Kids Learn to Love Whole Grains

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Len Marquart

Dept Food Science & Nutrition
University of Minnesota
Encourage kids to become a whole grain FAN:
- Familiar foods
- Availability
- Natural transition

Research projects: Consumption of whole grain foods in schools
- Partial whole grain foods (50:50 flour blend)
- Multi-component whole grain intervention
- After-school whole grain snacking program
- Foodservice staff knowledge and practices
Children: A Whole Grain FAN

- **F**amiliar foods
- **A**vailability
- **N**atural transition
Familiarity

- White whole wheat
  - Use of white whole wheat (WWW) flour in familiar grain-based foods may be one venue to increase WG consumption in schools
    - Lighter color, milder flavor, and lighter texture provide a sense of familiarity
  - Transitional foods between refined and WG products
Availability

- Lower availability is a significant barrier to WG consumption
  - WG only 13% all grain foods available on the market
  - 100% WG bread, grain products less likely to be available in low-income neighborhood grocery stores (Jetter et al., 2005)
  - Increased consumer demand mainly due to 2005 DG’s (M&B, April 24, 2007 issue)
Gradually introduce partial whole grains into the U.S. food supply

- Similar to the gradual transition from whole milk to skim milk
- Develop partial whole grain products with lower levels of whole grain flour
- Pizza, bread, rolls, crackers, cookies
Iowa Women’s Health Study: A Theoretical Model

- 30 individual foods / 10 categories
- Food frequency questionnaire
- Adjust proportion of whole grain flour
- Imperceptible effect on taste and texture
- Increased WG intake from 2.0 to 3.3 servings / day
  - May be approach to increase whole grain intake in U.S. population
  - May familiarize population with whole grains
### Gradual Inclusion of Whole Grain Flour

<table>
<thead>
<tr>
<th>Food</th>
<th>% WGF in Existing Formula</th>
<th>Feasible % WGF in Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark bread</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Muffin</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>White bread</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Refined cereal</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Whole grain cereal</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Brownie</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Cookie, ready made</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Pie, ready made</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Pizza</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Pancake/waffle</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Pasta</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Cracker</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Biscuit</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>
School-Meals Programs: Shaping Eating Habits of Children

National School Meals Program

- Program provides 9 million children school breakfast and 31 million children school lunch on a daily basis

- School meals establish “childhood eating patterns that influence lifelong eating habits”
  - Opportunity to expose children to new foods
  - Multiple food exposures lead to acceptance (Birch 1999)

- Schools are a logical site for health behavior programs
Project I

School-based Partial Whole Grain Products
Students / School

- 1st - 6th grades from one elementary school in Hopkins School District, MN

- Enrollment: 324 boys and 314 girls

- 69% (white)
  31% (African American, Hispanic, or Asian)

- 37% were eligible for free or reduced price school meals

- ~ 550 lunch meals were served each day
Study Site: School Cafeteria

➢ Study Design

- RW pizza crust was offered 2 times
- The 50:50 blend pizza crust was offered 4 times
- Both types of pizza were made with a cheese topping, and served with an accompanying salad
Plate Waste Procedure

- Children discard unfinished grain products into plate waste container
- Waste is weighed
- Grain products offered on the serving line
- Weigh 10 samples of grain product to determine mean weight
- Children discard unfinished grain products into plate waste container
- Waste is weighed
Pizza Products

**Refined Wheat**

100% refined red wheat flour

**50:50 Blend**

50% white whole wheat flour *
50% refined red wheat flour
16 g whole grain = 1 serving

*Ultragain, ConAgra Foods, Omaha, NE
• Percent Consumption was determined from plate waste in grade schools.
• Pizza crust made with white or red whole wheat was just as acceptable as traditional crust from refined flour.
• Percent Consumption was determined from plate waste.
• Rolls made with white whole wheat were as acceptable as rolls made with refined flour.
• Red whole wheat was less acceptable as shown by more waste.
• White whole wheat breadsticks were similar to those made with refined flour.

• Again, red whole wheat was less well accepted by kids.
• Whole grain delivery food must be selected carefully.

• French bread made with even white whole wheat was not well accepted by school children.
Pizza is an ideal food to introduce whole grain flour.
- Nearly a full whole grain serving for lunch
- Nearly doubles daily whole grain intake

The use of white whole wheat flour in familiar grain foods may be one approach to successfully increase whole grain intake in children.

Additional research needs to be conducted to examine the gradual introduction of whole grain flour in various foods in school cafeterias.
School-based Whole Grain Intervention
**Intervention Framework**

- **Model:** Multi-component school-based intervention.

- **3 main components addressing Social Cognitive Theory (SCT):**
  - School cafeteria (environmental factor)
  - Classroom curriculum (personal factor)
  - Family involvement (environmental and behavioral factors)

- **Primary outcome:** Increase whole grain consumption of 4th and 5th grade children by _ serving per day.
Selection of Schools

- Convenience sample of 2 schools within the Hopkins School District:
  - Eisenhower Elementary (intervention)
  - Tanglen Elementary (control)
School Cafeteria: Menu Changes

➢ Menu planning
  ▪ Incorporation of whole or partially whole grain products daily
    • Pizza, pasta, tortillas, buns & rolls

➢ Procurement
  ▪ Identification of vendors and products

➢ Training of foodservice staff

➢ Quality control
  ▪ Log of foods served
Meal Observations
### Whole Grain Consumption: Change from Baseline

<table>
<thead>
<tr>
<th></th>
<th>IS</th>
<th>n</th>
<th>CS</th>
<th>n</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG</td>
<td>-1.11 ± 0.20</td>
<td>56</td>
<td>-0.46 ± 0.15</td>
<td>80</td>
<td>0.0097</td>
</tr>
<tr>
<td>SWG</td>
<td>-0.20 ± 0.11</td>
<td>56</td>
<td>-0.05 ± 0.06</td>
<td>80</td>
<td>0.199</td>
</tr>
<tr>
<td>WG</td>
<td>1.05 ± 0.16</td>
<td>56</td>
<td>0.09 ± 0.06</td>
<td>80</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

**IS** = Intervention School  
**CS** = Control School  
Values represent means ± SD
Changes in Intake of Selected Grain Foods by Category*

<table>
<thead>
<tr>
<th>Grain Food</th>
<th>Refined Pre</th>
<th>Refined Post</th>
<th>Whole Grain Pre</th>
<th>Whole Grain Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixes</td>
<td>0.52</td>
<td>0.13</td>
<td>0.00</td>
<td>0.53</td>
</tr>
<tr>
<td>Bread/Rolls</td>
<td>0.42</td>
<td>0.11</td>
<td>0.04</td>
<td>0.26</td>
</tr>
<tr>
<td>Other Breads</td>
<td>0.26</td>
<td>0.04</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>Pasta</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
</tr>
</tbody>
</table>

*Values represent mean servings for selected grain foods
Summary

- 1st multi-component intervention study focusing on whole grains and children.

- Children accepted a variety of WG products (red wheat, white wheat, barley) in a school cafeteria environment.

- Significant increase in intake of whole grain foods by children (1 whole grain serving/day).
Project III

After School Snacking Program
Methods

- **Subjects**
  - 117 children K-8\(^{th}\) from 4 suburban elementary schools in the Roseville School District

- **Design**
  - Plate waste

- **Products**
  - Goldfish crackers,
  - Honey graham crackers
### Consumption (%) for Snack Products

<table>
<thead>
<tr>
<th>Snack Product (g WG)</th>
<th>Consumption (%)</th>
<th>WG consumed (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldfish 0g</td>
<td>$78 \pm 4.3^a$</td>
<td>0</td>
</tr>
<tr>
<td>Graham crax 5g</td>
<td>$80.2 \pm 5.1^a$</td>
<td>4.01</td>
</tr>
<tr>
<td>Goldfish 8g</td>
<td>$75.4 \pm 5.2^a$</td>
<td>6.03</td>
</tr>
<tr>
<td>Graham crax 26g</td>
<td>$52.0 \pm 11.4^b$</td>
<td>13.52</td>
</tr>
</tbody>
</table>
After school snack programs are a feasible/effective setting to increase WG intake
  * Whole grain intake increased by about _ serving

Further studies needed to determine upper threshold for WG flour content for adequate consumption

Industry needs to push the WG level higher in more products.
Interpretation and Significance

- Plate waste provides a “real” environment in school cafeterias to access consumption of whole grain products
  - Preference
  - Liking
  - Consumption

- Next Projects:
  - Whole grain + dietary fiber
  - Meal observations in school cafeterias
    - Assess how children consume whole grain foods
Project IV

School Foodservice Staff: Whole Grain Knowledge and Practices
Foodservice Staff

- School districts
  - Randomly selected 8 schools
  - 7 county metro area, Minneapolis / St. Paul

- Participants (n=40)
  - Foodservice director
  - Purchasing manager
  - School manager
  - Head cook
  - Supervisor

<table>
<thead>
<tr>
<th>Sample Criteria</th>
<th>Urban</th>
<th>Suburban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>&gt;10,000</td>
<td>&gt;7,000</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;5,000</td>
<td>&lt;3,500</td>
</tr>
<tr>
<td>Free</td>
<td>≥ 50%</td>
<td>≥ 30%</td>
</tr>
<tr>
<td>Non-free</td>
<td>&lt;30%</td>
<td>&lt;15%</td>
</tr>
</tbody>
</table>
**Interview Questions**

- **Knowledge**
  How would you define a whole grain food?

- **Barriers**
  What are the barriers that prevent school children from eating whole grain foods in your school?

- **Acceptability / liking**
  What do you do to help children in your school to like whole grain foods?

- **Availability**
  What types of whole grain foods do you serve in your school cafeteria?

- **Budget concerns**
  Are there any cost differences between whole grain foods compared to refined grain foods?
Participants used 3 general categories to identify a whole grain food:

- **Descriptor**
  - “Intact” “Natural” “Fiber” “Less processed”

- **% Whole grain**
  - “50% or more” “51%” “If it’s 100% wheat”

- **Label / Ingredients**
  - “We look at the nutrition label” “The first things listed are the main ingredient”
Definition / Purchase of Whole Grain Foods

Participants were unable to articulate specific definitions and purchasing specifications for whole grain foods

- “I underline whole grain, whole wheat, on my order”
- “We wanted it to be 51%”

School foodservice staff and vendors pass in the night as to the amount of whole grain contained in grain-based foods served in schools
Barriers to Whole Grain Consumption

- **Sensory**
  - “Color, texture, taste”
  - “The dryness”

- **Lack of exposure**
  - “If they’re not used to a product they’re not going to eat it”

- **Availability**
  - “The manufacturing side needs to make, nutritious, economical, acceptable, kid-friendly whole grain products”

- **Cost**
  - “White bread is cheaper”
  - “selling water has helped offset the cost”
Ways to Serve Whole Grains

- Urge manufacturers to produce more varieties of whole grain products

  “Push manufacturers to come up with more…kid-friendly products that contain whole grains”
Conclusions

The main themes that emerged indicate that School foodservice staff

- Have a limited knowledge about whole grain definitions
- Have limited knowledge and applicable skills in the purchasing process
- Dire need for effective communication with the food industry to establish common guidelines
Implications for Industry and Government

- The incorporation of whole grain flour into grain-based foods may be a feasible approach to increase whole grain intake in school children.

- The process should emphasize:
  - Familiarity
  - Availability
  - Natural transition

- The development of educational resources to assist school staff to incorporate more whole grain foods into schools.

- A Child Nutrition label to explicitly identify the level of whole grain in school foods.
Collaborative Research Model

Knowledge

Academia

Biological Science

Priorities

Consumer Science

Technology

Industry

Government

Long-term Research Agenda
Riding the Grain Train

- Collaboration
  - Government
  - Academia
  - Industry
  - Trade groups
  - Health advocates
  - Activist groups
  - Media

Are you on the Grain Train?
Acknowledgements

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- Great Northern Bakeries