Thinking critically about whole-grain definitions: summary report of an interdisciplinary roundtable discussion at the 2015 Whole Grains Summit

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ABSTRACT
Definitions for whole grain (WG) have been published by governments, the food industry, and grain organizations and generally fall into 2 categories: WG and WG food. WG definitions focus on the principal components of the WGs and their proportions, whereas WG-food definitions describe the quantity of WGs present in food. In the United States, widespread agreement exists on the main parts of a definition for a WG, with a definition for a WG food still in its early stages; a standard definition that has been universally accepted does not exist. Furthermore, nutrition policy advises consumers to eat WGs for at least one-half of their total grain intake (2010 and 2015 Dietary Guidelines for Americans), but confusion exists over which foods are considered WGs and how much is needed to achieve health benefits. In December 2014, a workshop sponsored by the subcommittee on collaborative process of the US Government’s Interagency Committee on Human Nutrition Research convened in Washington, DC, and recognized WG definitions as a key nutrition and public health–related issue that could benefit from further collaboration. As a follow-up to that meeting, an interdisciplinary roundtable meeting was organized at the Whole Grains Summit on 25 June 2015 in Portland, Oregon, to help resolve the issue. This article summarizes the main opportunities and challenges that were identified during the meeting for defining WGs and WG foods internationally. Definitions of WGs and WG foods that are uniformly adopted by research, food industry, consumer, and public health communities are needed to enable comparison of research results across populations.

Keywords: definitions, interdisciplinary, whole grain, whole-grain foods standard methods, HEALTHGRAIN, health benefits

INTRODUCTION
Since 2000, recommendations for whole-grain (WG) intake have been included in the Dietary Guidelines for Americans (DGA), with the initial message, “Choose a variety of grains, especially whole grains” (1). This message changed in the 2005 and 2010 Dietary Guidelines, which state, “Eat at least 3 ounce equivalents (oz-eq) of whole grain daily, and at least half of all grains consumed should be whole grain” (2, 3). The food industry has responded to dietary guidance with an explosion of products marketed to consumers as being or containing WGs (4). For example, in 2010, the number of new grain foods marketed as WG was nearly 20 times higher than the number introduced in the year 2000 (5). Survey data from the USDA reported that WG breads accounted for 6% of all pounds of bread purchases in 2001 and rose to 20% by 2007 (6). Over the same time period, WG cereals jumped from 30% of all cereals purchased to 46% (6).

Intakes of WG in the United States were recently assessed in a cross-sectional analysis of NHANES 2001–2012 (7). The results showed that adults consumed, on average, 0.72 WG ounce-equivalents (oz-eq)/d in 2001–2002, and 0.97 WG oz-eq/d in 2011–2012 (7). Children, on the other hand, consumed 0.56 WG oz-eq/d in 2001–2002 and 0.74 oz-eq/d in 2011–2012 (7). Although children and adults are still falling below the recommended amounts for WGs, this analysis indicates that WG intake did improve over the 10-y period.

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Abbreviations used: AACC, American Association of Cereal Chemists International; CVD, cardiovascular disease; DGA, Dietary Guidelines for Americans; FDA, Food and Drug Administration; oz-eq, ounce-equivalent; T2DM, type 2 diabetes mellitus; WG, whole grain.

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A recent report described that Danes consume ~63 g WG/d compared with a consumption of 36 g WG/d before the launch of the Danish Whole Grain Campaign (8). Furthermore, 30% of Danes now eat the recommended amount of 75 g WG/d (8). Another report described the change in WG intake in Denmark from 2000–2004 and 2011–2013 and found that children experienced a 107% increase (from 28 g/d in 2000–2004 to 58 g/d in 2011–2013), men had a 66% increase (from 39 g/d in 2000–2004 to 65 g/d in 2011–2013), and women had an 82% increase (from 28 g/d in 2000–2004 to 51 g/d in 2011–2013) (9). Although this is not a comprehensive review of WG intakes across the globe, the improvements in WG consumption both in the United States and Denmark indicate that WGs are acceptable and can be incorporated into a healthy diet. A focus on standardization of WG and WG-food definitions and guidelines may help decrease heterogeneity in research findings and further increase WG intakes.

Definitions and guidelines for WGs may add to consumer confusion. WG and WG foods have been defined by a food industry roundtable (10) along with many organizations, such as the American Association of Cereal Chemists International (AACC), the Whole Grains Council, the Food and Drug Administration (FDA), the USDA Food Safety and Inspection Service, HEALTHGRAIN, and the DGA (3, 10–17). Although each organization and the food industry have provided input on a WG definition, more work in this area is needed so that a standard definition can be accepted by all. In December 2014 a workshop sponsored by the subcommittee on collaborative process of the US Government’s Interagency Committee on Human Nutrition Research convened in Washington, DC, and included scientists from academia, the food industry, and federal agencies.

The committee recognized WG definitions as a key nutrition and public health–related issue that could benefit from further collaboration. As a follow-up to that meeting, an interdisciplinary expert roundtable meeting was organized at the Whole Grains Summit on 25 June 2015 in Portland, Oregon, to help resolve the WG definition issue. Experts were invited to the meeting and represented academia, nonprofit organizations, industry, and government. Young scientists with experience from academia, the food industry, and a nonprofit organization were also represented in the group. The primary objectives of the meeting were as follows:

- To briefly review the health benefits of WGs
- To identify the opportunities and challenges in the United States for defining WG and WG foods and applying these definitions
- To discuss the need for and the shared benefits of a standardized WG and WG-food definition, determined through a formal process with all stakeholders
- To form a collaborative interdisciplinary working group

Scientific Evidence Supports the Health Benefits of WGs

Evidence from WG intervention studies varies, but most studies still demonstrate specific improvements in disease biomarkers and select health outcomes (18). Because WG interventions vary, including the types of grains consumed, the amount eaten, and the overall diet, it is challenging to find clarity and consistency in study design (19). On the other hand, evidence from epidemiologic studies has repeatedly demonstrated the benefits of WG consumption (~3–5 servings/d) for several health outcomes, such as cardiovascular disease (CVD) (20), weight gain (20), type 2 diabetes mellitus (T2DM) (21), and both specific-cause and all-cause mortality (21–24). However, in 2013 Cho et al. (25) described that epidemiologic researchers applied inconsistent definitions of WG foods in their analyses, leading to questions about the strength of evidence for the health benefits of WG consumption. Although this is not a comprehensive review of WG studies, this article highlights some of the scientific findings.

Impact on All-Cause and Specific-Cause Mortality

Prospective cohort studies of WG consumption and mortality have relied on self-reported consumption data, such as food records and food-frequency questionnaires. Three independent meta-analyses of studies conducted in the United States and Europe reported that comparisons of the highest with the lowest WG consumption was associated with reduced risk of mortality from all causes, as well as deaths attributed to specific disease conditions. Evaluation of 11 cohort studies concluded that there was a 7% reduction in mortality with every additional daily serving of WGs (RR: 0.93; 95% CI: 0.88, 0.97) (23). In 2016 Li et al. (22) noted that, although deaths from stroke and diabetes were not associated with WG-consumption patterns, strong risk reduction trends were observed for deaths from all causes (RR: 0.93; 95% CI: 0.91, 0.95), CVD (RR: 0.95; 95% CI: 0.92, 0.98), and coronary artery disease (RR: 0.92; 95% CI: 0.88, 0.97) with each 30-g serving of WGs/d. Increasing WG consumption by 3 servings (90 g/d) was found to reduce all-cause mortality by 19%, deaths from CVD by 26%, and mortality from cancers by 9% (24). Differences in outcomes for US cohort studies compared with European research were noted by Aune et al. (21) in 2016; their meta-analysis calculated significantly reduced risks for increasing WGs by 90 g/d for all-cause mortality (RR: 0.83; 95% CI: 0.77, 0.90), CVD (RR: 0.71; 95% CI: 0.61, 0.82), and diabetes (RR: 0.49; 95% CI: 0.23, 1.05). Conflicting opinions of whether the dose-response relation between WG consumption and mortality is linear or nonlinear need resolution.

Impact on CVD

In a meta-analysis, the association between WG and fiber intake and the risk of CVD was assessed. The definition of CVD encompassed stroke, atrial fibrillation, myocardial ischemia, cardiovascular death, coronary artery disease, or myocardial infarction. The meta-analysis identified prospective cohort studies that directly investigated WG intake in relation to CVD risk in either men or women. The results showed a 21% reduction in CVD risk for those who were in the highest category of WG intake compared with those who were in the lowest category of WG intake (RR: 0.79; 95% CI: 0.74, 0.85) (20). A comparison of 3 prospective cohort studies found a reduced risk for stroke (RR: 0.84; 95% CI: 0.75, 1.03) when 90 g WGs was consumed, but no associations were found between WG breads or breakfast cereals and risk of stroke (21).

Impact on Weight Gain

Findings from prospective cohort studies have generally found less weight gain with a greater intake of WGs (26–28). For example, in the Nurses’ Health Study, 74,091 healthy female nurses were prospectively followed from 1984 to 1996, and their
dietary habits were assessed every 2 or 4 y (i.e., 1984, 1986, 1990, and 1994) with food-frequency questionnaires. The results indicated that over a 2- to 4-y period, increases in the intake of WGs were associated with less weight gain (1.07 kg) for women in the highest quintile (1.68 servings · 1000 kcal$^{-1}$ · d$^{-1}$) than for women in the lowest quintile (0.07 servings · 1000 kcal$^{-1}$ · d$^{-1}$) and a mean weight gain of 1.58 kg. P-trend < 0.0001 (28). Similarly, among 27,082 men in the Health Professionals Follow-Up Study, a dose-response relation was observed. For every 40-g/d increment in WG intake from all foods, weight gain was reduced by 0.49 kg during 8 y of follow-up (27). Finally, among 17,881 male physicians, participants who consumed ≥16 g WG cereals/d (1 serving/d), experienced lower weight gain over an 8-y period (0.35 kg) than those who rarely or never consumed WG cereals (26).

**IMPACT ON T2DM**

In 2007 a systematic review de Munter et al. (29) determined the associations between WG, bran, and germ intake relative to the risk of T2DM in the Nurses’ Health Study (I and II) and 4 other prospective cohort studies. Based on the pooled data for all of these studies, 2 servings of WG consumption/d was associated with a 21% (95% CI: 13%, 28%) risk reduction for T2DM. This was found after adjusting for potential confounders, such as BMI. The health benefits of WGs are due to several possible mechanisms in the human body. These mechanisms include 1) aiding in the maintenance of glucose and insulin homeostasis, 2) lowering of serum cholesterol, 3) lowering of LDL cholesterol, and 4) reducing inflammation and oxidative stress (20).

**OVERVIEW OF WG DEFINITIONS**

Many different agencies and organizations have published definitions for WG (3, 10–17) (Table 1). These definitions generally fall into 2 categories: WG and WG foods. WG definitions specify the principal components of the WG and their proportions (11, 13, 14). WG-food definitions specify the quantity of WG as an ingredient that must be present in a food before it can be described as a WG food (10, 12, 15–17).

**WG DEFINITIONS**

The AACCI published the first definition of WGs in 1999 (11). The definition states, “Whole grains shall consist of the intact, ground, cracked, or flaked caryopsis whose principal components, the starchy endosperm, germ, and bran, are present in the same relative proportions as they exist in the intact grain.”

**TABLE 1**

Overview of some WG and WG-food definitions, guidance, and regulations

<table>
<thead>
<tr>
<th>Agency or organization (reference)</th>
<th>WG or WG-food definition?</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AACCI (11)</td>
<td>WG</td>
<td>WGs shall consist of the intact, ground, cracked, or flaked caryopsis whose principal components, the starchy endosperm, germ, and bran, are present in the same relative proportions as they exist in the intact grain.</td>
</tr>
<tr>
<td>Whole Grains Council (13)</td>
<td>WG</td>
<td>WGs or foods made from them contain all the essential parts and naturally occurring nutrients of the entire grain seed in their original proportions. If the grain has been processed, the food product should deliver the same rich balance of nutrients that are found in the original grain seed.</td>
</tr>
<tr>
<td>HEALTHGRAIN (14)</td>
<td>WG</td>
<td>WGs shall consist of the intact, ground, cracked, or flaked kernel after the removal of inedible parts, such as the hull and husk. The principal anatomical components, the starchy endosperm, germ, and bran, are present in the same relative proportions as they exist in the intact kernel. Small losses of components, i.e., &lt;2% of the grain and &lt;10% of the bran, that occur through processing methods consistent with safety and quality are allowed.</td>
</tr>
<tr>
<td>AACCI (characterization of a WG product, not a final definition) (12)</td>
<td>WG-food</td>
<td>A WG-food product must contain ≥8 g WGs/30 g product.</td>
</tr>
<tr>
<td>USDA/FSIS (15)</td>
<td>WG-food</td>
<td>≥8 g dry WG ingredient per labeled serving and per RACC and ≥51% of the grain components are WG.</td>
</tr>
<tr>
<td>Industry roundtable (10)</td>
<td>WG-food</td>
<td>A WG food provides ≥8 g WGs/30 g (27/100 g) but does not contain excessive amounts of fat, sugar, sodium, or calories.</td>
</tr>
<tr>
<td>FDA Whole Grain Health Claim (1999, 2003, 2008) (16)</td>
<td>WG-food</td>
<td>Foods must be ≥51% WG by weight per RACC. Dietary fiber is used as a marker for compliance but may be waived on single-ingredient WG foods (e.g., brown rice).</td>
</tr>
<tr>
<td>2010/2015 DGA (3, 17)</td>
<td>WG-food</td>
<td>Make one-half of your grains WGs. Eat ≥3 oz-equ WGs daily. An oz-equ is ~1 slice of bread, ~1 ounce ready-to-eat cereal, or ~1/2 cup cooked rice, pasta, or cereal (1 oz-equ = ~30 g). Fifty-one percent WG is a significant amount. Foods with ≥8 g WGs/oz-equ. WGs provide benefits beyond fiber.</td>
</tr>
</tbody>
</table>

This is a comprehensive list of all relevant guidance, regulations, or policies on WGs. AACCI, American Association of Cereal Chemists International; DGA, Dietary Guidelines for Americans; FDA, Food and Drug Administration; FSIS, Food Safety and Inspection Service; oz-equ, ounce-equivalent; RACC, reference amount customarily consumed; WG, whole grain.
ground, cracked, or flaked caryopsis of the grain whose principal components, the starchy endosperm, germ, and bran, are present in the same relative proportions as they exist in the intact grain” (11). This definition was adopted with consumer-friendly wording and endorsed by the Whole Grains Council in 2004. The Whole Grains Council states, “Whole grains or foods made from them contain all the essential parts and naturally-occurring nutrients of the entire grain seed in their original proportions. If the grain has been processed, the food product should deliver the same rich balance of nutrients that are found in the original grain seed” (13). Furthermore, the AACC 1999 WG definition has been adopted and issued by the FDA in its 2006 draft guidance for industry and FDA staff on WG-label statements (16). Outside of the United States, some countries use an adapted AACC/FDA WG definition. For example, the Healthgrain Forum, a consortium of academic and industry scientists and policy makers, recently agreed on and published a WG definition (14). The HEALTHGRAIN definition is different from other WG definitions in the United States because it accounts for losses due to processing (i.e., losses of less than 2% of the grain and less than 10% of the bran that occur through processing methods consistent with safety and quality), but currently there is no consensus on the desirability of this (14). Most academic and government sources agree that a WG should meet the basic definition established by the AACC (18), although more must be done to educate consumers and industry. Some additional clarifications, similar to those in the HEALTHGRAIN definition (for processing losses and for reconstitution), could be useful.

WG-FOOD DEFINITIONS

Although widespread agreement exists on the main parts of a definition for a WG, a definition for a WG food is still in its early stages; a standard definition that has been universally accepted does not exist. The lack of a standard definition for WG foods has not only increased consumer confusion but misleads those who are trying to identify foods that can help meet the DGA (10). WG health claims for reducing heart disease and cancer may help some consumers identify WG products, as may the widely used Whole Grain Stamp; however, the FDA has still not issued final guidance for WG foods, which may be in part delaying the progress of an accepted WG-food definition. The WG-food definitions in Table 1 provide more details regarding the differences among definitions. For example, the AACC characterizes WG foods as those that contain ≥8 g WG/30-g product without a dietary fiber requirement (12); whereas, efforts led by the food industry have similar requirements except that the food cannot contain excessive amounts of fat, sugar, sodium, or calories (10). In 1999, the FDA allowed food manufacturers to apply a WG health claim, but to bear the claim, the food must contain ≥51% WG by weight per reference amount customarily consumed and meet other requirements for fat, fiber, etc. (16). Other definitions for WG foods come in the form of dietary guidance. The 2010 DGA recommend that Americans “Eat at least 3 oz. eq. of whole grains daily” (3) with similar recommendations for WG in the 2015 DGA (3, 30).

One of the major differences between each of these definitions is the units used to describe WG (e.g., grams, percentage, oz-equ). The variability in units not only confuses consumers who are trying to identify WG products, but it also limits researchers who are trying to accurately estimate WG intake in observational and intervention studies (19). Ross and colleagues (19) addressed the need for clearer reporting of WGs and made several suggestions, one of which was to “report the amount of whole grain consumed (in grams) rather than the absolute amount of the whole grain food product.” For example, “16 g whole grain wheat versus 28 g whole grain wheat bread.” Ultimately, following these suggestions could improve the reporting of WG intake and allow scientists to conduct properly designed studies. Improving the scientific evidence for WGs should translate into clearer and more consistent messages for consumers.

OPPORTUNITIES AND CHALLENGES WITH CURRENT WG AND WG-FOOD DEFINITIONS

During the roundtable discussion, experts participated in an activity to help identify the opportunities and challenges for defining and applying WG and WG-food definitions. Table 2 lists the opportunities and challenges that were identified by the working group with the common themes further described below.

Organizational representation is needed to concur on one definition for WG and WG foods

For the purposes of harmonization within the United States and potentially worldwide, it would be ideal if researchers, industry, and regulatory bodies would use the same definition of a WG food. The need for one standard definition is evidenced by the fact that WG foods are not consistently defined, WG foods and package labeling lack standardization, and consumers are often confused when shopping for WG foods because of discrepancies in labeling (10). Several organizations and agencies in the United States and Europe have already provided input on WG and WG-food definitions (3, 10–17). Rather than establishing another definition, it would be beneficial if representatives from different sectors (e.g., government, academia, industry, and nonprofits) agreed to collaborate on an initiative for resolving the WG definition challenge. Adopting one standard definition for a WG food would lead to simplified research, facilitate labeling of WG foods, and increase consumer understanding of WGs, helping to ensure a level playing field across all sectors.

The Healthgrain Forum developed a WG definition that accounts for small losses due to processing; this can serve as a model to improve a WG definition in the United States

The Healthgrain Forum identified the need for developing a WG definition with the following objectives: 1) to be more comprehensive than current definitions used in most European countries, 2) to provide a single definition of WG for use across Europe and, when possible, equivalent to definitions outside Europe (i.e., AACC definition), 3) to reflect current industrial flour manufacturing practices, and 4) to be useful in the context of nutrition guidelines and for purposes of food labeling (14).

The definition was developed with a straightforward process. A committee was formed to lead discussions and create the definition. Discussions were established as open meetings and included experts from regulatory affairs, cereal science, technology, plant breeding, and flour and milling (14). In the process of developing their WG definition, the Healthgrain Forum addressed
Opportunities Align with the HEALTHGRAIN definition of WG
Gain organizational representation across sectors to agree on a WG definition that benefits researchers, industry, and the consumer

Challenges Lack of standard methods to measure WGs
Need for better reporting of WG intake
Lack of education and inconsistent messaging to consumers
Issues around reconstitution and recombination
Current definitions may not encompass differences in grains that occur because of variability in growing conditions
Lack of data on individual particle size

TABLE 2
Some opportunities and challenges with defining and applying WG and WG-food definitions

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>WG definitions</th>
<th>WG-food definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align with the HEALTHGRAIN definition of WG</td>
<td>Allow more labeling flexibility on the amount of WG content required to be a WG food</td>
<td></td>
</tr>
<tr>
<td>Gain organizational representation across sectors to agree on a WG definition that benefits researchers, industry, and the consumer</td>
<td>Increase ability to make healthier grain-based foods and deliver them into the food supply</td>
<td></td>
</tr>
<tr>
<td>Lack of standard methods to measure WGs</td>
<td>Increase consumption by clarifying what is WG</td>
<td></td>
</tr>
<tr>
<td>Need for better reporting of WG intake</td>
<td>Deciding whether ingredients such as fat, sugar, and salt should be considered in the definition of a WG food</td>
<td></td>
</tr>
<tr>
<td>Lack of education and inconsistent messaging to consumers</td>
<td>Not all foods fit into the current definitions for WG because of the variability in serving size and moisture content</td>
<td></td>
</tr>
<tr>
<td>Issues around reconstitution and recombination</td>
<td>Lack of education and inconsistent messaging to consumers</td>
<td></td>
</tr>
<tr>
<td>Current definitions may not encompass differences in grains that occur because of variability in growing conditions</td>
<td>Issues around reconstitution and recombination</td>
<td></td>
</tr>
<tr>
<td>Lack of data on individual particle size</td>
<td>In efforts to make products healthier, manufacturers may respond negatively to the reformulation of refined grain products because of cost</td>
<td></td>
</tr>
</tbody>
</table>

WG, whole grain.

problemati 1c issues with current flour manufacturing practices, such as reconstitution and recombination. Therefore, unlike the United States, the HEALTHGRAIN definition of WG accounts for small losses of components that occur during processing (i.e., <2% of the grain and <10% of the bran) (14). Like the HEALTHGRAIN definition, some additional clarifications (with respect to processing losses and reconstitution) could be useful for improving a WG definition in the United States.

Because of a lack of standard methods, it is difficult to measure WGs

When asked to identify challenges with WG definitions, several experts agreed that there is a lack of standard methods to measure WGs; currently used biomarkers are qualitative and may never be quantitative. A lack of standard methods to measure WGs has posed substantial problems for researchers conducting human intervention studies. Without standard methods, it will be extremely difficult to ever understand the effects of individual grains or individual-grain components in human intervention trials (19). Other challenges identified by the group were as follows: a need for better reporting of WG intake, a lack of data on individual particle size, how to account for differences in grains that occur because of variability in growing conditions, issues around reconstitution and recombination, mixed public messaging about WGs, and a lack of consumer education.

Clarifying definitions of a WG and a WG food can lead to better consumer messaging and increase consumption among our population

A major opportunity exists if definitions for WG and WG foods become standard. The ultimate goal is for consumers to ingest more WG food and nutrients that WGs provide. A recent cross-sectional analysis showed that the major sources of WG identified for children and adolescents include ready-to-eat cereals (31%), bread and rolls (21%), and crackers and salty grain snacks (21%) (31). For adults, the main sources of WG are bread and rolls (27%), ready-to-eat cereals (23%), and pastas, cooked cereals, and rice (21%) (31). Altogether, these data indicate that WGs are consumed in our population, but from various food groups. Ready-to-eat cereal and bread and rolls are a major source of WG for children and adolescents and for adults. Additional clarification of a WG definition, coupled with consumer education, could lead to increased intakes in our population. Accomplishing this task requires the cooperation of industry, government, nonprofit organizations, and academia. The cooperation of the different sectors should help promote the development and use of more WG products, improve consumer choice and understanding, and ultimately encourage more WGs to be regularly included in the human diet (32).

Reformulation of refined grain products and its associated costs are challenges for manufacturers

Members of the roundtable identified reformulation and its associated costs as major challenges for food manufacturers once a standard WG-food definition is agreed on by all sectors. However, a report from the USDA Economic Research Service indicates that consumers respond to enhanced market choices and that manufacturers often provide those choices in response to changes in nutrition policy and labeling regulations (33). The report further mentioned that, because of competition over brand reputation, manufacturers have incentives to reformulate and make well-advertised investments in healthier ingredients and processes (33). An example of a reformulation effort occurred after the release of the 2005 DGA. Under those guidelines, at least half of a person’s daily grain intake should come from WGs (2). Manufacturers were quick to respond to the new WG recommendations by introducing new WG cereals, breads, pastas, etc., to the market. However, other studies by USDA Economic Research Service have shown that the higher prices associated with WG products compared with their refined grain counterparts is a deterrent to increased WG consumption (34).

What does a successful WG and a WG-food definition look like? To be successful, WG and WG-food definitions should have a shared benefit for researchers, industry, consumers, and public health but must reflect the reality of how grains are refined for consumer products. Different labeling regulations and policies are a barrier to the development of new WG foods and effective consumer education programs. Confusing messages about WGs
in turn lead to consumer misunderstanding and perhaps indifference. To make progress in WG definitions, harmonization across countries on a WG definition is essential. Efforts will then be needed to subsequently harmonize on a WG-food definition.

Although there is near-universal agreement on the core definition of a WG (“all of the bran, germ, endosperm in their original proportions”), some final adjustments regarding reconstitution and recombination and processing losses are required before global acceptance can be achieved, and much further effort is needed on a definition of a WG food. Finalizing both definitions is an effort that will take representation from different sectors (i.e., academia, government, nonprofit organizations, and industry) that are willing to work together on this issue and carry the efforts forward. Furthermore, continuing work with international partners is needed to gain global alignment. As Slavin (35) suggested, “Improvements to our food system and public health can only be realized if we work together, respecting the strengths of all parties”. After a process has been established and harmony is achieved on a WG definition, efforts can be taken to align on a food definition.

NEXT STEPS

During the expert roundtable discussion of next steps for adopting a consistent WG definition, it was agreed that organizational representation is needed across all sectors. The roundtable also agreed that we need a process for final alignment on a WG definition before tackling a WG-food definition. Learning from the Healthgrain Forum’s success in achieving a WG definition can be used as a springboard for the United States. Their process for establishing a definition can serve as a model for the United States and the world. In the context of a standard WG definition in the United States, for the next steps we propose the following:

- Step 1: Continue discussions with the Healthgrain Forum and determine how to agree on a standard WG and WG-food definition
- Step 2: Gain alignment across organizations in the United States on one WG and WG-food definition based on the outcomes of step 1
- Step 3: Propose an improved WG and WG-food definition for use in the United States to the FDA (as previously mentioned, this definition should be consistent with the science, feasible for interpretation by food manufacturers, and accepted by consumers)
- Step 4: Gain US and global acceptance for one standard WG and WG-food definition and how to quantify WG content of WG foods

CONCLUSION

Finalizing a standard WG definition is the first phase of engaging the grains community in efforts to eventually move toward the development of a universal definition for WG foods. Accomplishing this task will require the involvement and representation of all sectors that are willing to collaborate and understand the shared benefit of one definition. An intentional process will help identify the areas that need to be considered when aligning on a WG definition.

A WG definition should be consistent with the science, feasible in its implementation (within the food system and food environment), and transferable to a variety of grain-based foods. The ultimate goal of a shared definition is to increase consumption of WG foods and make them more available throughout the food environment. Industry can play a key role in facilitating this and in helping consumers include WGs as a regular part of their diet (36). Although the food industry has come under public scrutiny about the effect of processed foods on human health, food technologists are actively involved in research to develop innovative approaches to increase the range of WG products without compromising on health, taste, and texture (36, 37). As the food industry continues to introduce new varieties of WG products into the market, consumers need to receive clear and consistent messaging around WGs.

Some approaches to consistently convey these messages include debunking the negative media around WGs by educating consumers and those who do not have the proper knowledge to convey accurate scientific information. To accomplish this scientists should continue to converse with those who are responsible for communicating WG messages to the public so that consumers receive the right message. Consumers also need to be carefully introduced to new products and understand that WGs are actually “better for you.” Ultimately, facing the challenges of how to agree on standard WG definition among different sectors will be the first step in successfully increasing WG consumption throughout our population.

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