Product Development with Whole Grains

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Topics

• Whole grain dietary recommendations
• Strategies for whole grain product development
• Whole grain ingredients
• Communication to consumers
Dietary Guidelines for Americans 2010

• Focus on consuming nutrient dense foods
  – Whole grains

• Consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.

• Consumption of refined grain products that also are high in solid fats and/or added sugars should be reduced.
Whole Grain Foods are Needed

- Whole grains deliver significant quantities of several nutrients including fiber, B-vitamins, magnesium.

- There is considerable science support for the health & wellness benefits of whole grains.

- At least half of daily intake of grains should be from whole grain foods.

- Consumers aren’t eating enough whole grain foods.
## Whole Grain/Whole Wheat - Retail

<table>
<thead>
<tr>
<th>Category</th>
<th>Whole Grain Unit Sales Millions</th>
<th>Whole Grain’s Share within its Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold RTE Cereal</td>
<td>1107.3</td>
<td>50.3%</td>
</tr>
<tr>
<td>Fresh Bread/ Rolls/ Buns</td>
<td>679.2</td>
<td>14.9%</td>
</tr>
<tr>
<td>Hot Cereal</td>
<td>92.9</td>
<td>30.0%</td>
</tr>
<tr>
<td>Snack Bars/ Granola Bars</td>
<td>78.9</td>
<td>8.0%</td>
</tr>
<tr>
<td>Dry Pasta</td>
<td>72.7</td>
<td>6.0%</td>
</tr>
<tr>
<td>Crackers</td>
<td>50.2</td>
<td>3.2%</td>
</tr>
<tr>
<td>Tortillas - refrigerated</td>
<td>9.0</td>
<td>6.2%</td>
</tr>
<tr>
<td>Cookies</td>
<td>7.3</td>
<td>0.4%</td>
</tr>
<tr>
<td>Flour</td>
<td>5.2</td>
<td>2.7%</td>
</tr>
<tr>
<td>Toaster Pastry</td>
<td>4.2</td>
<td>1.8%</td>
</tr>
<tr>
<td>Baking Mixes</td>
<td>3.7</td>
<td>0.5%</td>
</tr>
<tr>
<td>Salty Snacks</td>
<td>2.3</td>
<td>0.1%</td>
</tr>
<tr>
<td>Pancake Mix</td>
<td>1.9</td>
<td>1.8%</td>
</tr>
<tr>
<td>Frozen Bread/ Dough</td>
<td>0.8</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

**Source:** IRI Retail Sales - 52 weeks ending Dec 27, 2009. Total grocery & mass merchandisers, excluding Wal Mart
Fastest Growing Whole Grain Retail Categories

Unit Sales % Change Yr Ago
IRI Sales Data F/D/Mx (Last 52 Wks Ending Dec 27, 2009)

- Frz Bread and Dough: 43% Whole Grain, -2% Regular
- RFG TORTLLA: 20% Whole Grain, -5% Regular
- Pasta: 14% Whole Grain, 4% Regular
- Crackers: 11% Whole Grain, -0.2% Regular
- Baking Mixes: 10% Whole Grain, 2% Regular

Source: IRI
Retail Sales 52 weeks ending Dec 27, 2009.

Total grocery & mass merchandisers, excluding Walmart
To Increase Consumption of Whole Grain Foods

• Optimize Taste
  – Flavor, color and texture

• Increase Availability of Whole Grain Foods
  – More whole grain foods needed
  – Whole grain food choices needed in all market segments

• Increase consumer awareness

• Control costs
Product Development with Whole Grains
Whole Grains are Versatile

- Baked goods (breads, tortillas, biscuits, muffins, quick breads)
- Pasta
- Pilaf side dishes
- Bars (granola, fruit & grain, etc.)
- Hot and ready-to-eat cereals
- Snacks – crackers, cookies
- Coatings, toppings
- Meats
There are Many Types of Grains
Recommended to FDA by AACCIR Whole Grain Task Force 2006

• **Cereal Grains**
  – Wheat (includes spelt, emmer, farro, einkorn, Kamut®, durum)
  – Rice
  – Corn (maize, popcorn)
  – Oats
  – Barley
  – Rye
  – Canary Seed
  – Fonio

• **Pseudocereal Grains**
  – Amaranth, Buckwheat, Quinoa
Whole Grain Ingredient Considerations

• Grain Type - Hard or soft wheat, others grains, multigrain mixtures, gluten free

• Grain Seed Color - White, yellow, red, brown, black, purple

• Particle Size and Shape - Coarse, medium, fine, ultrafine flours, cracked, crushed, rolled, etc.

• Nutritional targets
  – Fiber level and type
  – Vitamins and minerals
  – Protein level and quality
  – Other phytonutrients

• Functionality
  – Fiber, protein, starch type and granule size
  – Processing – toasted, puffed, instantized, sprouted, etc.
Formulating Foods with Whole Grains

• Inclusion level – product attributes, nutrition/claims, processing
  – 15-30% minimal impact on product & processing; entry level claims
  – 51% stronger claims, can be good source of fiber
  – 100% often good to excellent source of fiber

• Whole grains absorb more liquid
• Additional functional ingredients may be needed
• Processing conditions may require adjustment
Formulating Whole Grain Foods

- Add selected amounts of whole grains to popular grain-based foods – gradual approach
  *Ultrafine white whole wheat flour for stealth whole grain*

- Increase nutritional density with grain selection
  *Higher fiber grains*

- Try new grains and multigrain blends
  *Ancient grains: Amaranth, Quinoa, Millet, Sorghum, Teff*
Add selected amounts of whole grains to popular grain foods

• Gradually incorporate whole grains into foods
  – Make partial whole grain foods-containing whole grains and refined grains
  – Allow consumers time to get used to changes

• Begin with popular items such as pizza crust, tortillas, pasta, buns

• Make stepwise increases over time

• Use clear labeling to communicate benefits
Ultragrain® Whole Wheat Flour

• Specially selected white wheat
  – Lighter color, milder flavor, excellent functionality
  – Available in Hard and Soft

• Whole grain flour with fine particle size
  – Particle size similar to refined flour using a special milling process
  – Smooth appearance and texture
  – 100% whole grain
  – Patents 7,419,694 and 7,425,344
100% Whole Wheat Breads

Fine Red Whole Wheat  Ultragrain® White Whole Wheat
Effect of Wheat Color and Whole Grain Inclusion Level

Control
0.8 g fiber/30 g

25%
1.3 g fiber

50%
1.7 g fiber

100%
2.7 g fiber

Fine Red Whole Wheat

Ultragain® White Whole Wheat
## Pizza Crust with Whole Wheat Flour

<table>
<thead>
<tr>
<th>Bakers % Ultragrain</th>
<th>Formula % Ultragrain</th>
<th>Dietary Fiber/55 g RACC*</th>
<th>Claims Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.9 g</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>15</td>
<td>1.8 g</td>
<td>9 g whole grain per serving</td>
</tr>
<tr>
<td>51</td>
<td>30</td>
<td>2.6 g</td>
<td>17 g whole grain per serving</td>
</tr>
<tr>
<td>100</td>
<td>57</td>
<td>4.2 g</td>
<td>33 g whole grain per serving</td>
</tr>
</tbody>
</table>

*FDA Good Source of Fiber*

FDA Fiber from Grains, Fruits, Veg/Cancer (101.76)

FDA Whole Grains/Cancer & Heart (99P-2209)
Benefits of Ultragrain® White Whole Wheat

• 100% Whole Grain

• Flavor, color & texture more similar to refined flour

• Available in Hard and Soft versions

• Beneficial across inclusion range – stealth to 100% whole grain
Increase nutritional density with higher fiber grains

- Barley and Rye
  - Highest fiber content of common cereal grains
  - Soluble fiber (~4%)
    - Beta-glucan in barley
    - Arabinoxylans in rye
    - Fructans

- Opportunities with fiber-enhanced grain varieties
  - Waxy, hulless barley (e.g., Sustagrain 30% fiber)
  - HiMaize whole corn flour
Sustagrain® Barley - unique composition, enhanced benefits

- Waxy, hulless, shrunken endosperm
- Identity-preserved (IP)
- High in fiber (30%) and half the starch (30%) compared to other grains
- 3x more beta-glucan than oats & barley
- 100% Whole Grain
Whole Grains: Fiber Comparison

- Sustagrain Barley
- Barley
- Oats
- Rye
- Wheat
- Brown Rice

Fiber, %

- Insoluble Fiber
- Soluble Fiber
Sustagrain® - Extended Health & Wellness Benefits

• **Heart Health** - beta-glucan from barley & oats, 21 CFR 101.81

• **Blood Sugar Management** - Shown to lower glycemic response in products including hot cereal, bars, baked goods, beverages
  - Foster-Powell, et al, AJCN, 76:5, 2002

• **Hunger/Weight**
  - Liljeberg, et al., AJCN, 69:647, 1999 - Breakfast including Sustagrain delayed between-meal fasting, increased satiety, improved glucose tolerance at lunch.
  - Schroeder, et al., Appetite, 2009 - Subjects significantly less hungry with Sustagrain compared to whole wheat and refined rice

• **Digestive Health** – higher fiber
Sustagrain® Product Development Opportunities

• Broad Range of Applications
  – Including breads, pilaf, pasta, bars, tortillas, coatings, meat, quick breads, cookies, crackers, extruded cereals and snacks

• Enables claims in a range of products
  – Foods with small serving size
  – Foods with low % grain ingredients
  – Multigrain blends

• Can also provide functional benefits
  – Moistness (muffins)
  – Reduced staling (breads)
  – Flexibility (tortillas)
## Whole Grain Fiber Comparison for Claims

<table>
<thead>
<tr>
<th>Whole Grain</th>
<th>FDA Heart Health (1)</th>
<th>FDA Heart Health (2)</th>
<th>Good Source Fiber</th>
<th>Excellent Source Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats*</td>
<td>15</td>
<td>18.8</td>
<td>26.6</td>
<td>53.2</td>
</tr>
<tr>
<td>Wheat*</td>
<td>43</td>
<td>NA</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Barley, Sustagrain®</td>
<td>5</td>
<td>6.3</td>
<td>8.4</td>
<td>16.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grams Whole Grain Needed for Claim (minimum)</th>
</tr>
</thead>
</table>

1) 0.6 g soluble fiber from fruit, veg or grains (CFR 101.77)
2) 0.75 g beta-glucan soluble fiber from oats or barley (CFR 101.81)

*Oats USDA 09402
Sustagrain® Barley Impact on Crumb Softness in 51% Whole Grain Pan Bread
Enhanced Nutrient Whole Grains - Why Use?

**Sustagrain Barley Example**

- Whole Grain
- Rich in Fiber
- Higher soluble:insoluble compared to most grains, fruits & vegetables
- Qualifies for FDA approved food specific heart health claim
- Enhanced health and wellness benefits
- Clean label
- Functional benefits (moisture retention for shelf life)
Try New Grains and Multigrain Blends

- Ancient grains
  - **Amaranth** – higher protein value, minerals & folic acid
  - **Quinoa** – Incas, higher protein value, potassium, folic acid
  - **Sorghum** – 5th highest in world, versatile, more cost effective
  - **Millet** – versatile, mild flavor
  - **Teff** – staple in Ethiopia, very tiny seed, higher minerals

- Ancient Grains also include spelt, Kamut®, farro, einkorn, emmer

- What is different/better about ancient grains?
  - Unique flavors
  - Visual interest – seed size, shape and color
  - Primarily used as whole grains ingredients
Ancient Grains

- Consumer interest is increasing
  - Increased use in fine dining
  - Now found beyond natural foods section of supermarkets
  - Appealing to adventurous consumers
  - Health & wellness benefits of interest
Ancient Grains = Whole Grain + Cuisine Adventure

- Still small at retail and less known to consumers
- Whole grain nutrition

Made with 51% whole 9-grain blend including amaranth, quinoa, millet, sorghum, teff

Made with Amaranth
## Ancient Grains

<table>
<thead>
<tr>
<th>Whole Grain Flour</th>
<th>Absorption</th>
<th>Flavor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaranth</td>
<td>Strong hydration</td>
<td>Fresh corn husk/silk notes</td>
</tr>
<tr>
<td>Millet</td>
<td>Low hydration</td>
<td>Low impact flavor, baking can impart bitter notes</td>
</tr>
<tr>
<td>Quinoa</td>
<td>Moderate hydration</td>
<td>Corn and legume notes</td>
</tr>
<tr>
<td>Sorghum</td>
<td>Low hydration</td>
<td>Slightly sweet, light corn notes</td>
</tr>
<tr>
<td>Teff</td>
<td>Moderate hydration</td>
<td>Low impact, hint of molasses</td>
</tr>
</tbody>
</table>
Product Development with Ancient Grains

- 15% (flour basis) can be used in a broad range of applications
- Breads 25%
- Quick breads/muffins 50%
- Cookies 50%
- Crackers 25%
- Extruded Cereals/Snacks 50%
- Pasta 25%
Ancient Grains add Variety: amaranth, quinoa, millet, sorghum and teff

- Unique flavors
- Visual interest and texture
- Naturally gluten free
- Whole grain nutrition
- Product applications include bakery, pasta, extruded snacks, batters & breading
Communicating Whole Grain Benefits to Consumers
Labeling to Identify Whole Grain Foods

- **Product Name**
  - e.g., “100% Whole 7-Grain Bread”, “Bun Made with Whole Grain”

- **Amount of Whole Grain**
  - Grams or % Whole Grain

- **Symbols – Whole Grains Council Stamp**

- **FDA Approved Whole Grain Health Claim**
  - At least 51% whole grain by product weight & meets other criteria

- **Ingredient Legend**
  - Designate as whole or whole grain – e.g., whole grain oats, whole grain brown rice
What is a Whole Grain *Food*?

- Not universally defined today

- Definition needed for package labeling, consumer communication, research data assessment

- AACC Whole Grain Working Group is working to provide recommendations

- Several definitions under consideration, including
  - at least 51% of grain ingredients as whole grain
  - at least 8 g per ounce-equivalent
Wrap Up - Formulating Whole Grain Foods for Success

• Add selected increments of whole grains to popular grain-based foods (e.g., pizza, tortillas, pasta, snacks)

• Improve acceptability of whole-grain foods via
  – % grain inclusion
  – Grain selection (e.g., white wheat vs. red)
  – Grain ingredient processing methods (e.g., flour particle size)

• Increase offerings of new/unique whole grain foods
  – Use new or less familiar grains (e.g., ancient grains, purple barley, rye)
  – Use creative product formulations

• Utilize consistent, clear labeling and claims