Cooperative Extension

- Nationwide educational network
- Reaching out
  - Extends the education and research from the university into the local community
  - Solve public needs with university resources through non-formal programs
- Partnership between University of Florida & County Governments
  - All 67 counties in Florida have Extension offices
  - Most have a Family & Consumer Sciences Agent
  - Main website www.SolutionsForYourLife.com
Please complete the evaluation that will be sent following the webinar.

**Learning Objectives:**

- Participants will describe, compare and contrast the various health benefits of dietary and functional added fibers.
- Participants will identify, by label reading, the common fiber ingredients added to foods.
- Participants will identify daily fiber needs, high fiber foods and describe ways to increase fiber intake.
Dietary Fiber

- First described in 1929
- Trowell (1972) - “the skeletal remains of plant cells that are resistant to digestion (hydrolysis) by enzymes of man”
- Role in plant - structural integrity, water resistance, “glue” between cells

Fiber Definitions (IOM)

Dietary Fiber
- Nondigestible carbohydrates in plant foods
  - E.g. fiber in cereals, beans, fruits and vegetables

Functional Fiber
- Isolated, nondigestible carbohydrates that have beneficial effects in humans – usually added to foods.

Total Fiber = Dietary fiber + Functional fiber

Dietary Fiber Contents of Foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Fiber (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lentils, cooked, ½ cup</td>
<td>8</td>
</tr>
<tr>
<td>Peanuts, boiled, ½ cup shelled</td>
<td>8</td>
</tr>
<tr>
<td>Black beans, cooked, ½ cup</td>
<td>7.5</td>
</tr>
<tr>
<td>Figs, dried, ½ cup</td>
<td>7</td>
</tr>
<tr>
<td>Wheat bran flakes cereal, 1 cup</td>
<td>7</td>
</tr>
<tr>
<td>Prunes, dried or canned, ½ cup</td>
<td>6</td>
</tr>
<tr>
<td>Orange, raw, 1 large</td>
<td>4</td>
</tr>
<tr>
<td>Popcorn, air-popped, 3 cups</td>
<td>4</td>
</tr>
<tr>
<td>Potato, baked, with skin, 1 medium</td>
<td>4</td>
</tr>
<tr>
<td>Barley, pearled, cooked, ½ cup</td>
<td>3</td>
</tr>
<tr>
<td>Oatmeal, cooked, ½ cup</td>
<td>2</td>
</tr>
<tr>
<td>Whole wheat bread, 1 slice</td>
<td>2</td>
</tr>
</tbody>
</table>

g = grams

We would do well if we consumed these foods!
Fiber Label - US

- High fiber or Excellent source of fiber: 5 g or more per serving 20% of the DV (Daily Reference Value of 25 g/day)
- Good source of fiber: 2.5 g to 4.9 g per serving (10-19.9% DV)
- More or added fiber: At least 2.5 g more per serving than the reference food

Fiber Recommendations*

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>grams (g) per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men, ages 19-50</td>
<td>38</td>
</tr>
<tr>
<td>Men, ages 51+</td>
<td>30</td>
</tr>
<tr>
<td>Women, ages 19-50</td>
<td>25</td>
</tr>
<tr>
<td>Women, ages 51+</td>
<td>21</td>
</tr>
</tbody>
</table>

*14 g fiber per 1000 kcal
Based only on coronary heart disease risk reduction.

Dietary Fiber and Disease Risk
- Cardiovascular disease (eg. heart attack, stroke)
  - 9% decrease risk for each 7 g/d increase in dietary fiber
  - Lower cholesterol, blood pressure, inflammation
- Type 2 Diabetes
  - Strong evidence that higher fiber intakes decrease risk
- >20 g of fiber per day in older adults decreases risk
- Cancer
  - 10% cancer risk reduction for every 10 g of total dietary fiber consumed daily.
- Obesity
  - Fiber protects from weight gain
Dietary Fiber and Mortality

- 10% reduction in risk for each 10 g/day increase in fiber
- Based on 17 prospective studies (1997-2014) that had a total of 67,260 deaths and 982,411 participants.
- Higher dietary fiber intake associated with a reduced risk of death


Dietary Guidelines for Americans 2010

Where do we get our fiber?

- Major source of dietary fiber - grains: pasta meals, pizza and noodle soups (18%)
- Fruits at 15%, vegetables at 14%
- Dry beans, peas, other legumes, nuts and seeds: only 6% of the dietary fiber intake
Langkamp-Henken B et al. 2012. Fecal lactic acid bacteria increased in adolescents randomized to whole-grain but not refined-grain foods, whereas inflammatory cytokine production decreased equally with both interventions. / Nutr J 2013;12.

<table>
<thead>
<tr>
<th>Whole-Grain Foods</th>
<th>Fiber/oz eq</th>
<th>Whole Grain/oz eq</th>
<th>Refined-Grain Foods</th>
<th>Fiber/oz eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honey Nut Cheerios (General Mills Inc, Minneapolis, MN)</td>
<td>3 g</td>
<td>19 g</td>
<td>Frosted Flakes (Kellogg Co, Battle Creek, MI)</td>
<td>&lt; 1 g</td>
</tr>
<tr>
<td>100% Whole Wheat Bread (Arnold, Premium breads, Horsham, PA)</td>
<td>3 g</td>
<td>22 g</td>
<td>Country White Bread (Arnold, Premium breads, Horsham, PA)</td>
<td>1 g</td>
</tr>
<tr>
<td>Whole Wheat Boxed (Frosted Flakes, Battle Creek, MI)</td>
<td>2 g</td>
<td>14 g</td>
<td>Honey Nut Cheerios (General Mills Inc, Minneapolis, MN)</td>
<td>3 g</td>
</tr>
<tr>
<td>Whole Wheat Macaroni and Cheese (Kraft Foods Group Inc, Northfield, IL)</td>
<td>1 g</td>
<td>15 g</td>
<td>Nature Valley Oats and Honey-Golden Blend Rice (Barilla G. &amp; R. Fratelli, Parma, Italy)</td>
<td>11 g</td>
</tr>
</tbody>
</table>
### Mean Fiber Intake

<table>
<thead>
<tr>
<th>Group</th>
<th>Fiber Intake (g/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>11.5 ± 0.7</td>
</tr>
<tr>
<td>WG</td>
<td>12.0 ± 1.1</td>
</tr>
<tr>
<td>RG</td>
<td>13.5 ± 1.1</td>
</tr>
</tbody>
</table>

*On a per oz eq, WG foods - higher in fat, fiber and lower in sodium.*

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**Nutrition Facts**

**Mini Wheats**

- Total Carbohydrate: 11g (4%)
- Dietary Fiber: 0g (0%)
- Sugars: 2g

**Ritz Crackers**

- Total Carbohydrate: 11g (4%)
- Dietary Fiber: Less than 1g (3%)
- Sugars: 2g
Which of these breads contains the most fiber?

Ingredients: Stone ground whole wheat flour, water, brown sugar, yeast, wheat gluten, contains 2% or less of each of the following: salt, vegetable oil (coconut),"
What fiber ingredients are added to food?

- Soy fiber
- Oat fiber
- Cottonseed fiber
- Pea fiber
- Sugarcane fiber
- Wheat bran
- Rice bran
- Corn bran
- Corn or wheat dextrin (resistant)
- Psyllium seed husk
- Inulin (chicory root fiber)
- And many more...

Added functional fibers differ greatly in their food functionality and physiological effects

And whether they work in recipes!

https://www.youtube.com/watch?v=YxykbuuDqlI

Oligosaccharides (eg. FOS, inulin, chicory root)

- Should short chains of non-digestible sugars (3 to 9 sugar units) be considered fiber?
- Left to national authorities eg. FDA. Major issue for food companies…
**Gastrointestinal Wellness**
**Fiber, Bulking and Prevention of Constipation**

- 5+ g bulking/g of fiber in bran fed (insoluble)
- 3 g bulking/g of cellulose fed (insoluble)
- 1 – 2 g bulking/g soluble fibers

Stool weights to vary from 72 to 470 g/day

Typically about 100 – 120 g/day Western diet.

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**Bowel Movement Frequency**

Salmeen et al, 2013

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**Nutrition Facts**

Mini Wheats Maple Brown Sugar

<table>
<thead>
<tr>
<th>Nutrition Facts</th>
<th>Per Serving</th>
<th>Calories: 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories from Fat</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Sodium</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Sugar</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Protein</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

**Ingredients:** Whole grain wheat, sugar, brown sugar (sugar, molasses), contains 5% or less of brown rice syrup, natural and artificial flavor, caramel color, gelatin, BHT for freshness.
Heart-Healthy Diet

- American Heart Association:
  - >25 g/d fiber
  - viscous (soluble) fiber
    - e.g. β-glucan & pectin for cholesterol lowering
  - However - Insoluble fiber associated with cardiovascular risk reduction

Viscous Fiber

- Certain fibers, when mixed with water, increase viscosity.
- Viscosity of fiber affects:
  - Gastric (stomach) emptying
  - Glucose absorption (blood sugar)
  - Cholesterol – through interference with bile acid reabsorption
**Warnings:**

- **Choking:**
  
  "Eating this product without at least a full glass (8 oz) of liquid per serving may cause choking. Do not eat Fiber Wafers if you have difficulty in swallowing."

- **Allergy alert:**
  
  "This product may cause allergic reaction in people sensitive to inhaled or ingested psyllium.
  
  Keep out of reach of children. In case of an accidental ingestion, contact a doctor or a Poison Control Center right away."
What about prebiotic fiber?

• Fiber that benefits health by stimulating the growth or activity of beneficial bacteria in the colon – bifidogenic

• Found in breast milk, wheat, onions, beans, legumes and are added to many foods.

  e.g. Oligofructose, FOS (fructo-oligosacharides) etc.

Whole grain impact in middle school kids....

• Daily stools increased by 0.2 stools/day with 60 g of whole grains

• Fecal Bifidobacteria increased with both the refined and whole grain foods, but lactic acid bacteria increased only in the whole grain foods.

Henken et al., 2012

Satiety

• Recent studies have provided some evidence that oligofructose intake may decrease food intake.
Fiber in Supplements

- Wheat dextrin
- Inulin (chicory root fiber)
- Methylcellulose
- Hydrolyzed guar gum
- Psyllium

What about side effects?

- Some people may experience uncomfortable gas, bloating and discomfort with fermentable fiber intake
  - E.g. 1-3% have severe symptoms with oligosaccharides (e.g. FOS)
- Increasing fiber intake gradually will help to determine one's tolerance to gas symptoms but will symptoms get better over time?
### How does consuming foods with added fiber affect nutrient intake?

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Baseline (n = 48)</th>
<th>Treatment Period (n = 45)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fiber (g)</td>
<td>12.1 ± 0.5</td>
<td>24.3 ± 0.5</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>12.1 ± 0.5</td>
<td>11.5 ± 0.5</td>
<td>NS</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>800 ± 41</td>
<td>997 ± 37</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>2065 ± 84</td>
<td>2315 ± 80</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>3266 ± 130</td>
<td>3068 ± 108</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

### How much fiber is too much fiber?

![Image of fruits and vegetables]

### Simian Diet – Vegetables and Fruits (143 g of fiber)

![Graphs showing changes in LDL, LDL/HDL, and waist circumference over time]

*Jenkins DJ, Kendall CW et al. Metabolism 2001*
Take Home Messages

• If a fiber dissolves in water, it bulks less (many supplements, yogurt, fiber beverages), but may be prebiotic
• If a fiber doesn’t dissolve in water is likely a good bulker (cereals, breads, cookies)
• If a fiber is viscous, it will help lower cholesterol and glycemic response when consumed with meals
• Recommend a plant-based diet, fruits, vegetable, beans, whole grains and nuts, but boost fiber intake by choosing foods with added fiber. **There is no upper limit 😊**

Educational information - University of Florida EDIS database

• Facts about Fiber
  http://edis.ifas.ufl.edu/pdfs/FY/FY84900.pdf
• Guide to Fiber Supplements
  http://edis.ifas.ufl.edu/pdfs/FS/FS16200.pdf
• Shopping for Health: Foods with Added Fiber
  http://edis.ifas.ufl.edu/pdfs/FS/FS23500.pdf
• Pureed Foods and Fiber
  http://edis.ifas.ufl.edu/pdfs/FS/FS20900.pdf