

A Gradual Approach to Increasing Whole Grain Consumption in Children

- Children in the United States today are not meeting recommendations to consume three servings of whole grain foods daily.
- Gradually increasing whole grain content in popular grain-based foods, such as pizza, rolls, and snacks, helps to increase whole grain intake among school-age children.
- Improved communication and partnership between foodservice staff, academia, food industry, government, and trade/scientific organizations can help improve whole grain availability and acceptance.

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Making a Case for a Gradual Approach

School intervention studies have measured the acceptance rate of reduced-fat foods (8,20) and increased consumption of low-fat milk over time (29). However, efforts have not been reported that document acceptance of gradual changes in food composition—particularly everyday foods—allowing for adaptation over several months.

Birch and Fisher (1) suggested that developing preferences for new foods, with the exception of sweet and salty foods, is not an instantaneous process. It is believed that it takes an average of 5–10 exposures to increase liking for new foods and, subsequently, increase intake of those foods (2,3,21,22). And since repeated exposure to unfamiliar foods appears to increase acceptance by children, whole grain foods may need to be offered over an extended period of time to gain acceptance (28).

In addition, acceptance of a new food may occur more readily if the new food combines familiar and unfamiliar elements within the same product, as in the example of pizza with a whole grain crust. Children may be more willing to taste and accept a slightly different type of pizza. Repeated exposure to pizza with a whole grain crust may induce an acquired flavor preference for the taste of whole grains, further increasing the overall level of liking for whole grain products.

Additionally, introducing changes in a gradual way, slowly adding more whole grain while reducing the amount of refined

Not Enough Whole Grains

Recommendations by numerous organizations and authorities suggest we consume at least three servings of whole grain (3 ounces) per day in order to receive the healthful benefits whole grains provide (23,24). Yet, despite these recommendations, dietary studies indicate that whole grain consumption by children is far less than the recommended intake—averaging less than one serving of whole grain daily for children 6–11 years old (10). These findings raise questions about what can be done to improve children’s diets to ensure they get enough whole grains.

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flour over a period of months, may result in a better outcome. Serving “partial whole grain” foods containing a combination of whole grains and more familiar refined grains may encourage consumption by children, as these partial whole grain items resemble refined foods that are more familiar. A study comparing the effect of exposure and reward on acceptance of new foods by school children suggested that repeated exposure was indeed an effective manner to increase consumption (28). As food manufacturers continue to introduce more whole grain items, the concept of repeated exposure as an effective tool to improve liking and acceptance will be further tested with consumers (14).

The idea of gradually incorporating whole grain ingredients into commonly consumed grain-based foods was described in a paper by Marquart and colleagues (12). Researchers designed a study to examine baseline dietary intake data using the 1986 food frequency questionnaire from the Iowa Women’s Health Study (a prospective cohort study of 34,492 postmenopausal women). They reviewed data for 30 commonly consumed flour-based grain foods, assessing each for approximate flour content and making hypothetical estimates on the level of whole grain flour that might be substituted for refined flour. If whole grains were used in place of refined flour in these 30 common foods, the resulting increase in whole grain consumption would be about 2.0–3.3 servings per day (assuming 16 g of whole grain is equivalent to one serving of whole grain). This simple, yet very significant change in the food supply could be quite beneficial for U.S. consumers who often eat a large portion of grain foods that contain refined flour—and are not getting enough whole grains in their diet.

Based on this hypothesis, a series of studies were designed to see if a gradual increase in whole grain foods offered in school lunch settings could increase whole grain consumption and promote a balanced diet in school-aged children. By eating more whole grains, children would be more likely to receive potential health benefits, such as reduced risk of heart disease and diabetes, as well as improved weight maintenance—all known benefits linked to adequate whole grain consumption on a daily basis.

Evidence in Support of a Gradual Approach

Pizza Crust, Bread, and Rolls

Burgess-Champoux and associates (4) tested an intervention to increase consumption of whole grains among fourth- and

fifth-grade students in a Minneapolis, MN, U.S.A., public school ($n = 67$ child/parent intervention pairs) using another similar school ($n = 83$ pairs) for comparison. A multipronged approach was used that included classroom educational lessons, school menu modifications, and family newsletters and activities. Consumption of whole grains (pizza, pasta, tortillas, buns, and rolls) increased by one serving per meal occasion, while refined grain consumption decreased by the same amount in the intervention school. Increases were noted in the availability of whole grain foods and the ability to identify whole grains, in addition to improvements in parenting scores for role modeling and enabling behaviors. The results indicated that a school-based intervention could effectively improve children’s whole grain intake.

In another study, Chan and colleagues (6) used white whole wheat flour as a substitute for red refined wheat flour in pizza crust. Pizza crust with refined flour was served to school children in first through sixth grade on two separate occasions, two weeks apart. Then, pizza made with 50% white whole wheat flour in place of refined flour was served on four different days, two weeks apart. Plate waste (food uneaten) was collected and reported by grade. Also, fourth and fifth graders who ate the pizza recorded how well they liked the pizza. Researchers found no difference in pizza consumption and no difference in overall liking when whole wheat flour replaced up to 50% of the refined wheat flour in the pizza crust. No changes to sauce or toppings were made, probably helping to mask any differences in flavors often associated with whole grains.

Rosen and coworkers (15) studied the consumption of sandwich buns and dinner rolls made with red or white whole wheat flour at two elementary schools in Hopkins, a suburb of Minneapolis, MN. During the course of the school year, the whole wheat flour content of buns and rolls was increased from 0 to 91% (Table I). Consumption was estimated by collecting plate waste—uneaten food left over from the meal. Consumption and liking of either bread product was not statistically different from the other until the percentage of whole grain approached 70%—the point at which consumption and liking levels began to fall. Additionally, consumption may have been dependent upon accompanying foods that are part of the meal service since a sandwich bun surrounding a chicken or hamburger patty received a more positive response than did a side dinner roll—possibly due to the perceived

changes in moisture content in the bread or merely a more favorable liking of the entrée sandwich altogether.

Consumption of pizza and French bread made with up to 50% red whole wheat flour or 50% white whole wheat flour compared with like foods made with refined flour at two elementary school cafeterias in St. Paul, MN, was assessed by Schroeder et al. (19). Results showed that red whole wheat flour was as acceptable as white whole wheat flour in pizza, perhaps due to the presence of the sauce and cheese toppings, which characterize the flavor of the pizza more than the crust. On the other hand, consumption of French bread made with red whole wheat flour was statistically reduced compared with French bread made with white whole wheat flour. Differences noted in bread consumption may be attributed to the lack of familiarity since children may be more familiar with white bread and the change in color was not easily masked. Furthermore, whole grain substitutions in foods likely to be consumed by observant children must be well planned or disguised for the best outcome.

Grain-Based Snacks

After-school snacks are an area of opportunity for adding whole grains to children’s diets. Sadeghi and Marquart (16) measured consumption of two types of goldfish crackers (0 or 8 g of whole grain per serving) and two types of graham crackers (5 or 26 g of whole grain per serving) served to children at four elementary after-school programs in a school district in Roseville, a suburb of St. Paul, MN. Each child was offered each of the four different snacks on four separate occasions. Plate waste was collected for consumption records and liking was recorded and discussed in focus group interviews. Results showed no significant differences in consumption and liking between the goldfish with 0 g of whole grain, goldfish with 5 g of whole grain, and graham crackers made with 8 g of whole grain. Consumption decreased significantly for the graham crackers with 26 g of whole grain; however, the average amount consumed (13.5 g of whole grain—more than three-fourths of a serving of whole grain) was indeed higher than the whole grain content in the next highest product (8 g of whole grain) (Table I). Taste, texture, and appearance were cited as the reasons children disliked the 100% whole grain graham crackers.

In another study by Sadeghi and Marquart (17), school children enrolled in an after-school program in Minnesota were offered each of four different graham

snacks (containing 5, 8, 12, and 16 g of whole grain per serving) on four separate occasions to determine whether 16 g of whole grain delivered in a graham snack was acceptable. Consumption was measured by plate waste. Liking was assessed by taste tests and focus group sessions and included a separate expert panel of adults. No significant differences were noted with consumption of any graham snack (values range from 76 to 80% as measured by plate waste) or in liking. Focus group findings showed that children thought the whole grain snacks were sweet and had good golden color. The six-person expert panel found the flavor profile and intensity to be similar for all four whole grain snacks, noting only slight differences in texture (grahams with 5 g and grahams with 12 g had a slightly harder texture compared to grahams with 8 g and grahams with 16 g of whole grain). The average amount consumed was 13 g of whole grain—more than three-fourths of a serving of whole grain.

Foodservice Issues

Looking at whole grain issues from the side of the foodservice provider, foodservice personnel were interviewed to determine their attitudes and knowledge of whole grains and nutritional quality. Hesse et al. (11) conducted focus groups with a sample of 36 school foodservice directors and managers from school districts throughout the state of Minnesota. Foodservice personnel were asked about their experiences with whole grain foods in schools on topics ranging from purchasing to preparing and serving foods. School foodservice personnel indicated they were confused about whole grain definitions, whole grain measurement (such as grams and percentages), and how to determine

the amount of whole grain actually present in a food item.

Research by Chan et al. (7) assessed the knowledge of foodservice directors and staff at eight school districts in the Minneapolis area in group interviews. Participant knowledge of whole grains, information about cost and purchasing of whole grains, as well as barriers to preparation and consumption were discussed. Similar to the Hesse et al. (11) study, researchers found that foodservice personnel had a limited understanding of whole grains. They expressed concern over higher cost, limited availability of quality whole grain foods, and lack of kid-friendly options. Unappealing sensory characteristics (appearance, taste, and texture) and lack of exposure were identified as barriers to consumption of whole grains by children. School foodservice personnel felt strongly that education of both children and parents is crucial to increase the intake of whole grains among school children.

Discussions with foodservice staff in these studies confirmed that the topic of whole grains is a challenge. In simple terms, a whole grain must contain all three parts of the grain: germ, endosperm, and bran. Yet definitions for whole grains and health claims describing potential benefits run the gamut from botanical descriptions to hard-to-decipher scientific terminology (5,18,25,26) (See also the February 2000 issue, Vol. 45, No. 2, of *CEREAL FOODS WORLD*). The myriad references to whole grains are confusing to everyone—from foodservice staff to health professionals to consumers alike. Whole grain claims, ingredient notations, and various symbols and seals on packaging are complicated and can be misleading. The lack of consistent definitions and claims tends to impede availability of whole grain options and

thus consumption of such items in schools. Smaller school districts often lack the buying power of larger entities, placing them at a financial disadvantage. Inconsistent product quality of whole grain foods often results in lower-quality offerings and greater waste. Along with quality concerns, the cost of whole grain items is often higher than refined grain counterparts and schools cannot afford high-cost items. Concern over communication barriers and unclear promotional messaging between schools, vendors, and industry abounds. It is crucial to turn these barriers into opportunities in order to increase whole grain use and consumption in school lunchrooms.

Wagner et al. (27) collected school lunch data from 330 schools in Minnesota, in addition to interviews, to test four hypotheses: 1) student demand for lunches as part of the National School Lunch Program are negatively associated with nutrition; 2) nutritional meals cost more; 3) healthier meals require a separate production process; and 4) indirect costs assessed to foodservice by the school board negatively influence the nutritional quality of school meals. The results of this one-state study showed that only hypotheses 3 and 4 were accepted. Student demand for less nutritious food did not increase when more nutritious meals were served—indicating that there is an opportunity to make nutritional improvements. In addition, nutritious meals are not more costly. However, foodservice managers stated that significant costs were necessary to make nutritious meals available. Researchers suggest that similar data be collected nationally and studied thoroughly—beyond the eight nutrient categories specified in the federal regulations. Expanding the definition of “nutritious” to include minimal levels of sodium and cholesterol, more dietary fiber, greater fruit and vegetable inclusion, and expanded food variety may alter this result.

What's Next?

The next step is to bring together experts from school foodservice, academia, government, industry, and scientific/trade organizations to work toward a new paradigm for the development, delivery, and service of whole grain foods in school meals. Experts can work together to identify potential opportunities to improve communication and develop partnerships among government, industry, and school nutrition professionals. Developing working relationships and improved communication across a variety of disciplines is a prerequisite for the successful delivery of whole grain foods in schools.

Table I. Consumption of partial and 100% whole grain foods by elementary school children

Grain Products Served (serving size)	Average Number of Children (N)	Percentage of Grain Ingredients as Whole Grain	Amount of Whole Grain (grams per serving)	Consumption Average (%)
Hamburger bun (2 oz) ^a	320	0–91	0–25	63
Pizza (1 slice) ^{b,c,d}	290	0–50	0–16	74
Pasta (1/2 cup) ^e	340	23–100	6–25	73
Rolls (1.5 oz) ^a	360	0–91	0–19	68
French bread (1 oz) ^d	345	50	6	45
Crackers (30 g) ^f	115	0–100	0–26	71
Cookie (30 g) ^e	275	75–100	5–10	74

^a Rosen et al. (15).

^b Pizza slices were 129–144 g per serving.

^c Chan et al. (6).

^d Schroeder et al. (19).

^e Unpublished data, University of Minnesota.

^f Sadeghi and Marquart (16,17).

Recently, the Grains for Health Foundation (9), made up of a team of experts in the fields of whole grains and foodservice, convened in Minneapolis to identify various ways that both foodservice staff and industry can work together to improve whole grain intake among the children they serve. Foodservice personnel may alter whole grain offerings and intake by creating a “guide for food manufacturers” to help the food industry include whole grains in products developed for school use—for example, making partial whole grain foods more widely available in more types of foods.

In addition, foodservice staff can help identify whole grain gaps and successes—what products and forms are missing from foodservice offerings and what has worked well. Key findings from recent research (13) suggest that whole grain product acceptability is affected by many factors, including the level of whole grain contained in the food, flour color, particle size, optimum texture, product type, and whether accompanying foods were served. Gradually incorporating whole grains into foods works well in foodservice environments, particularly when popular grain-based foods, such as breads, rolls, pizza, and crackers, are served. Foodservice can improve whole grain specifications and standards for more accurate and efficient whole grain food orders. They can work to reconcile, in cooperation with industry, serving size issues and cost/unit tradeoffs to make whole grain foods easier to serve—as well as improve communication with vendors, parents, and children.

Food manufacturers have a unique opportunity to shape the availability and use of healthier, good-tasting foods in the school environment today. The food industry can use lobbying power to increase funding for school lunch programs to assure they offer the best nutrition for children at the lowest cost (9). They can use marketing dollars to educate the public on the value of whole grain foods and the benefits they provide. Food manufacturers can create partnerships with school foodservice to improve communication, identify product development needs, and assist in planning. By updating product packages with accurate nutrition labels and ingredient lists to improve identification of whole grain foods, as well as keeping crucial allergen information accurate, the food industry can play a critical role in improving the delivery of grain-based foods that are rich in whole grains and fiber, while maintaining taste appeal with controlled contributions from fat, sodium, and sugar, all within the current USDA cost structure (9,11,13).

Summary

Overall, it will continue to take combined efforts and better communication among vendors and distributors, along with key players in government, industry, and school foodservice, for changes to occur. Given the current economic environment and health status of our nation, upcoming discussions and collaborations should be set in the context of rising energy and food-related costs, an escalating prevalence of chronic diseases among children and adults, and sky-rocketing health care costs. Together, with improved communication and partnerships, we can shift our nation toward the development of healthier whole grain foods and implement policy and regulatory recommendations that can improve the diets of our children and help ensure a better future through successful delivery of whole grain foods in schools.

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