



# Preparing for the 2015 Dietary Guidelines: Attributes of Refined Grains, Added Fibers, and Bran<sup>1</sup>

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Whole grains have become a prominent discussion point over the past few years, making a fitting and timely subject for a Hot Topic session at the 2011 AACC International Annual Meeting. The 2010 Dietary Guidelines Advisory Committee recommends that Americans “consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.” Although this recommendation may be achievable, in many cases it is interpreted to recommend modification of the diet by replacing all refined grains with whole grains, without consideration for the nutritional and culinary impact on diet and foods.

The 2011 AACCI Annual Meeting session Preparing for the 2015 Dietary Guidelines: Attributes of Refined Grains, Added Fibers, and Bran provided an opportunity to explore the current scientific understanding of the nutritional and culinary value of non-whole grains, including refined grains, added fibers, and bran, in the diet. After a series of point-counterpoint presentations, attendees were invited to explore the current scientific understanding of the nutritional and culinary value of these carbohydrate components. Together, speakers and conference participants identified science gaps and research opportunities that might provide more information for use in deliberations for the 2015 *Dietary Guidelines for Americans*.

## 2010 Whole-Grain Recommendations

David Klurfeld (USDA Agricultural Research Service) opened the interactive session by highlighting the controversy created by the 2010 recommendation to make at least half of grain servings whole grains. The first time whole grains were specifically called out in their own recommendation in the *Dietary Guidelines for Americans* was in 2005. Over the years, the guidelines have expanded from 10 to 90 pages, and the level of complexity has likewise increased. This requires a higher level of understanding on the part of both individuals interpreting the guidelines for consumers and consumers themselves, who are already bombarded with nutrition information on a multitude of topics. In 2005, recommendations for grains referred to “ounce equivalents,” which can vary due to moisture content, and were not congruent with label servings for whole grains, which added another level of complexity. The guidelines also noted that whole-grain products could help in achieving fiber-intake recommendations, but that some folate-fortified refined-grain

products should be included as well. In 2010, a subtle yet notable change that may have been intended to simplify this language created more ambiguity by stating that refined grains should be replaced with whole grains.

Whole grains are defined by the U.S. FDA as those ingredients that include germ, bran, and endosperm in naturally occurring proportions. When whole-grain health claims are made, products must contain at least 51% whole grains (by weight), and the whole grains must contain  $\geq 11\%$  dietary fiber to conform to the FDA standard. However, most of the epidemiologic studies evaluated in developing the guidelines included  $>25\%$  bran cereals, wheat germ, or rye bread as whole-grain foods. While fiber is highlighted as a “nutrient of concern” by the 2010 *Dietary Guidelines for Americans*, bran, despite its higher fiber content and potentially significant contribution to dietary fiber intake, is not emphasized in the same way as whole-grain consumption to achieve the fiber-intake recommendation of 25–38 g/day. The unintended consequences of this wording can be seen in the National School Lunch Program, which is increasingly aligned with the guidelines, as some school districts are removing bran cereals in favor of those containing whole grains without recognizing that the latter are lower in fiber.

The 2010 *Dietary Guidelines for Americans* are structured around a series of evidence-based reviews conducted in response to a specific research question. While none of the 2010 questions ask about fiber specifically, recent systematic reviews indicate that the fiber component of a grain, rather than the quantity of a whole grain, is a major contributing factor to the association between whole-grain consumption and reduced heart disease, diabetes, and obesity. This suggests that although whole grains are an important part of a healthy diet they may also serve as a marker of other healthy lifestyle patterns and could be supplemented by inclusion of other grain components, like bran, to maximize health benefits.

## Nutritional and Culinary Utility of Added Fiber

Joanne Slavin (University of Minnesota) continued the discussion by focusing on the nutritional and culinary utility of added fiber. As a member of the 2010 Dietary Guidelines Advisory Committee, she had a firsthand look at how the data used in developing the guidelines was gathered and evaluated. Fiber, as Slavin indicated, is tricky to categorize because it is a food component that affects health by virtue of not being absorbed, in contrast to other nutrients for which absorption is critical to functionality. Additionally, the guidelines strive to focus on food groups rather than individual nutrients, making it difficult to assess fiber by itself without also justifying individual analyses for vitamins, minerals, and macronutrients. In addition, although many people are becoming more familiar with the characterization of fiber as “soluble” or “insoluble,” there is still widespread misunderstanding about the sources and health benefits of both, and an even larger knowledge gap when it comes to added fiber.

<sup>1</sup> The Technical Committee on Carbohydrates of the International Life Sciences Institute, North American Branch, cosponsored the session held during the 2011 AACC International Annual Meeting.

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While data link whole grains to health benefits, not all whole grains are good sources of fiber. In the United States, the majority of fiber intake comes from white bread and potatoes, but only because of the amounts consumed, not because they are inherently high in fiber. Due to high consumption of these low-fiber foods, Americans fall short of meeting fiber-intake goals by about half (consuming 12–15 g/day). Because added fiber can be integrated into commonly consumed refined-grain products, there is clearly an opportunity to improve this statistic. Sometimes called “functional fibers,” added fibers consist of isolated or purified carbohydrates not digested and absorbed in the human intestines that confer beneficial physiological effects, such as improved laxation and attenuation of blood lipids and glucose levels. Despite these promising attributes, it remains unclear which fiber characteristics cause these effects—solubility, fermentability, viscosity, or others—and whether these attributes are preserved when fibers are isolated from plant structures for addition to food products. There is also the barrier of public perception of added fibers as “fake” and, therefore, unable to produce the same health benefits as fibers from sources that are naturally occurring.

There are many limitations to the research in this field. Much of the fiber-intake data relies on databases that do not include fiber beyond what is intrinsic to food, and even this is subject to the shortcomings of self-reporting and food composition data that may not be updated as quickly as new products enter the food supply. In addition, relationships between food components and disease that exist in trials, even controlled intervention studies, may not hold true for all people, as there are infinite uncontrolled-for variables in free-living individuals. Carbohydrates and fiber are also underrepresented in the scientific literature, and whole-grain and fiber content are confounded in epidemiological studies. More research is needed to study the effects of different fiber types and forms on energy intake (satiety), laxation, glucose control, and lipid reduction, and as prebiotics, and creative protocols will be necessary to determine differences between intrinsic fiber and added fiber.

### Role of Refined Grains in the Diet

Julie Miller Jones (St. Catherine’s University) rounded out the session by offering insights on the role of refined grains in the diet, addressing several questions. Should half of grain intake be whole, or would it be better to include as many whole grains as possible? What are the potential repercussions of eating fewer refined, enriched grains on micronutrient intake? The rationale for recommending that at least half of grain servings be whole grains is based on epidemiological studies that show a reduction in the risk of heart disease with 2.7–3.2 servings of whole grains per day; this is about half of the 6 servings of grains the 2010 *Dietary Guidelines for Americans* recommend be consumed per day as part of a 2,000 cal diet. Many Americans are unfamiliar with what a “serving” constitutes, however, and may eat as many

as 3 or 4 servings of refined staples such as rice or pasta in a sitting. Complicating this debate is the wide variety of foods included in the “refined grains” category—everything from white rice and pasta to cakes and cookies. Many epidemiological studies group these foods together despite their significantly different calorie, fat, and micronutrient contributions.

Some refined, enriched staple grains are important sources of nutrients for much of the population, and fortificants may be more bioavailable than nutrient forms in whole-grain products. For example, despite brown rice having nearly double the iron content of white rice, the improved bioavailability of iron from white rice makes absorption nearly equivalent (Table I). Additionally, “antinutrient” factors found in grain fibers, such as phytate, trypsin inhibitor, oryzacystatin, and haemagglutinin-lectin, can reduce absorption of vitamins and minerals such as calcium, iron, and magnesium. However, it is possible that these factors themselves have health benefits that are not yet fully understood. It is widely known that the fortification of refined grains with folate in 1998 reduced the occurrence of neural tube defects in U.S. newborns by 37%, and because regulations dictate that whole grains cannot be fortified, it is unclear whether encouraging their consumption in place of refined grains could reduce the gains made with folate fortification.

### Discussion

By the end of the session, several themes that may offer insights into interpreting the 2010 *Dietary Guidelines for Americans* and create the basis for a refined approach to the 2015 guidelines were recognized by the speakers and participants:

- Due to differences in methods used to analyze the fiber content of foods and inconsistent definitions of dietary fiber, there are limitations to relying on epidemiological studies to ascribe health benefits to fiber amount and type.
- Added fiber is often not reflected in current databases or diet assessment tools used in epidemiologic studies, such as food frequency questionnaires; understanding the potential benefits and possible synergies achieved through this kind of supplementation requires much more research. Additionally, food composition databases are outdated and need to be kept current by the food industry.
- Bran, and other forms of fiber, should be directly addressed by the Dietary Guidelines Advisory Committee with specific questions posed on these topics. Confounding that exists between cereal fiber and whole grain should also be addressed in specific questions.
- Research on the health benefits of fiber, whole grains, and refined grains should use appropriate study populations—for example, use subjects with high cholesterol to determine whether cholesterol can be reduced by dietary modification.
- The varying definitions of whole-grain foods have created problems in interpreting research; this issue needs to be addressed.
- There is a need for population data on endpoints of interest that may be influenced by the intake of different fibers, such as fecal weight, fermentation, and gut microbiota.
- Finally, additional clinical research is required on functional fibers to assist the Dietary Guidelines Advisory Committee in providing clearer direction on the benefits associated with fiber in general and different fiber types.

**Table I. Brown and white rice and iron absorption (n = 12 Philipinos)<sup>a</sup>**

Rice	Fe Content (mg/100 g)	Fe Absorbed (mg/100 g)
Brown <sup>b</sup>	1.1 ± 0.1	0.13 ± 0.2
White	0.6 ± 0.1	0.14 ± 0.2
Brown rice meal		0.36 ± 0.04
Milled rice meal		0.35 ± 0.03

<sup>a</sup> Data from T. P. Trinidad et al. (Int. J. Food Sci Nutr. 60:688, 2009).

<sup>b</sup> Tannic acid 2× higher; phytic acid 4× higher.