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2015 Dietary Guidelines Advisory Committee

Re: Comments Relevant to the 2015 Dietary Guidelines Development

Dear Dietary Guidelines Advisory Committee,

The Institute of Food Technologists (IFT) appreciates the opportunity to provide comments pertinent to the development of the 2015 *Dietary Guidelines for Americans*. Founded in 1939, IFT is a nonprofit scientific society of nearly 18,000 members from academia, industry, and government. Our organization brings together the community of food scientists, technologists and other related professionals. For nearly 75 years, IFT has existed to advance the science of food. IFT's long-range vision is to ensure a safe and abundant food supply contributing to healthier people everywhere.

During the past few decades, the food industry has been responding to dietary guidance to provide new, innovative healthful foods and beverages for Americans. The 1988 Surgeon General's Report stated that "the public would benefit from increased availability of foods and food products low in calories, total fat, saturated fat, cholesterol, sodium and sugars, but high in a variety of natural forms of fiber and, perhaps, certain minerals and vitamins. Food manufacturers can contribute to improving the quality of the American diet by increasing the availability of palatable, easily prepared food products that will help people to follow the dietary principles outlined here. Because the public is becoming increasingly conscious of the role of nutrition in health, development of such products should also benefit the food industry." More recently, the 2010 *Dietary Guidelines* recommended that the food value chain "initiate partnerships with food producers, suppliers, and retailers to promote the development and availability of appropriate portions of affordable, nutritious food products (including, but not limited to, those lower in sodium, solid fats, and added sugars) in food retail and foodservice establishments" (USPHS 1988; USDA/DHHS 2010).

IFT believes that an understanding of food science and technology and its role in addressing public health issues such as reducing food components (for example, sodium, saturated fat, *trans*-fat, and sugar), increasing nutrients of concern (for example, folic acid, vitamin D, calcium, and dietary fiber), eliminating acute and chronic malnutrition, reducing chronic disease, and providing safe, healthy and affordable foods for Americans is crucial for the 2015 *Dietary Guidelines* deliberations. Thus, **IFT urges the Department of Health and Human Services, (DHHS), U.S. Department of Agriculture (USDA), and the Dietary Guidelines Advisory Committee (DGAC) to seek guidance and invite a food scientist and/or technologist to provide "testimony" during one of its public meetings as the 2015 *Dietary Guidelines for Americans* are developed. Further, IFT also urges the DHHS, and USDA to consider at least one permanent designation of a food scientist and/or food technologist for future (2020 and beyond) DGACs. This was a recommendation from some members of the 2010 DGAC.**

IFT underscores the importance of ensuring that the recommendations regarding nutrient or food intake must be supported by the preponderance of credible scientific evidence. It is equally important to recognize and consider the capabilities and limitations of the food supply relating to agricultural practices, fishing restrictions, and environmental challenges (land, water, and energy) in the *Dietary Guidelines* recommendations. Including food scientists and food technologists to the table would greatly enhance the 2015 *Dietary Guidelines* process. It is their critical insights on existing technological capabilities and limitations germane to a global food supply and its impact on food manufacturing and food safety; sensory appeal of the food; cost and time constraints; and consumer acceptance that can make significant differences in dietary recommendations, consumer behaviors and the wellness of the global community.

The *Dietary Guidelines* have a great impact on food and beverage development and the cost and time that are involved in product development, as well as other factors including domestic and international regulations affecting the food supply chain. These ramifications are seldom considered when revising the guidelines. Food scientists and technologists are the translational partners of the *Dietary Guidelines for Americans*. Food scientists and technologists invoke their skills and knowledge to assure availability of food products that are consistent with the intent of the *Dietary Guidelines.* These highly educated, trained, and experienced scientists create and/or reformulate foods, develop new ingredients, and discover and design new packaging to influence positive food choices and positively affect public health through increased provision of nutrients of concern, while maintaining food safety. Examples include:

- reducing sodium content in foods such as prepared meals, breakfast cereals, canned soups, cheese, pasta sauce, and tomato sauce through the identification of new product development approaches (e.g., use of herbs and spice blends, mineral salts such as milk salt, magnesium sulfate, and taste enhancers) and innovations (e.g., adjusting the size and structure of the salt crystal, transforming standard salt crystals into free-flowing hollow crystalline microspheres to reduce salt content yet maintaining taste) to assist consumers in reducing dietary sodium intake
- developing fibers of smaller molecular weight, and with enhanced solubility to provide a convenient form to deliver dietary fiber in a variety of foods and beverages
- reformulating refined grain foods to increase whole grain content
- developing fat replacers, improving fatty acid profiles of foods (e.g., through new baking technologies) to decrease saturated fatty acid content

- using structured lipids and blending of oils to avoid *trans*-fat formation
- reformulating foods (e.g., breakfast cereals, soft drinks, dairy foods, and bakery foods) to reduce sugar content, developing non-nutritive and low calorie sweeteners
- developing plant-based sources of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) through innovative technologies to increase consumption of omega-3 fatty acids
- enrichment and fortification of foods to prevent nutrient related disease risk such as adding folate to flour to reduce incidence of neural tube defects
- fortifying foods with bioactive compounds and nutrients to such as orange juice fortified with calcium, and margarine fortified with plant stanols and sterols
- developing new ways to reduce post-harvest loss and losses in key nutrients, reduce waste due to spoilage, maximize the efficiency of food processing to conserve resources, create packaging to minimize waste, and place food production plants in key locations for efficient transportation and distribution of foods
- designing portion-control packaging to manage caloric intake
- researching ways to increase satiety to help consumers reduce caloric intake.

Food Processing and the Role of Food Science and Technology

According to biological anthropologist Richard Wrangham, cooking—the original form of food processing—began with the discovery of fire (Wrangham 2009). Later, cooking was augmented by fermenting, drying, preserving with salt, and other forms of food processing (Hall 1989; Floros 2008). Study of every ancient civilization has shown that humans overcame hunger and disease by not only harvesting food from a cultivated land but also by processing it with sophisticated methods (Floros 2004). Food processing has evolved from the need to preserve food to improve nutritional and other desirable qualities for better consumer health and wellness. Today our complex farm-to-fork food system includes agricultural production and harvesting; post-harvest processing including holding and storing of raw materials; ingredient transformation; food manufacturing (formulation, food processing and packaging); transportation and distribution; retailing; food service; and food preparation at home. Food scientists and technologists transform raw food materials and ingredients into a variety of nutritive, tasty, foods that may be consumed year around. By integrating various disciplines, including biology, chemistry, microbiology, nutrition, and toxicology, food scientists and technologists develop and implement solutions to address food and nutrition-related public health issues such as nutrient deficiency-related diseases and food safety. It would be hard to imagine a world without food science and technology. Food processing serves many purposes including to (IFT 2010):

- enhance nutritional quality of food
- provide an efficient nutrient delivery system
- improve health and wellness
- meet consumer needs for convenient, safe, healthy, nutritious, diverse, tasty and affordable foods
- improve food safety and quality (remove potential toxic substances and anti-nutrients, prevent growth of pathogens, control spoilage microorganisms)
- improve digestibility, bioavailability, and palatability of foods
- increase shelf-life of foods

- reduce post-harvest losses
- improve transportability of foods
- develop technologies/processes to produce foods more sustainably

The 2010 *Dietary Guidelines* recommend that nutrient needs be met through consumption of more nutrient dense foods and fewer energy dense foods, and to limit intake of solid fats, *trans*-fat, sugar, and sodium (USDA/DHHS 2010). Successful dietary changes are being achieved today through food reformulation and/or creation of new foods. This is a challenging endeavor for food scientists as they need to adhere to statutory requirements, including standards of identity while replacing ingredients or nutrients to limit with safe ingredients without sacrificing palatability and affordability. Advances in food science and technology have led to the creation of healthy foods to help meet the 2010 *Dietary Guidelines* **—** increase fiber intake; and reduce salt, sugar, *trans*-fat, and total fat intake. Through food science and technology and by integrating other disciplines, food scientists are shaping the character of the food supply. There are technological limitations, however, that still need to be considered in the development of the 2015 *Dietary Guidelines*, to ensure that the food system is capable of providing foods that will help meet the dietary guidance. The recommendations must be practical and achievable. Based on the capabilities and limitations of the available technologies, food scientists and technologists strive to meet consumer's needs, preferences, and expectations of healthy, nutritious, appealing and affordable foods that are available all year round.

<u>Nutrient contributions of processed foods</u>

One of the 67 questions identified by the 2010 DGAC was to--understand how the food environment facilitates or hinders achievement of food groups and dietary components recommendations. A study recently commissioned by the Academy of Nutrition and Dietetics, American Society for Nutrition, Institute of Food Technologists, and International Food Information Council that examined the contributions of processed foods to total dietary intakes of nutrients to encourage and food components to reduce, **found that "processing level was a minor determinant of individual foods' nutrient contribution to the diet and, therefore, should not be a primary factor when selecting a balanced diet"** (Eicher-Miller and others 2012). Results of this and other studies that addressed this question are discussed below.

Eicher-Miller and others (2012) examined the daily intake of processed foods and the percent contribution of each processed food category (five categories as defined by the International Food Information Council) to the total daily energy, nutrients to encourage, food components to reduce, and other select nutrient and dietary constituents among individuals two years of age and older. The authors reported the following:

- All processing levels contributed to daily dietary nutrient intake; no levels contributed solely to nutrients to encourage or solely to food components to reduce.
- Processing level is not a major determinant of individual foods' nutrient contribution to the diet, and does not have a clear association with the health benefits of a food as determined by either "nutrients to encourage" or "food components to reduce."
- Foods should be selected based on their nutrient composition, and the frequency and amount consumed rather than the processing level.

- For many Americans, nutrient inadequacy and deficiency is prevented because of the contributions of processed foods.
- Foods categorized by processing levels make major contributions to the nutrient and energy intake of the U.S. population.
- Proportionally, "minimally processed" foods contribute to low daily energy intake with a large percentage of contributions to the daily intake of several nutrients including dietary fiber, vitamin D, calcium, and potassium.
- Many foods in the "minimally processed" category (e.g., milk, fresh fruits, vegetables, and meats) are nutrient-dense and account for 27% of total foods consumed; and foods in this category (e.g., meat, and eggs) contribute proportionally large amounts to total cholesterol.

Analysis of nutrient intake data of the National Health and Nutrition Examination Survey (NHANES) participants showed the following (Dwyer and others 2012):

- Processed fruits and vegetables (e.g., canned, dried, frozen) made important nutrient contributions (e.g., fiber, folate, potassium, vitamins A and C) to the diet
- Processed foods also contributed to intakes of sodium and added sugar

Fulgoni and others (2011) separately determined the intakes of micronutrients naturally occurring in foods and intakes of nutrients contributed by enrichment and/or fortification, and reported the following:

- Enrichment and/or fortification of processed foods improves the intakes of vitamins A, C, D, thiamin, iron and folate.
- An evaluation of total usual intake showed that most Americans meet their recommended nutrient target for the majority of vitamins and minerals; however, this was achievable because of fortification and enrichment.
- The percentage of the population exceeding the tolerable upper limit as a result of enrichment and/or fortification and use of supplements was minimal, which suggest that these types of processing help in meeting the nutrient needs of Americans.

These studies show that**, it is not the level of processing that is important, rather it is the nutrient contribution of foods. It may be productive to educate consumers on the nutrient contributions of various foods so they can make informed choices based on available food options rather than recommend limiting processed foods in their diets.**

An understanding of the current dietary patterns and contribution of processed foods to nutrient intake is crucial in the development of realistic dietary guidance goals that consumers can achieve. Today, American diets include a variety of foods that have undergone some level of processing. In recent years there has been a controversy over the nutritional contribution from processed foods in the American diet. Food processing can add nutrients to the diet to help consumers meet the Dietary Reference Intakes. However, technological limitations, and the need to continue to provide safe, affordable and high quality foods that meet consumers' expectations may necessitate the addition of food components at levels that are not encouraged by the *Dietary Guidelines*, until suitable substitutes are available.

Sodium

The 2010 *Dietary Guidelines* recommends sodium intake of less than 2,300 mg/d for all individuals and an intake of 1,500 mg/d for persons who are 51 years of age and older, and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease. The Institute of Medicine (IOM) recommended that the food industry reduce the sodium content of the food supply in a way that goes unnoticed (slowly and over time) by most consumers as individuals' taste sensors adjust to the lower levels of sodium (USDA/DHHS 2010; IOM 2010a). Food scientists and technologists responded assertively to both recommendations to lower sodium levels in foods. As part of the National Salt Reduction Initiative (IOM 2010a), reformulation efforts have led to reduced sodium content in foods such as breakfast cereals (Thomas and others 2013), canned soups, cheese, pasta sauce, and tomato sauce to assist consumers in reducing dietary sodium intake (NYC Press release 2013).

Additionally, approaches such as use of herbs and spice blends, mineral salts (e.g., milk salt, magnesium sulfate, and potassium chloride), phosphates, umami compounds such as the amino acid glutamate (Beauchamp 2009), and taste enhancers, and innovations such as adjusting the size and structure of the salt crystal, transforming standard salt crystals into free-flowing hollow crystalline microspheres look promising to help reduce salt content while maintaining taste (Buttriss 2013).

The primary source of sodium in the diet is sodium chloride. Sodium chloride is a multifunctional ingredient which historically has been used as a food preservative. Salt is added to foods and beverages to (DeSimone and others 2013; IOM 2010a):

- prevent spoilage, inhibit growth and survival of undesirable microorganisms
- develop the characteristic texture associated with foods (e.g., breads, meats, and cheeses)
- increase shelf-life of foods
- improve stability of emulsions (e.g., gravies, sauces, and salad dressings)
- control fermentation (e.g., bakery goods)
- provide structural integrity (e.g., meat, and cheese)
- color (e.g., meats, and breads)
- prevent formation of ice crystals in frozen products
- enhance positive flavors and mask off flavors
- improve taste

Additionally, foods have a standard of identity that defines certain ingredients required in a food, which may contain sodium. For example, pasteurized process cheese requires one or more emulsifying agents that frequently contain sodium (e.g., sodium salts of mono, di, tri, and hexameta phosphate, sodium acid pyrophosphate, tetrasodium pyrophosphate, and the sodium salts of aluminum, citrate, tartrate, and potassium tartrate). The standard of identity also dictates the weight of the emulsifying agents that may be safely used.

Despite the success in reducing sodium in foods, functional and technological challenges in balancing the multiple functions of sodium and consumers demands of palatable foods remain. The safety and functionality of foods are impacted by sodium salts, and palatability is a very serious barrier to development of low sodium foods. Sodium not only imparts taste but also reduces or masks objectionable and enhances pleasant flavors. Unfortunately, currently there are no alternatives that mimic the sensory properties without imparting unpleasant characteristics. The development of a suitable salt substitute is hindered by the fact that the salt receptors on the tongue respond to sodium, potassium and lithium only. Lithium chloride is toxic, and potassium chloride which is used as a salt substitute imparts bitter taste that is difficult to mask (DeSimone and others 2013). In developing strategies, it is important to consider that salt reduction depends on the composition of the food, other ingredients in the food, processing, and other conditions. Therefore, any replacement, partial or complete with other compounds in processing must be preceded by scientific research to assure its feasibility, safe implementation at large scale (Buttriss 2013; Bautista-Gallego 2013), palatability, and importantly acceptability by consumers.

<u>Sugars</u>

The 2010 *Dietary Guidelines* recommended reducing the intake of calories from added sugars. Further, the IOM workshop in 2010 discussed ways the food industry can use contemporary and innovative food processing technologies to reduce calorie intake (USDA/DHHS 2010; IOM 2010b). Using alternative approaches (e.g., low calorie and non-caloric sweeteners), food scientists have successfully reformulated foods with reduced sugar content including breakfast cereals, soft drinks, dairy foods, and bakery foods. For example, sugar content in ready-to-eat breakfast cereals has been decreased by 7.6% (Thomas and others 2013).

Sugars occur naturally in fruits, vegetables, and dairy foods and beverages. Sugar (as glucose or fructose) also is commercially added to processed foods. The specific sugar used is determined by food process and preservation requirements for safety, functional impacts on texture and flavor, and cultural preference. Reducing the amount of sugar in foods or replacing them partially or completely with low calorie or non-caloric sweeteners significantly affects the processed food. A major role of sugar in food is to impart sweetness. For processing purposes, sugars and sweeteners are also used as (Buttriss 2013):

- preservatives/stabilizers
- texture modifiers
- fermentation substrates
- flavoring and coloring agents
- bulking agents

Therefore, it is important to recognize that alternative approaches to reduction or removal of sugars pose challenges, both regulatory and/or technological. Further, constraints including the type of food to which sugars or substitutes can be added, gastrointestinal discomfort with high intakes of polyols, cost, and, an inability to replicate the unique flavor profile remain (Buttriss 2013). Great strides have been made in the development of high intensity and non-caloric sweeteners. Developments in the application of nanotechnology and flavor chemistry also look promising to reduce the need for caloric sweeteners and enhance flavor without the presence of after tastes.

Dietary fats

Dietary fats are a source of energy and essential fatty acids, aid in absorption and metabolism of fat soluble vitamins, act as carrier for nutrients, and contribute to satiety. Fats contribute significant functionality in processed foods. Fats are used in food manufacture for several purposes including development of flavor, color, texture, and stability. Fats are chosen for applications based on the ability to confer textural variety in sauces and dressings, chocolates and confectionaries, and baked goods. The fatty acid composition of fats and oils markedly affects their ability to function in food formulations; the very chemistry that affects food formulation also is believed to affect nutritional and health outcomes.

Since 1980 the *Dietary Guidelines* have recommended reduced intake of fats, particularly saturated fats. Food scientists and technologists responded to these recommendations by developing foods low in fat, and saturated fat using fat replacers. Food manufacturers increasingly used hydrogenated oils and shortenings from vegetable oil as substitutes for saturated fats. However, chemical hydrogenation of vegetable oils led to an increase in *trans*-fatty acids. Subsequently, as research reported an association between *trans*-fat intake and cardiovascular disease, food scientists and technologists continue their efforts to reduce saturated fatty acids, and to reduce or eliminate *trans*-fat in foods.

A number of approaches such as use of fat replacers; removal of fat during processing for example, skimming of milk; improving the fatty acid profile to decrease saturated fatty acid; use of structured lipids (interesterification) and blending of oils to avoid the processes associated with the formation of *trans*-fat (Pszczola 2012); use of new baking technologies to change the fatty acid profile or to reduce the fat content in snack foods have been used to decrease total fat, saturated fatty acids and/or *trans*-fatty acids in foods (Buttriss 2013).

By applying various technologies, food scientists have made significant strides in reformulating or creating foods without *trans*-fatty acids or with less than 0.5 g/serving. In a study by Otite and others (2013), 66% of U.S. store brand and brand-name foods analyzed were reformulated (2007 through 2011) to reduce the *trans*-fat content. However, one approach is not suitable for all food categories or for foods within the same category. Constraints to fat substitutions remain, including cost and time, and an inability to mimic the structural and organoleptic characteristics of saturated fatty acids (Buttriss 2013).

Nutritional science and the *Dietary Guidelines* increasingly support the nutritional benefits of consumption of monounsaturated fatty acids, in preference to saturated fatty acids, due to their beneficial effects on several cardiovascular disease risk markers. New forms of oils with increased levels of monounsaturated fatty acids, which are more stable than polyunsaturated fatty acids are being developed for use in foods, thus reducing or eliminating the need for hydrogenation and the formation of *trans*-fat.

The 2010 *Dietary Guidelines* recommend intake of fish that is high in EPA and DHA. Intake of both EPA and DHA is associated with reduced cardiac deaths among individuals with and without pre-existing cardiovascular disease. DHA is important for fetal growth and development, and is associated with improved infant health outcomes, such as visual and cognitive development (USDA/DHHS 2010). Through innovative technologies food scientists are developing plant-based sources of EPA and DHA (and their precursors), which traditionally are found in oils derived from fish and algal sources (Pszczola 2012). Such innovations can be useful to consumers, particularly those who have fish allergies and who do not eat fish or products derived from fish, in meeting their nutrient needs.

Fiber

The 2010 *Dietary Guidelines* identified dietary fiber as a "nutrient of concern," and recommend increasing the intake of dietary fiber through consumption of foods which naturally contain fiber such as legumes, fruits and vegetables, whole grains, and nuts. It is important that the 2015 DGAC reconsider the emphasis placed on obtaining dietary fiber through only naturally-occurring foods sources, and emphasize the need to consume adequate fiber whether naturally-occurring or added, to help meet the recommendations. Fortifying foods with nutrients to promote health is a well-accepted practice and has been successful in reducing nutrient deficiencies. Further, the 2010 *Dietary Guidelines* acknowledge that "…in some cases, fortification can provide a food-based means for increasing intake of particular nutrients…" (USDA/DHHS 2010). Even though dietary fiber is present in many foods (e.g., whole grains, fruits and vegetables, and legumes) in the diet; fewer than 3% of Americans consume the recommended intake (Adequate Intake 14g/d per1000 kcal) (IOM 2005; USDA/ARS 2010), consistent with the IOM recommendations (IOM 2005). The IOM's recommendation for dietary fiber (Adequate Intake 19-38 g/d) is based on total dietary fiber which includes naturally occurring and added fiber (IOM 2005). However, the 2010 *Dietary Guidelines* focuses heavily on naturally fiber-containing foods.

Evidence suggests that fiber intake is linked to energy intake which poses challenges for consumers particularly those who are overweight or obese, in trying to increase fiber intake while attempting to reduce or maintain calorie intake. A modeling study designed to assess the impact of added dietary fiber on total fiber and energy intake in the current dietary patterns showed that adding dietary fiber to grain-based foods increased total fiber intake without an increase in energy intake. Further, the study showed that increasing the consumption of currently available whole grain foods increases dietary fiber intake, but with a substantial increase in energy intake (Nicklas and others 2011). It is clear from the modeling study that fiber intake can be increased by adding dietary fiber to grain-based foods. The majority of the population falls short of meeting the recommendations for dietary fiber, and those who try to meet the recommendations through naturally-occurring sources concomitantly increase their calorie intake. Fortification with dietary fiber may help consumers meet the recommendations. This approach has been adopted by food scientists and technologists. An analysis of ready-to-eat breakfast cereals showed a significant increase (13.4%) in fiber levels from 2005 to 2011 (Thomas and others 2013). Despite the success in developing or reformulating foods to increase fiber content, sensory appeal (taste, texture, color, moisture content) particularly with whole-grain foods remains an important barrier to consumer acceptance that food scientists continue to address as they develop/reformulate products.

Innovation in fiber ingredients and product development has broadened the scope of fiber containing foods, from traditional low-moisture foods such as breads and cereals to dairy foods and beverages. For example, leading technology enables the development of smaller molecular weight fibers, and fibers with enhanced solubility rendering them “invisible” in the food systems. These technologies provide a convenient form to deliver dietary fiber in a variety of foods and beverages (Niba 2012).

Emphasizing adequate fiber intake from all sources (naturally-occurring and added) in the 2015 *Dietary Guidelines* will lead to innovative ways to add fiber to grain-based foods to (whole and enriched grain); increase fiber content in breakfast and snack foods, since their contribution to total daily dietary fiber intake is less compared to lunch and dinner (Clemens and others 2012); increase fiber content in other foods such as yogurt, as well as beverages; and address the challenges related to sensory appeal. This will provide more choices and benefit consumers in meeting the recommendations for dietary fiber without exceeding caloric intake. Further, by providing specific recommendations based on the type of fiber (for example, viscous and fermentable) and associated health benefits, food scientists will be able to formulate foods and beverages with health benefits of interest to the consumers.

<u>Whole grains</u>

The 2010 *Dietary Guidelines* recommend increasing whole grain intake by replacing at least half of refined grains with whole grains (USDA/DHHS 2010). Consumption of whole grains increased by 20% from 2005 to 2008 due to a significant increase in the number of whole grain foods (e.g., breads, French toast, pasta, crackers, snacks, wraps, entrees and pizza crust) in the market, yet only 11% of grains consumed is whole grains (Whole Grain Council 2013). Barriers to increasing the consumption of whole grains include consumer taste preference, the inability to identify whole grain foods, difficulty in substituting whole grains for existing ingredients in meal patterns, price, availability, and convenience. Consumer education should include tips on how to substitute whole grains for refined grains without adding more calories to the diet (Marquart and others 2013).

Food scientists and technologists face many different challenges such as the bitter taste and coarse texture in formulating whole grain foods as compared to those formulated with refined grains. One way to address the taste issue is to increase the sodium content; however, this presents a nutrition/taste conundrum for the food scientists--how to increase whole grain and fiber content without impacting the taste and simultaneously keeping the sodium levels within recommended limit. To address this, new technologies to reduce sodium content without affecting flavor, product safety and shelf-life are being developed. For example, “inhomogeneous spatial distribution” of salt in a food matrix can reduce up to 25% of salt in bread without loss of flavor or use of flavor enhancers or other such ingredients. Technology to create whole grain foods exists; however, cost constraints limit its use and application to a wider range of foods. Further, challenges regarding the amount of whole grains that can be realistically added to foods remain. Novel food technologies that are cost-effective, and can mask the undesirable flavors and sensory perceptions while maintaining the healthy profile of whole grains are needed (Marquart and others 2013). It is important to recognize that without processing, especially milling, the nutritional qualities of whole grains would not be available.

Enrichment and fortification

The 2010 *Dietary Guidelines* recommend meeting nutrient needs by consuming foods that provide a well-balanced, nutrient dense diet. Most foods contain some level of naturally occurring nutrients. Food processing techniques such as enrichment and fortification can add essential nutrients to foods that are either lost during processing (enrichment) or add nutrients at a higher level than are naturally-occurring in the food (fortification), thus helping consumers meet the intake of nutrients through foods. Most grain foods are enriched. For example, bread is enriched with thiamin, niacin, riboflavin, and iron; most ready-to-eat cereals are fortified with iron, and B vitamins, including folate; milk and margarine are fortified with vitamin D; salt is fortified with iodine; flour is fortified with folate. Foods are fortified to ensure adequate nutrient intake and to prevent risk of certain diseases such as rickets (vitamin D deficiency), neural tube defects (folate deficiency), and goiter (iodine deficiency). The World Health Organization and Food Agriculture Organization regard fortification as a worldwide strategy to decrease the incidence of nutrient deficiency (IFT 2010; Eicher-Miller and others 2012; Fulgoni and others 2011). A study by Fulgoni and others (2011) showed that enrichment and/or fortification dramatically improved intakes of several nutrients including thiamin, folate, iron, and vitamins A and D. Further, the 2010 *Dietary Guidelines* acknowledge that "…fortification of certain foods may be advantageous in specific situations to increase intake of a specific vitamin or mineral. In some cases, fortification can provide a food-based means for increasing intake of particular nutrients or providing nutrients in highly bioavailable forms" (USDA/DHHS 2010).

The DGAC may consider expanding recognition of fortified foods as viable sources of shortfall nutrients among some subpopulations. Intake of both EPA and DHA is associated with reduced cardiac deaths among individuals with and without pre-existing cardiovascular disease. DHA is important for fetal growth and development, and is associated with improved infant health outcomes, such as visual and cognitive development (USDA/DHHS 2010). For a variety of reasons, it may be difficult for many individuals or subpopulations to obtain long chain omega-3 fatty acids from natural sources such as primarily fish. Fortification of foods is a positive means to enhance the nutrient contribution of many foods widely available to Americans generally and subpopulations specifically, including the economically disadvantaged.

Food at a very basic level is viewed as a source of nutrition to meet the daily requirements for survival, but there is a growing interest to achieve health and wellness through foods. Using innovative technology, food scientists have fortified foods with nutrients and/or bioactive components to improve wellbeing. Examples include: orange juice fortified with calcium for bone health; margarine fortified with plant stanols and sterols for heart health (IFT 2010); and addition of probiotics or prebiotics to improve gut health. These foods are often referred to as functional foods, and help consumers meet the *Dietary Guidelines*. However, as for traditional foods, the success of functional foods is also dependent on taste, affordability and acceptance by the consumers.

Sustainability

While developing dietary guidance, it is important to consider whether the existing agricultural system will be able to provide Americans with fruits, vegetables, nuts, seeds, fish and dairy foods to meet dietary recommendations, and its impact on natural resources such as land, water and energy. For example, it is estimated that more cropland would be needed to support vegetable and fruit production, and harvesting of wild fish is not sustainable (Dwyer and others 2012). The demand to feed the growing world population, the impact of climate change on food production, limited natural resources such as water, energy, and an increase in food security gap in certain regions of the world and in some places in the US, require science-based solutions to address these issues. While the current food system is capable of feeding seven billion people, it needs improvements to feed the anticipated nine billion by 2050. As food scientists and technologists attempt to meet the food/nutrient needs of a growing population, one challenge is the management of production waste. Food scientists and technologists are working towards developing new ways to reduce post-harvest loss, reduce waste due to spoilage, maximize the efficiency of food processing to conserve resources, create packaging that is reduced, recycled and reusable to minimize waste, and place food production plants in key locations for efficient transportation and distribution of foods (IFT 2010).

In addition to the efforts undertaken to address these challenges, an understanding of how to conduct a life cycle analysis of food production, and identifying the critical points that can be altered to increase sustainability is needed. Research to develop alternative technologies such as non-thermal processing that not only improves food quality and sensory attributes but is also environmentally responsible is needed. Continued improvement in food and beverage processing is needed to deliver safe, nutritious and affordable foods (IFT 2010). As indicated by Macdiarmid and others (2013), a healthy diet may not be sustainable; therefore further research is needed to better understand the sustainability of a healthy diet and for developing future dietary recommendations.

Summary

"Consumers ultimately determine what they eat and therefore what the food system produces. But governments, international organizations, the private sector and civil society can all help consumers make healthier decisions, reduce waste and contribute to the sustainable use of resources, by providing clear, accurate information and ensuring access to diverse and nutritious foods" (FAO 2013).

Food science and technology is integral to addressing rapidly changing demands of the global marketplace and meeting consumers' needs for a safe, healthy, nutritious, affordable and abundant food supply that contributes to health and wellness. Advances in agriculture and food science and technology have led to reduction in nutrient deficiency through fortification and enrichment; a generally safe food supply; high quality of foods all year around; range of delicious, healthy and nutritious foods; foods requiring minimal preparation time (convenient for working families); reduced food waste; and an efficient global food distribution that can be exploited in times of natural and man-made disasters (IFT 2010). Continuing advances in food science and technology enable development and delivery of appealing, affordable foods with important public health benefits. However, significant scientific and processing challenges remain.

Motivating consumers to eat healthfully and to choose a variety of foods to meet nutrient needs is important. Almost all foods currently consumed are processed, and many consumers fail to realize that food processing has historically provided and will continue to provide a safe and abundant food supply that provides significant public health benefits. In addition to providing healthy food choices, it is also important to address confusion, misinformation and negative perceptions about food processing and processed foods (Dwyer and others, 2012) so that consumers can make informed decisions while selecting foods for themselves and their families. Food formulation is just one tool to help Americans eat healthier. There is an ongoing need for consumer education and social marketing programs designed to encourage individuals to change existing behavior and to make better informed food choices. It is important to educate consumers to select foods based on the nutrient content of foods and not on the level of processing. Collaboration between food scientists, technologists, dietitians, nutritionists, behavioral scientists and other professionals is imperative to make positive changes in the food supply and overall health of Americans.

IFT and IFT members are ready and able to provide expertise on food science and technology that is critical to the development of the 2015 *Dietary Guidelines for Americans*. Our members are committed to assisting with the process, and we believe our technological and scientific capabilities will help the DGAC in developing evidence based recommendations that are practical and achievable. IFT appreciates the opportunity to provide comments for your consideration. Please contact Ms. Farida Mohamedshah, Director, Food Health & Nutrition, if we may provide further assistance. Ms. Mohamedshah may be reached at 202-330-4986 or via email at fmohamedshah@ift.org.

Sincerely,

janet e collins

Janet E. Collins, Ph.D., R.D., CFS
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References

Bautista-Gallego J, Rantsiou K, Garrido-Fernàndez A, Cocolin L, Arroyo-López N. 2013. Salt reduction in vegetable fermentation: Reality or desire. J Food Sci 78(8):R1095-R1100.

Beauchamp GK. 2009. Sensory and receptor responses to umami: An overview of pioneering work. Am J Clin Nutr 90:723S-7S.

Buttriss JL. 2013. Food reformulation: The challenges to the food industry. Proc Nutr Soc 72:61-9.

Clemens R, Kranz S, Mobley AR, Nicklas TA, Raimondi MP, Rodriguez JC, Slavin JL, Warshaw H. 2012. Filling America's fiber intake gap: Summary of a roundtable to probe realistic solutions with a focus on grain-based foods. J Nutr 142:1390S-1401S.

DeSimone JA, Beauchamp GK, Drewnowski A, Johnson GH. 2013. Sodium in the food supply: Challenges and opportunities. Nutr Rev 71(1):52-9.

Dwyer JT, Fulgoni VL, Clemens RA, Schmidt DB, Freedman MR. 2012. Is "processed a four-letter word? The role of processed foods in achieving Dietary Guidelines and nutrient recommendations. Adv Nutr 3:536-48.

Eicher-Miller HA, Fulgoni VL, Keast DR. 2012. Contributions of processed foods to dietary intake in the US from 2003–2008: A report of the Food and Nutrition Science Solutions Joint Task Force of the Academy of Nutrition and Dietetics, American Society for Nutrition, Institute of Food Technologists, and International Food Information Council. J Nutr 142(11):2065S-72S.

FAO. 2013. The state of food and agriculture: Food systems for better nutrition. Food Agriculture Organization of the United Nations. Rome, Available from: http://www.fao.org/docrep/018/i3300e/i3300e00.htm. Accessed on Sept 25, 2013.

Floros J. 2004. Food and diet in Greece from ancient to present times. Proceedings of the Indigenous Knowledge Conference. May 27–29, 2004. PennStater Conference Center, Pennsylvania State University, University Park, PA. p 5. Available from: http://www.ed.psu.edu/ICIK/2004Proceedings/section2-floros.pdf. Accessed Feb 22, 2010.

Floros J. 2008. Food science: Feeding the world. Food Technol 62(5):11.

Fulgoni VL, Keast DR, Bailey RL, Dwyer J. 2011. Foods, fortificants, and supplements: Where do Americans get their nutrients? J Nutr 141:1847-54.

Hall RL. 1989. Pioneers in food science and technology: Giants in the earth. Food Technol 43(9):186–95.

IFT. 2010. Feeding the world today and tomorrow: The importance of food science and technology. A Scientific Review of the Institute of Food Technologists, Chicago, Ill. By J. Floros, R. Newsome, W. Fisher, G. Barbosa-Canovas, H. Chen, C.P. Dunne, J.B. German, R.L.

Hall, D.R. Heldman, M.V. Karwe, S.J. Knabel, T.P. Labuza, D.B. Lund, M. Newell-McGloughlin, J. Robinson, J.G. Sebranek, R.L. Shewfelt, W.F. Tracy, C.M. Weaver, G.R. Ziegler. Comp Rev Food Sci Food Safety 9(5):572-99.

IOM. 2005. Dietary Reference Intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids (macronutrients). Food and Nutrition Board. Institute of Medicine. Washington, DC: National Academies Press.

IOM. 2010a. Strategies to reduce sodium intake in the United States. Food and Nutrition Board. Institute of Medicine. Washington, DC: National Academies Press.

IOM. 2010b. Leveraging food technology for obesity prevention and reduction efforts: Workshop Summary. Food and Nutrition Board. Institute of Medicine. Washington, DC: National Academies Press.

Macdiarmid JI. 2013. Is a healthy diet an environmental sustainable diet? Proc Nutr Soc 72:13-20.

Marquart LF, Jonnalagadda SS, Van Klinken J, Clemens R, Jensen G, Arndt E, Webb D. 2013. Delivering healthy and affordable whole grain foods: How can the food industry produce whole grain products that consumers will eat? Food Technol 67(7):52-62.

New York City Press Release. 2013. Mayor Bloomberg, Deputy Mayor Gibbs and Health Commissioner Farley Announce results of national effort to reduce sodium in pre-packaged foods. Feb 11.

Niba L. 2012. Progress in fiber-enriched foods. Food Technol 66(11):36-43.

Nicklas TA, O'Neil CE, Liska DJ, Almeida NG, Fulgoni VL. 2011. Modeling dietary fiber intakes in US adults: Implications for public policy. Food Nutr Sci 2:925-31.

Otite FO, Jacobson MF, Dahmubed A, Mozaffarian D. 2013. Trends in trans fatty acids reformulations of US supermarket and brand-name foods 2007 through 2011. Prev Chronic Dis 10:120198.

Pszczola DE. 2012. Fats: The good, the bad, and the in-between. Food Technol 66(6):81-100.

Thomas RG, Pehrsson PR, Ahuja JKC, Smieja E, Miller KB. 2013.Recent trends in ready-to-eat breakfast cereals in the U.S. Proc Food Sci 2:20-6.

USDA/ARS. 2010. Dietary fiber (g): Usual intakes from food and water, 2003-2006, compared to adequate intakes. What we eat in America, NHANES 2003 – 2006. Updated April 1, 2010. U.S. Department of Agriculture/Agricultural Research Service.

USDA/DHHS. 2010. *Dietary Guidelines for Americans, 2010*, 7th ed. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Washington, DC: U.S. Government Printing Office.

USPHS. 1988. The Surgeon General's Report on Nutrition and Health. Office of the Surgeon General. U.S. Public Health Service. DHHS (PHS) Publication No. 88-50201. Washington, DC: U.S. Government Printing Office.

Whole Grain Council. 2013. Whole grain statistics. Available from: http://wholegrainscouncil.org/newsroom/whole-grain-statistics. Accessed Sept 13, 2013.

Wrangham R. 2009. Catching fire: How cooking made us human. New York: Basic Books. 320 p.