations into categories of non-starch polysaccharides and total dietary fibre, consumption still falls short of recommended levels.

Traditional sources of dietary fibre have been polysaccharides found in fruits, vegetables and grains. However, availability of dietary fibre from these sources can be limited by factors such as income, geography, food storage and transportation, and seasonality. In recent years, food scientists and manufacturers have developed new food constituents which have the physiological properties of plant-wall polysaccharides, but which can be produced from widely and readily available materials. They are well-suited to inclusion in the diet in a variety of forms. They are also stable and storable and not subject to seasonal availability. Examples of these products include inulin-type fructans (fructo-oligosaccharides, oligofructose, inulins), galacto-oligosaccharides, gluco-oligosaccharides, xylo-oligosaccharides, polydextrose, resistant maltodextrins, β-cyclodextrins resistant starches, gums, pectins and modified cellulose products.

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[15] Institute of Medicine (IOM). Dietary, Functional and Total Fiber, Chapter 7, and Macronutrients and Healthful Diets, Chapter 11. In Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Protein and Amino Acids. The National Academy of Sciences, Washington, D.C., USA, 2002/2005.

[16] Cho, S, DeVries, J.W., and Prosky, L. Dietary Fiber Analysis and Applications, AOAC International, 1997, Gaithersburg, MD, USA.

[17] Dietary Fibre: Definition, Analysis, Physiology & Health. ILSI Europe, Brussels, 2006. Tables 8 and 9.

Given the difference between actual and recommended fibre consumption, consumption of products that exhibit the essential physiological properties, irrespective of the origin, of the fibre would be expected to provide public health benefit. Limiting the definition of fiber to "intrinsic plant cell wall polysaccharides" not only discourages future scientific creativity and innovation, but may, as a result, limit public access to a greater variety of fiber-rich healthy foods.

HEALTH BENEFITS OF DIETARY FIBRE

The range of products that meet the 2005 CCNFSDU dietary fibre definition (Appendix III of Alinorm 06/29/26) share the core characteristics of being fully or partially fermented by microflora in the large intestine. As a result, each such ingredient may provide health benefits at different levels, partly depending on the degree and type of fermentation by microflora in the large intestine. Short-chain fatty acids produced during this fermentation, mediate a number of such beneficial effects, some directly and some indirectly. These effects include, among others, improved composition of intestinal flora, improvement of large bowel function, lowering of blood cholesterol levels, lowering of post-prandial blood glucose and insulin levels.

Other beneficial effects are the absorption or inactivation of procarcinogens, inhibition of the growth of harmful yeast and bacteria, increasing mineral absorption, reducing food intolerance and allergy, modulation of the production of gastrointestinal peptides, reduction of undesirable compounds and production of digestive enzymes and B group vitamins[18]. In turn, these effects have been linked with improved bowel function, improved bone health, reduction in coronary heart disease and improved diabetes management.

While most observational studies demonstrating these benefits have been based on association with consumption of whole grain products, human clinical studies have demonstrated similar beneficial effects for different carbohydrate polymers obtained by physical, enzymatic, chemical or synthetic means, food constituents which would be excluded in the proposed ICW definition. Moreover, the levels of important short chain fatty acids produced by their fermentation are similar to those obtained from products such as oat and wheat bran[19].

CONCLUSION

The dietary fiber definition that has been under development since 1998 by the CCCNFSDU, having reached step 7, accurately reflects the current state of scientific knowledge. Scientific evidence does not support limiting health benefits to "intrinsic cell walls" as dietary fiber. Moreover, "intrinsic" and "non-intrinsic" dietary fibre cannot be distinguished analytically.

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The concept of the nutritional consequences of dietary fibre arose from observations of the low prevalence of colon cancer, diabetes and CHD in parts of Africa, amongst people whose diets were high in unrefined carbohydrates, and whose stools were typically more frequent and bulkier than those observed in individuals consuming western more refined diets. Over the past decades considerable efforts have been dedicated to characterising the chemical nature of the dietary components of dietary fibre and especially those that might confer health benefits. Naturally occurring dietary fibre is derived exclusively from plant foods. Whole grains, and legumes when minimally processed are particularly concentrated sources of sources; however, vegetables and fruits also contain significant amounts.

[18] Dietary Fibre: Definition, Analysis, Physiology & Health. ILSI Europe, Brussels, 2006. Box 4.

[19] Dietary Fibre: Definition, Analysis, Physiology & Health. ILSI Europe, Brussels, 2006. Table 10.

More recently, individual components of dietary fibre which have been isolated from plant cell walls and synthetic carbohydrate polymers are increasingly entering the food supply.

Most cereals (grains) that we consume are refined, broken into pieces, and then refined by sifting away the bran, germ and, commonly the aleurone layer. This removes most of the fibre, oil, and B vitamins, as well as approximately 25% of the protein. Polishing, as often performed on rice, removes additional nutrients. Many high-income countries therefore fortify refined cereals, including flour, with B vitamins and iron to restore or increase what was originally present in the grain. The term whole grain should be reserved in those products that contain the constituents of the intact grain. Since there is presently no internationally accepted definition, whole grains are presently refined to a variable extent. The type and intensity of the processing affect the digestibility of the CHO, and also affects the physiological processes that occur in the large bowel thus, affecting health outcomes. Processed grains have a higher glycaemic responses than unprocessed grains, and, generally the greater the degree of processing, the greater the glycaemic index

Refined grains in the form of white rice, wheat bread, or pasta, are considered easier to cook, masticate and digest than whole grains; they are also lighter in colour – which makes them more attractive to some consumers; they also have a longer shelf-life than wholegrain products since they lack the bran; the oil in bran usually contains alpha-linolenic acid which goes rancid relatively quickly.

Breakfast cereals as consumed in industrialized countries also account for a significant proportion of grain eaten. Many breakfast cereals particularly in high-income countries, are based on grains (whole or refined), but also may contain a large proportion of added sugars, or sweeteners, salt and other additives. Traditionally, refined cereal milled products foods were considered more nutritious since they provide more energy per unit of weight and because they are easier to digest. However this categorization may need to be reconsidered in light of the present epidemic of obesity, diabetes and related disorders. High intakes of dietary fibre have been associated with reduced risk of cardiovascular disease as well as of some cancers, particularly colo-rectal cancer. Whole grains contribute to satiety and thus may contribute in the prevention of unhealthy weight and diabetes.

IUNS is concerned that the current CODEX proposal to define dietary fibre which includes 3-9 dp CHOs and other synthetic CHO polymers may not be supported by the existing data relating fibre to human nutrition and health, thus may lead to confusion of the public and food processors alike. We are aware that a FAO/WHO expert group has proposed an alternative definition based on physiological phenomena. We believe this is more appropriate approach, although it requires further refinement in terms of quantitative measurements of specific plant cell wall components.

IUNS has put together a group of experts that is exploring the issue of analytical assays and other issues that need to clarified prior to reaching a final conclusion regarding a sustainable. We have invited IUPAC to participate in this process and will keep you informed on the progress. Please consider this as a formal request to extend the period of consultation to allow this process to be completed.