



*Calorie Control Council*

1100 JOHNSON FERRY ROAD, SUITE 300 • ATLANTA, GA 30342 • (404) 252-3663 • FAX (404) 252-0774  
E-MAIL: CCC@KELLENCOMPANY.COM • WWW.CALORIECONTROL.ORG

## The Definition of Dietary Fiber

The Calorie Control Council is an international association representing the low-calorie and reduced-fat food and beverage industry. It represents 30 manufacturers and suppliers of low-calorie, low-fat and light foods and beverages, including the manufacturers and suppliers of more than two dozen different dietary sweeteners, fat replacers, dietary fibres and other low-calorie ingredients. This paper presents the Council's perspective on the Codex Alimentarius definition of dietary fibre.

The agreement of a definition for dietary fibre by the Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU 2008 and Annex 1) and its subsequent adoption by the Codex Alimentarius Commission (CAC 2009) represents a significant step forward for consumers and for the food industry who supply their needs. While there has long been agreement amongst nutrition scientists about the benefits to consumer health provided by diets rich in fibre, the absence of a harmonised definition has meant constraints on the ability of the industry to provide foods for the global marketplace which could be clearly and consistently described in terms of their fibre content and consequently confusion for consumers attempting to select foods on the basis of their contribution to healthy lifestyles. Most of the aspects of the Codex definition reflect a firm, science-based consensus, reached after many years of discussion, and are therefore fully supported by the Calorie Control Council.

However, some other equally important aspects, for which no clear scientifically based supporting rationale is available, have been left to interpretation by national authorities. If the public health benefits to be gained from increased consumption of fibre are to be realised through the provision of a choice of foods which meet consumer expectations of attractiveness and palatability and their need for clear nutrition labelling, implementation of the definition in a harmonised and consistent fashion is now a priority.

Key aspects of the definition have the potential to detract from its implementation in a harmonised fashion and in order to maintain the value of the definition as a global standard, they need to be addressed. They relate specifically to the delegation to national authorities of the decision whether to include carbohydrate polymers with 3 to 9 monomeric units; and to the fact

that the nature of the physiological effects of benefit to health, required as a characterising feature of 'added' fibres, is left open to interpretation. Both of these issues had been debated extensively during the Codex discussions on the dietary fibre standard and were previously addressed through inclusion in the definition until the very last proposal at Step 8.

#### *Inclusion/exclusion of carbohydrate polymers with 3 to 9 monomeric units*

There is a clear scientific basis for setting the lower limit of the definition to 3 carbohydrate monomeric units, since to do so excludes digestible mono- and disaccharides and undigestible disaccharides, whose effects on intestinal function are mediated to a large extent by their osmotic properties (e.g. polyols). Indeed, during discussions of the definition in the CCNFSDU, the lower limit was proposed as 3. It was extensively debated over a number of years and in 2005, the CCNFSDU 'agreed to retain this value [i.e. 3] and to delete the reference to a value of 10' (CCNFSDU 2006). Moreover, there are carbohydrates with chain lengths in the range 3 – 9, such as fructo-oligosaccharides, which are considered by many to be dietary fibre by virtue of the beneficial physiological effects they exert (Lupton et al 2009).

However, there is no physiological basis for distinguishing between polymers of chain length 3 – 9 and those with chain length of 10 or greater. There are polymeric carbohydrates with chain lengths both above and below this threshold which exert effects conventionally associated with dietary fibre, inulin and polydextrose being particular examples. Nor can the distinction be drawn on the grounds of analytical methodology. Methods that use ethanol precipitation to capture polymers with higher molecular weights that are insoluble in alcohol while excluding those that are not, are not specific to a 'cut-off' at a chain length of 10. This is because the ability to precipitate in alcohol is dependent on the type of fibre being analysed and its precise solubility in alcohol/water mixtures and no method can accurately quantify nor separate according to a cut-off above or below a threshold of 10 monomeric units.

While over the years other methods have been developed using different technologies to capture and therefore allow quantification of components with a variety of chain lengths, and today these are widely in use in the field of dietary fibre analysis (CCNFSDU 2009), none of these will measure dietary fibre according to an arbitrary cut-off at a chain length of 10 monomers.

Moreover, it should be noted that definitions already currently in place in many parts of the world include carbohydrates with chain lengths of 3 and more monomeric units. Examples include:

- FSANZ in Official Australia & New Zealand , 2001;
- EFSA (European Food Safety Authority), 2007;
- European Commission, 2008;
- Institute of Medicine in the USA, 2001/2005;
- ILSI (International Life Science Institute), 2006;

- AACC (American Association of Cereal Chemists), 2001;
- AOAC (Association of Analytical Chemists), 1997;

### *Physiological effects of benefit to health*

There is an established consensus that the consumption of carbohydrates in general and dietary fibre in particular is linked to many beneficial physiological effects. These have been reviewed by numerous authors, among those most recent are Cummings and Stephen (2007), Lunn and Buttriss (2007), and Buttriss and Stokes (2008). In addition, institutions such as the US Institute of Medicine (IOM 2001, 2005) and the European Commission (EU 2008) have considered laxation, normalisation of blood lipid concentrations, attenuation of blood glucose responses and colonic fermentation as indicators of a beneficial physiological effect.

During the development of the Codex definition, similar physiological effects were previously listed (CCNFSDU 2005) as typical dietary fibre properties, including decreased intestinal transit time, increased stool bulk, fermentability by colonic microflora, reduction in total and/or LDL cholesterol levels, and reduction in post-prandial blood glucose and/or insulin levels. These remained in the proposed definition until the version finally adopted at Step 8 in 2008, when the physiological benefits to be demonstrated were left undefined. While this has the advantage that, in a field in which the science is continually advancing, the definition is open to the inclusion of additional dietary components as and when their beneficial effects are accepted as relevant and scientifically substantiated, it also carries with it the risk that the definition will be interpreted differently over time and by different competent bodies.

Effective implementation of the Codex definition for dietary fibre requires a common understanding of the nature of the beneficial physiological effects considered relevant. A common approach is essential if acceptance of specific dietary fibres gained under the Codex definition at the national and/or regional level is to be recognised globally. National and regional authorities should work together within the CCNFSDU to establish a mechanism to ensure commonality of approach. To enable an effective implementation, the inclusion of the following physiological effects, which have already been recognised earlier by the US Institute of Medicine, the Codex Alimentarius and the European Commission, would provide a core list with an acknowledged common and solid basis:

- decreased intestinal transit time and/or increased stool bulk (laxation);
- fermentability by colonic microflora;
- reduction/attenuation of postprandial blood glucose and/or insulin levels;
- reduction/normalisation of total and/or LDL cholesterol levels.

### *Conclusions*

- The Calorie Control Council welcomes the adoption of the Codex definition for dietary fibre as a positive step towards achieving a market for attractive and palatable foods meeting consumer expectations of healthy eating and the need for clear, informative labelling.
- The Council believes that implementation of the definition should be a priority if such a market is to be achieved in reality.
- While it may have been necessary in the interest of compromise for Codex to allow individual authorities latitude in setting the monomeric chain length for carbohydrates qualifying as dietary fibre under the definition, the science-base in relation to a physiologically based definition clearly supports a lower limit of 3 monomeric units (i.e., dietary fibre should include carbohydrates with 3 or more monomers).
- Effective implementation of the Codex definition for dietary fibre requires a mechanism to ensure a common understanding of what constitutes relevant physiological effects of benefit to health.

## References

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*The Codex Definition of Dietary Fibre*

(Report of the 30th Session of the Codex Committee on Nutrition and foods for Special Dietary Use, ALINORM 09/32/26, Annex II)

Dietary fibre means carbohydrate polymers<sup>1</sup> with ten or more monomeric units<sup>2</sup>, which are not hydrolysed by the endogenous enzymes in the small intestine of humans and belong to the following categories:

- 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 and which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities,
- synthetic carbohydrate polymers which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities

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<sup>1</sup> 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 oligo-saccharidic 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 polysacchrides, these associated substances may provide additional beneficial effects (pending adoption of Section on Methods of Analysis and Sampling).

<sup>2</sup> Decision on whether to include carbohydrates from 3 to 9 monomeric units should be left to national authorities.