

Letter to the Editor

National Academies of Science definitions relating to food fibre only add confusion

The Food and Nutrition Board (FNB) of the Institute of Medicine of the National Academy of Sciences (Washington DC, USA) recently published definitions for 'dietary', 'functional', and 'total' fibre (Institute of Medicine, 2002). Dietary fibre consists of non-digestible carbohydrates and lignin, which are intrinsic and intact in plants. Functional fibre consists of isolated, non-digestible carbohydrates that have beneficial physiological effects in human subjects. Total fibre is the sum of dietary fibre and functional fibre.

The American Association of Cereal Chemists (AACC) is a scientific organization with a long record of being deeply involved with various aspects of research on dietary fibre, including health benefits, analytical methodology and the development, production and promotion of foods containing fibre, so it must respond to this proposed definition. A complete discussion of this topic has recently been published (DeVries, 2003)

Irrelevant *v.* relevant definitions

A definition for dietary fibre must be scientifically sound, promote international harmonization, and define the constitution and make-up of a macrocomponent of food, based on its physiological or physico-chemical properties, not its state of being. The FNB definition(s) do not satisfy these requirements. The FNB definitions do not reflect current scientific consensus on the physiology of dietary fibre and are operationally impractical. In contrast, the AACC, utilizing a scientific review committee with representation from academia, industry and government, accepting global input via teleconferences and utilizing interactive workshops and a website, adopted the following definition (American Association of Cereal Chemists, 2000*a*, 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 plant substances. Dietary fibres promote beneficial physiological effects including laxation, and/or blood cholesterol attenuation, and/or blood glucose attenuation.'

The last sentence includes beneficial physiological functions for which there is significant scientific agreement, enabling enfranchisement of food components that offer these effects, but does not limit the physiological functions to those listed for perpetuity.

Analytical concerns

The FNB definition incorporates references to 'intrinsic and intact', terms that are not nutritional definitions or descriptions, merely terms reflecting a state of being. Intrinsic and intact are neither physiologically relevant properties nor measurable quantities. Accurate measurement and characterization of 'dietary' fibre as distinct from 'functional' fibre in food products will never exist. Intrinsic and functional have no unique analytical qualities and differentiation is unnecessary and impossible, because neither has distinct physiological properties. Without accurate methods, databases on the food supply cannot be compiled; without adequate databases, it is unrealistic to expect that recommended dietary intakes can be set.

Previous scientific debate

Classification of dietary fibre into two arbitrary categories was proposed previously to the AACC Dietary Fiber Definition Committee in a public scientific forum (American Association of Cereal Chemists, 2001). The proposal was rejected because there is no scientific evidence of any difference in nutritional functionality in dietary fibre, whether intrinsic in a food or food product or added to a food product as an ingredient. To illustrate why the FNB definition will be of no practical value, we can look at a system that has been in place in Canada since 1985: this system attempts to differentiate between intrinsic and intact fibres and other fibres (termed 'novel' fibres), an approach that has been unsuccessful with regard to either theoretical or practical applications. In 1985, the Expert Advisory Committee on Dietary Fiber recommended this definition, which the Canadian Government uses but has not incorporated into the Food and Drug Regulations (Nora Lee, Bureau of Nutritional Sciences, Food Directorate, personal communication to the American Association of Cereal Chemists (1999) website on dietary fibre definition in July 1999).

Health impact concerns

Disease risk, particularly for ageing consumers, is a grave concern. One strategy for dealing with both diabetes and obesity involves increased dietary fibre intake, reduced digestible carbohydrate intake and proper physical activity (Mokdad *et al.* 2001). If dietary fibre is divided into two arbitrary categories, severe limitations are placed on food

manufacturers trying to produce the elevated-fibre foods necessary to meet the recommended intakes. We firmly believe that to maximize the benefits of dietary fibre intake by consumers, dietary fibre should not be separated into two arbitrary categories for labelling or other purposes.

Negative impact on nutrition research and education

The FNB definitions will delay advances in nutrition research and education. Based on assessments by their own key scientists, most of the countries around the world have adopted the use of the methods of AOAC International (1995) and the AACC approved methods (American Association of Cereal Chemists, 2000*b*) for analysis of dietary fibre. These methods are based on the definition for dietary fibre developed by Trowell (1972*a,b*, 1974) and Trowell *et al.* (1976). Dietary fibre is divided into soluble and insoluble dietary fibre based on scientific consensus of physiological effects. A report from the National Academy of Sciences supports this scientific consensus (Institute of Medicine, 2001). Establishing relationships between diet and improved health involves epidemiological observations and studies, feeding studies and accurate analysis, and depends on long-term consistency in data collection methods. Results collected over 25 years using the methods of AOAC International (1995) and the American Association of Cereal Chemists (2000*b*) serve almost exclusively as the basis for research on the relationship between dietary fibre and health. If the FNB definition is used, the current dietary fibre databases immediately become invalid, because none of the current results directly correlates with any of the three terms in the FNB definition, nor will health effects necessarily relate in any way to such an arbitrary categorical separation; thus epidemiological efforts will cease.

Consumer confusion

The use of the terms 'total', 'dietary', and 'functional' fibre is confusing. Dietary fibre will refer only to something that is 'intrinsic and intact', terms unfamiliar to most consumers. Consumers will find it difficult to understand how oat bran that is packaged and ready to cook is dietary fibre, while concentrated oat bran added to a ready-to-eat cereal made from another grain is functional fibre. The FNB definitions attempt to provide dietary guidance veiled as definitions, seeking to increase intake of whole grains, fruits and vegetables, as opposed to defining a measurable macronutrient component of a food or diet. Federal regulations require that food package labels accurately reflect the nutrient profile, i.e. the quantity of nutrients present, of the product in the package. The FNB definition cannot provide the consumer with an accurate representation of the quantity of dietary fibre in the food, because it cannot be accurately measured. Further, dietary fibres that do not qualify as either dietary or functional fibre in the FNB definition will not be appropriately accounted for, yet will be dietary fibre nonetheless.

A daily reference intake for dietary fibre cannot be set

A daily reference intake for dietary fibre cannot be set based on the FNB definitions. 'Dietary' and 'functional' fibres cannot be distinguished historically, analytically or physiologically. An adequate daily intake of dietary fibre of 38 and 25 g/d for men and women respectively, aged 19–50 years, has been recommended (Institute of Medicine, 2002) based on the meaningful definitions of the past, but the recommendation is meaningless when the FNB definition is applied. Most of the studies used as a basis for setting these recommendations used isolated cellulose, pectin, psyllium, inulin, isolated and hydrolysed guar, or polydextrose added to test diets, but these are not considered dietary fibre under the FNB definition.

Scientific agreement

The AACC agrees with the FNB conclusions that resistant starch and oligosaccharides are components of dietary fibre and that three physiological effects (a positive effect on laxation, attenuation of blood cholesterol levels and/or attenuation of blood glucose levels) currently have sufficient scientific evidence to be recognized as characteristics of dietary fibre. We also agree that additional physiological effects will probably be attributed to dietary fibre in the future, and the best possible definition of dietary fibre should be utilized.

Recommendation

The AACC Board of Directors continues to support the definition of dietary fibre developed by the AACC Dietary Fiber Definition Committee, as described earlier, approved and adopted in May 2000 (American Association of Cereal Chemists, 2000*a*, 2001). We believe this definition is scientifically credible and pragmatic and can form the basis of regulatory policy around the world.

Brendan Donnelly

*American Association of Cereal Chemists
3340 Pilot Knob Road
St Paul, MN 55121-2097, USA
Email: osteigman@scisoc.org*

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