



UNIVERSITY OF MINNESOTA



Kids Learn to Love Whole Grains

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Points of Interest

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

- **Familiar foods**
- **Availability**
- **Natural 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)

Natural Transition

- 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

Food	% WGF in Existing Formula	Feasible % WGF in Formula
Dark bread	50	0
Muffin	0	50
White bread	0	25
Refined cereal	0	50
Whole grain cereal	75	0
Brownie	0	100
Cookie, ready made	0	50
Pie, ready made	0	25
Pizza	0	30
Pancake/waffle	0	50
Pasta	0	25
Cracker	0	50
Biscuit	0	15

Marquart, L et al. CFW, 51
(3) 2006, 118-121.

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

- 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



- Grain products offered on the serving line



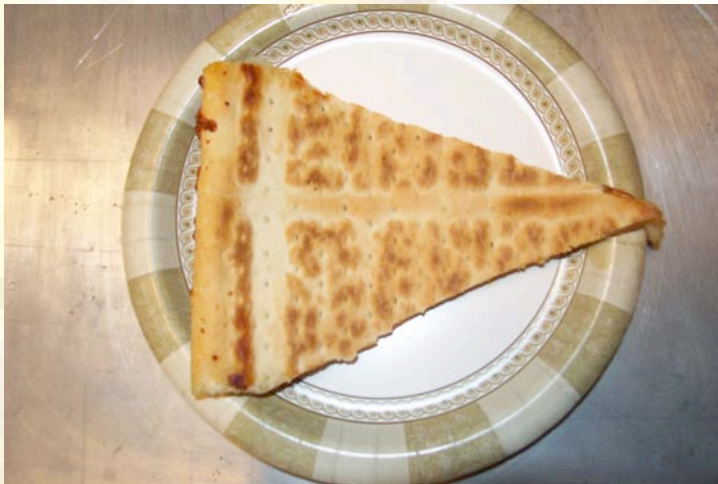
- Weigh 10 samples of grain product to determine mean weight



- Children discard unfinished grain products into plate waste container
- Waste is weighed

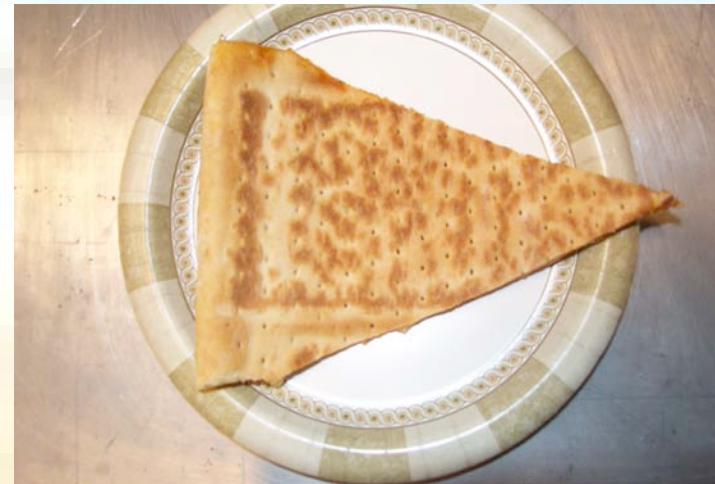
Pizza Products

Refined Wheat



100% refined red wheat flour

50:50 Blend

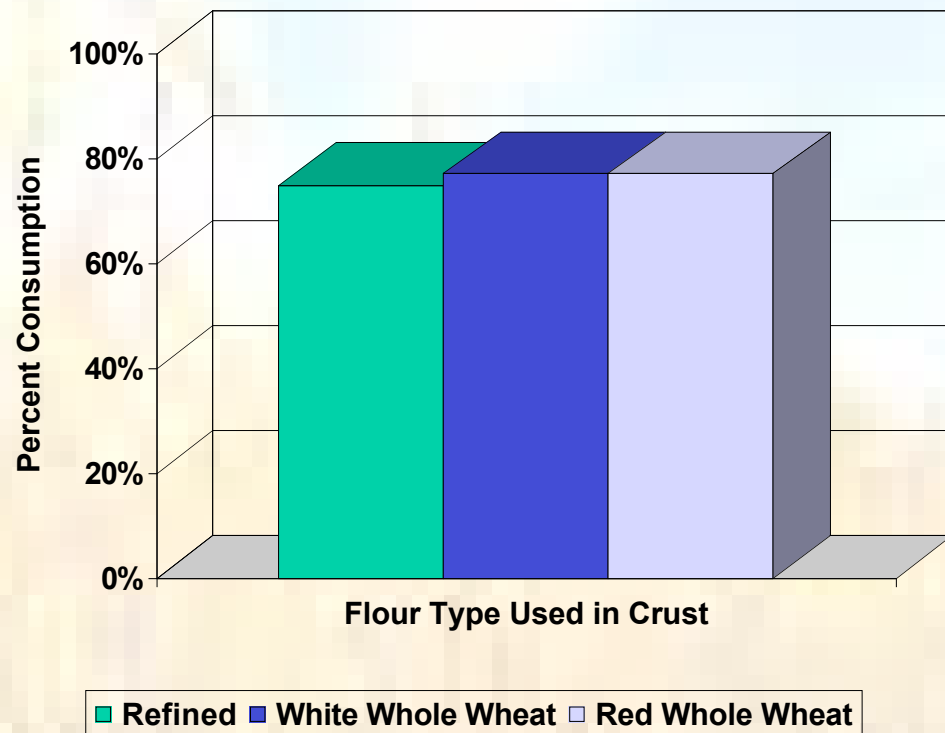


50% white whole wheat flour *
50% refined red wheat flour
16 g whole grain = 1 serving

***Ultragrain, ConAgra Foods, Omaha, NE**

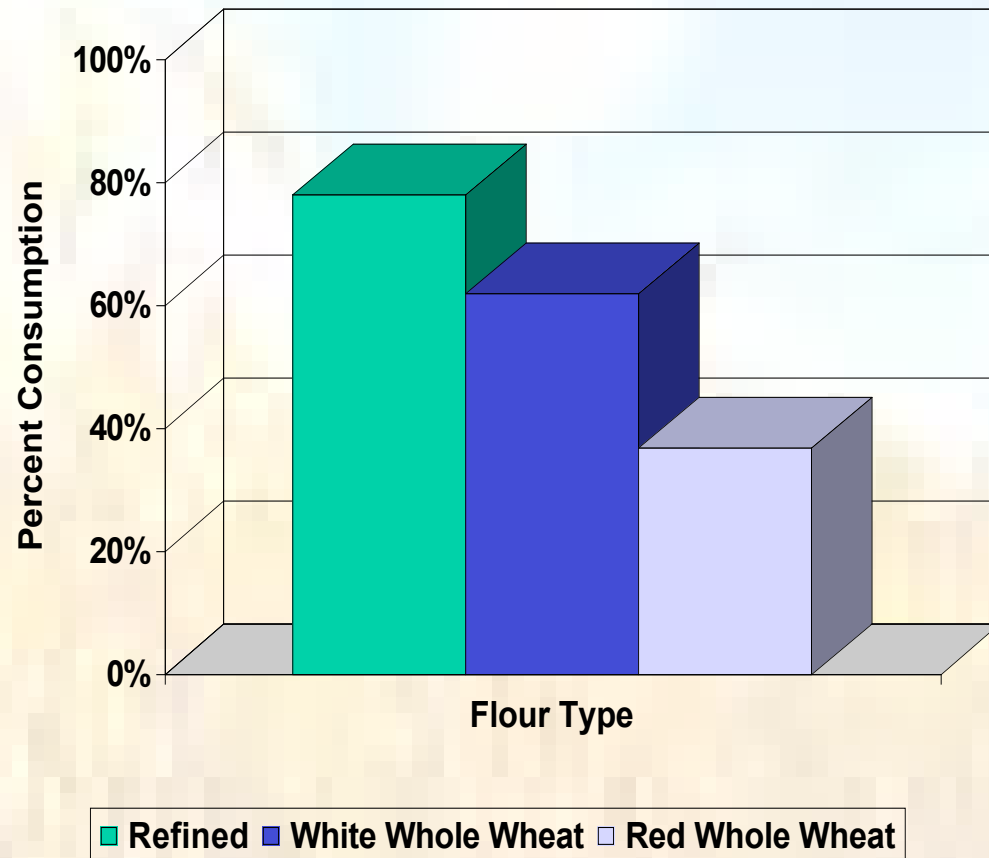
Pizza - 50 / 50 Flour Blend

- 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.



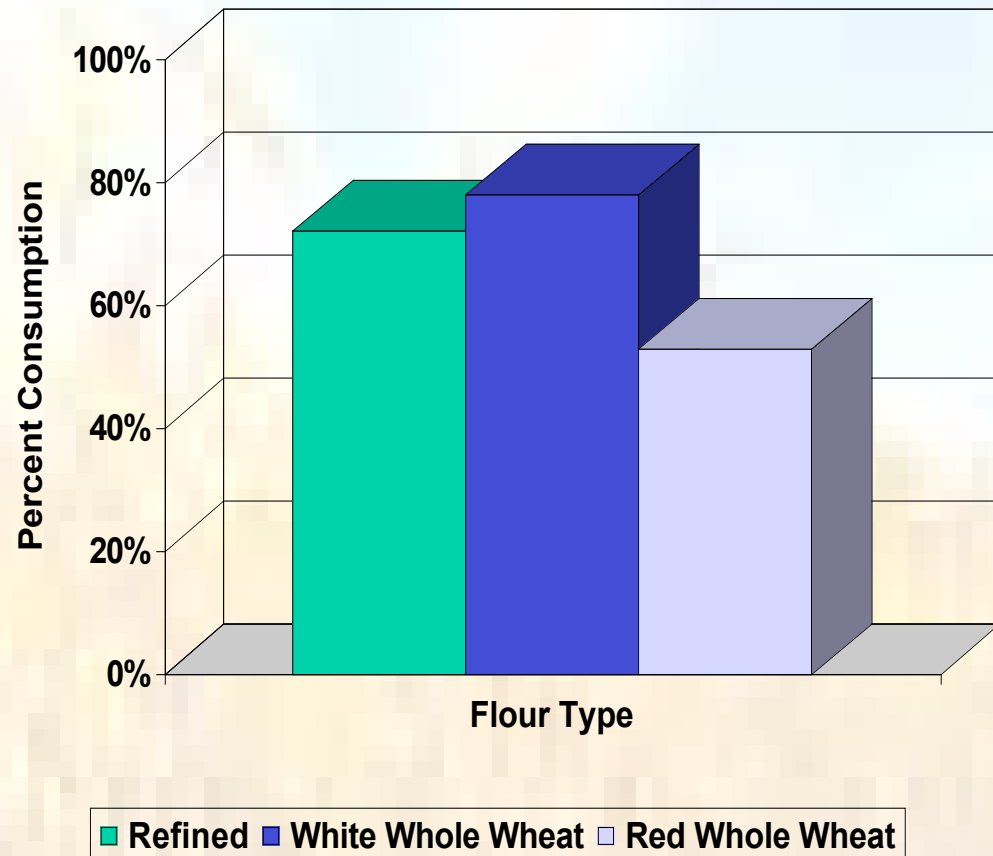
Dinner Rolls - 50 / 50 Flour Blend

- 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.



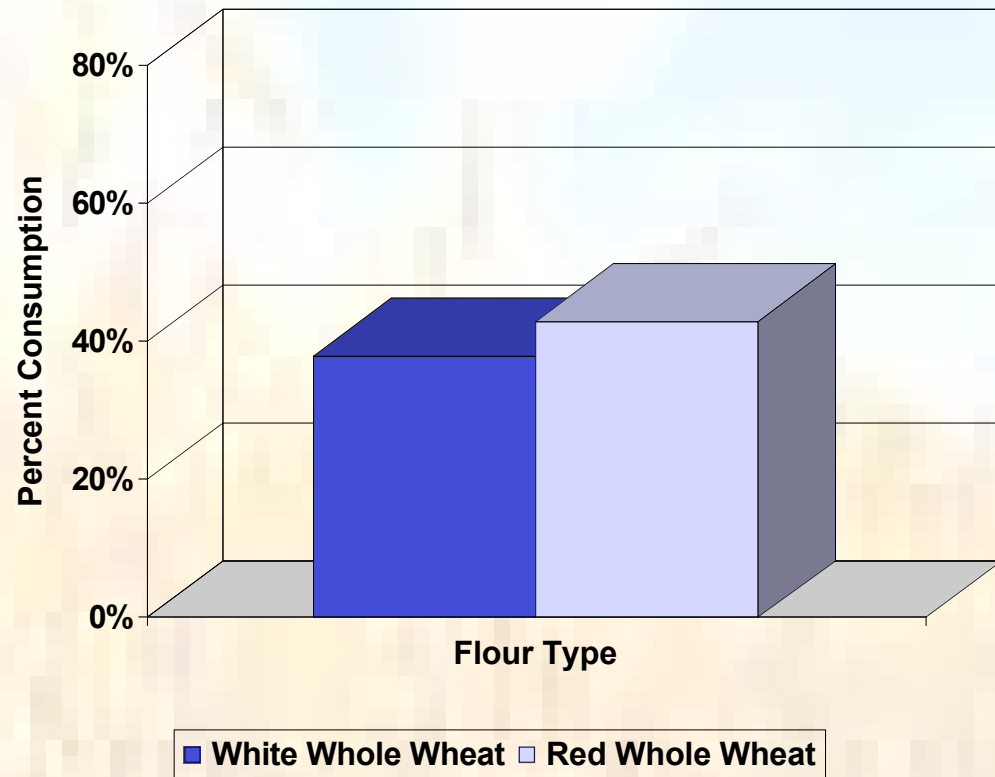
Breadsticks - 50 / 50 Flour Blend

- White whole wheat breadsticks were similar to those made with refined flour.
- Again, red whole wheat was less well accepted by kids.



French Bread - 50 / 50 Flour Blend

- Whole grain delivery food must be selected carefully.
- French bread made with even white whole wheat was not well accepted by school children.





Summary

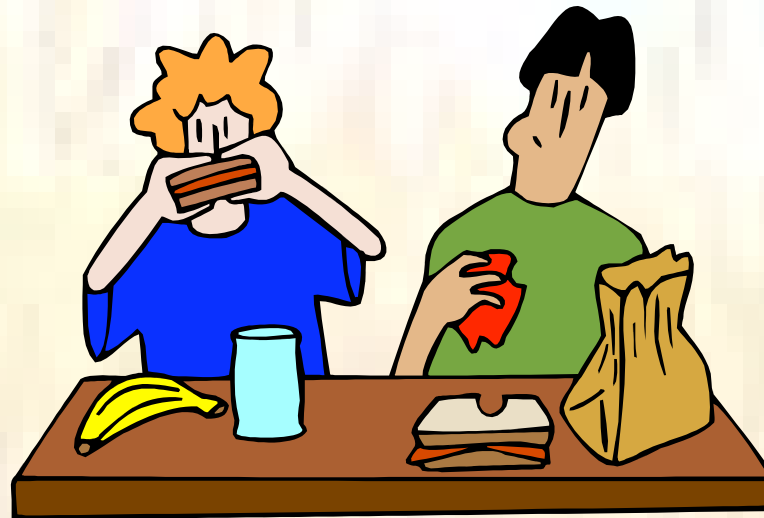
- Pizza is an ideal food to introduce whole grain flour.
 - Nearly a full whole grain serving for lunch
 - Nearly doubles daily whole grain intake

- 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

Project II

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.

Research Design

➤ 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

	IS	n	CS	n	P-value
RG	-1.11 ± 0.20	56	-0.46 ± 0.15	80	0.0097
SWG	-0.20 ± 0.11	56	-0.05 ± 0.06	80	0.199
WG	1.05 ± 0.16	56	0.09 ± 0.06	80	0.0001

IS = Intervention School **CS** = Control School

Values represent means ± SD

Changes in Intake of Selected Grain Foods by Category*

Grain Food	Refined		Whole Grain	
	Pre	Post	Pre	Post
Mixes	0.52	0.13	0.00	0.53
Bread/Rolls	0.42	0.11	0.04	0.26
Other Breads	0.26	0.04	0.00	0.02
Pasta	0.13	0.00	0.00	0.26

*Values represent mean servings for selected grain foods

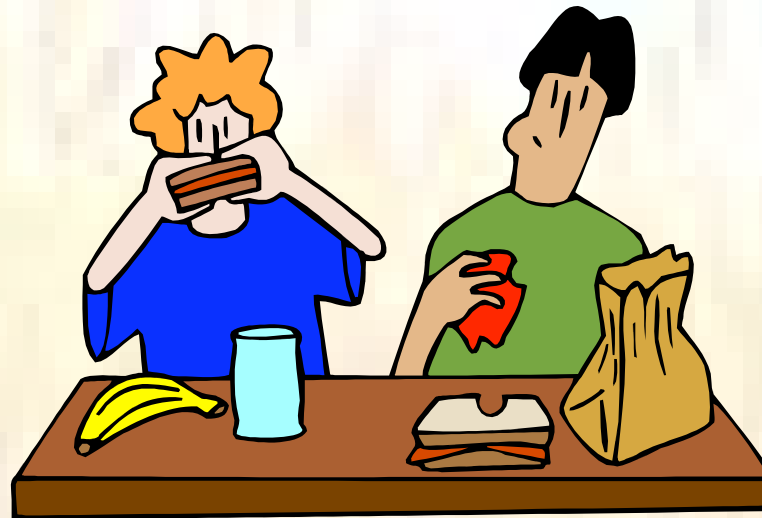
Summary

- 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-8th from 4 suburban elementary schools in the Roseville School District
- Design
 - Plate waste
- Products
 - Goldfish crackers,
 - Honey graham crackers

Consumption (%) for Snack Products

Snack Product (g WG)	Consumption (%)	WG consumed (g)
Goldfish 0g	78 ± 4.3^a	0
Graham crax 5g	80.2 ± 5.1^a	4.01
Goldfish 8g	75.4 ± 5.2^a	6.03
Graham crax 26g	52.0 ± 11.4^b	13.52



Summary

- 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.

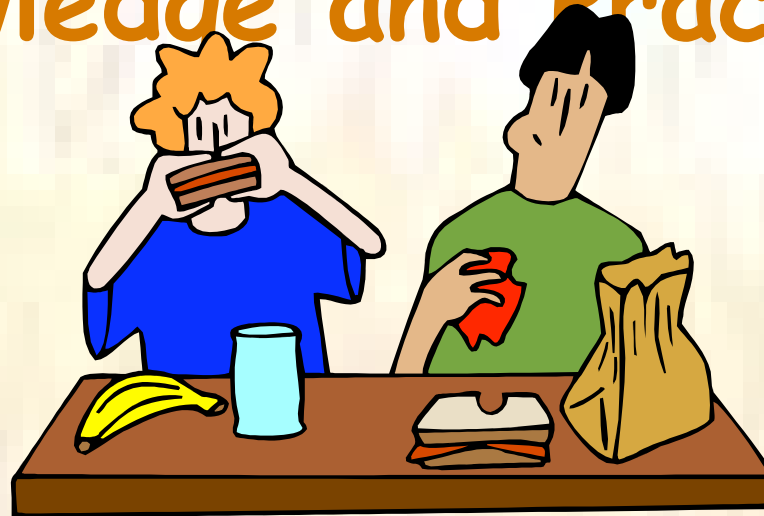
Interpretation and Significance

- Plate waste provides a “real” environment in school cafeterias to assess 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

Sample Criteria

	Urban	Suburban
Large	>10,000	>7,000
Small	<5,000	<3,500
Free	≥ 50%	≥ 30%
Non-free	<30%	<15%

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?

Whole Grain Food Definitions

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

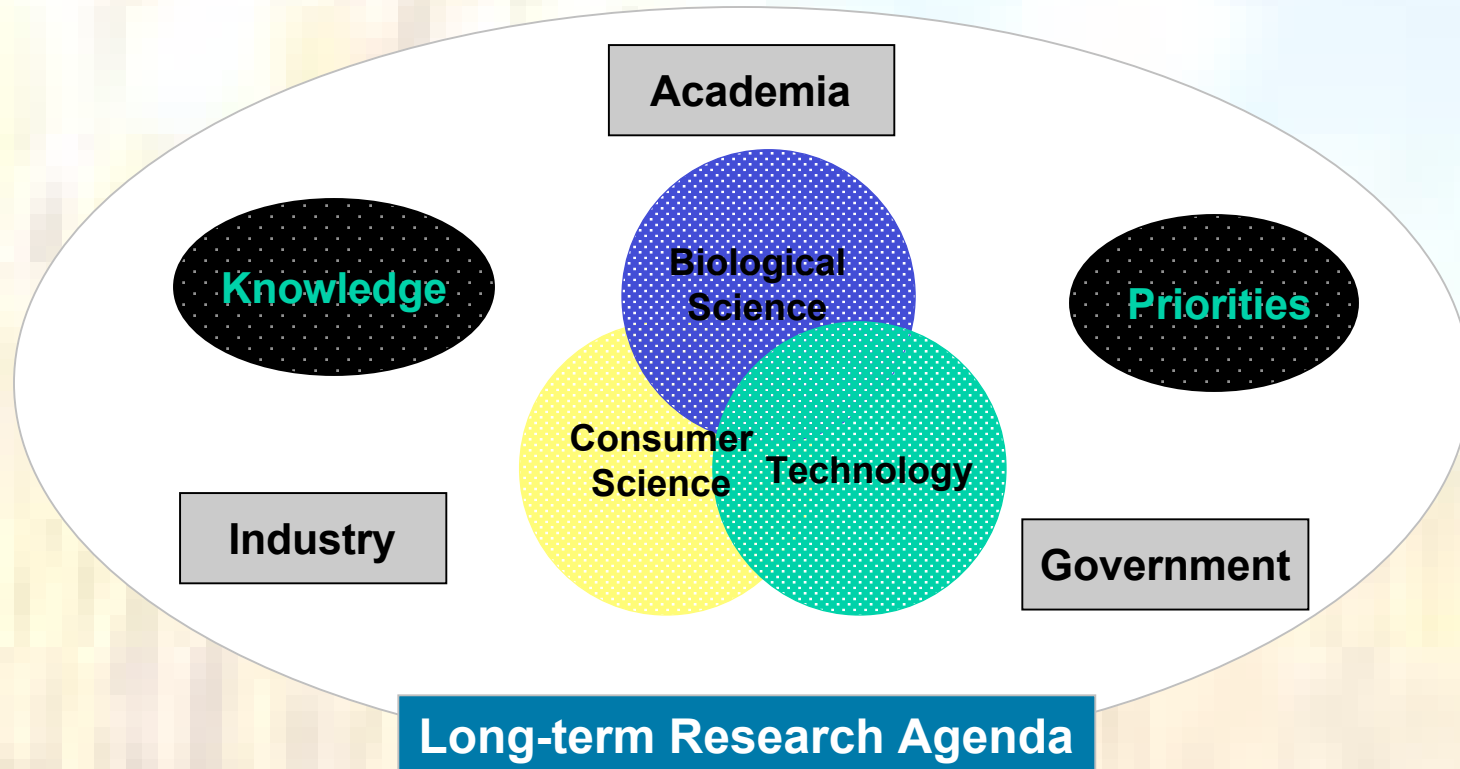
The main themes that emerged indicate that School foodservice staff

- 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



Riding the Grain Train



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

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