Clearing Up the Confusion & Controversy About Processed Food & Health

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Food Ingredients, Health and Statistics

Lies, damned lies, and statistics

"Lies, damned lies, and statistics" is a phrase describing the persuasive power of numbers, particularly the use of statistics to bolster weak arguments. It is also sometimes colloquially used to doubt statistics used to prove an opponent's point.

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What is the most important cause of critical thinking failure?

- The public has only minimal background knowledge of nutrition and nutrition science
- Human nature has limitations in critical thinking ability
- The media (including social media and celebrities) get in the way of people's ability to think critically
- Education systems do not adequately teach critical thinking

Courtesy of Brandon McFadden & Jason Riis
Understanding Causality?

**CORRELATION IS NOT CAUSATION!**

Both ice cream sales and shark attacks increase when the weather is hot and sunny, but they are not caused by each other (they are caused by good weather, with lots of people at the beach, both eating ice cream and having a swim in the sea).
Processed Foods Saves Lives
Why food processing?

• Processing enhances safety, e.g., pasteurization of milk
• Processing makes foods palatable, e.g., most grains
• Processing to ensures availability throughout the year (beyond the typical growing season), e.g., canned and frozen fruits/vegetables
• Fortification of processed foods contributes to public health
• Processed foods provide affordable options

Courtesy of GH Johnson; Summarized by Eicher-Miller et al., J Nutr 2012; doi: 10.3945/jn.112.164442
Fruits and Vegetables: All Forms Nutritious

What nutrition research tells us …

- Most fat-soluble nutrients (including carotenoids, vitamin A, vitamin E) are higher in processed fruit & vegetables: true, in part, because mild heat treatment allows greater bioavailability of lipid-soluble nutrients.¹

- Processed fruit and vegetables may contain greater nutritional value because some processing cultivars are more nutritious than fresh cultivars, as is the case with tomatoes.¹

- The antioxidant capacity (no official FDA-approved method) of dried fruit is much higher than the corresponding values for fresh because the antioxidants are concentrated in a smaller volume during dehydration.²

¹ Rickman J et al. J Sci Food Agri. May 2007; 87(7);1185-1196
Benefits of Modern Food System

- **Increased Food Availability**
  - Decreased post-harvest losses → more food
  - Techniques: millings, grinding, canning, preserving, freezing and drying

- **Safety and Freshness**
  - Pasteurization (e.g., milk)
  - Packaging (reduces contamination)
  - Packaging atmospheres (e.g., MAP, CO₂)

- **Convenience and Affordability**
  - More food options → more affordability

- **Variety and Choice**
  - Expanded agriculture → improved nutrition (e.g., nutrient-dense)

- **Improved Nutrition**
  - Fortification and Enrichment (e.g., vitamin D, folic acid)
  - Reduced intolerances (e.g., gluten, lactose)

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## Nutrition and Food Technology

<table>
<thead>
<tr>
<th>Food Product, Ingredient or Technology</th>
<th>Potential Benefit or Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iodine added to NaCl; Niacin added to flour; Vitamin D in milk</td>
<td>Elimination of goiter; Elimination of pellagra; Elimination of rickets;</td>
</tr>
<tr>
<td>Oils from soybean cultivar</td>
<td>Reduced saturated fatty acids and higher n-3 unsaturated fatty acids</td>
</tr>
<tr>
<td>Resistant starches</td>
<td>Weight management, satiety, (gut microflora?)</td>
</tr>
<tr>
<td>Grains/flour fortified with zinc, β-carotene, folic acid</td>
<td>Improved nutriture of individuals in developing countries; significant reduction in NTD</td>
</tr>
<tr>
<td>Low-gluten foods</td>
<td>Increased choices for those with celiac disease</td>
</tr>
<tr>
<td>Foods without/reduced allergens (e.g., hydrolysates) or with allergens (labelled)</td>
<td>Increased choices for those with food allergies</td>
</tr>
<tr>
<td>Lactobacillus acidophilus and other potential probiotics in diary products (e.g., yogurt)</td>
<td>Addition of healthful bacteria to the diet (gut microbiota)</td>
</tr>
<tr>
<td>Reduction of toxins (e.g., aflatoxins, fumonisins)</td>
<td>Improved food safety</td>
</tr>
<tr>
<td>Whole grain-rich foods (e.g., enhanced with bran, and grain other components)</td>
<td>Weight management, satiety, cholesterol-lowering</td>
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What About These Foods?

- Medical foods
- Military foods (MRE)
- Space foods
- Rehydration
- Plumpy Nut
<table>
<thead>
<tr>
<th>Food</th>
<th>Toxin</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato; tomato</td>
<td>Glycoalkaloids (choline esterase inhibitor) natural pesticides and fungicides</td>
<td>Physically remove; monitor during harvest</td>
</tr>
<tr>
<td>Red kidney beans</td>
<td>Lectin (phytohaemagglutnin); natural insecticide</td>
<td>Soak and cook</td>
</tr>
<tr>
<td>Raw eggs</td>
<td>Avidin (biotin binder)</td>
<td>Cook</td>
</tr>
<tr>
<td>Avocado</td>
<td>Persin (terpenoid)</td>
<td>Carefully remove seed and skin</td>
</tr>
<tr>
<td>Celery/Parsley</td>
<td>Psoralens (phototoxic dermatitis);</td>
<td>Minimize exposure; used as pharma agent against UV</td>
</tr>
<tr>
<td>Seed fruits (e.g., peaches, cherries, apples)</td>
<td>Cyanogenic glycosides</td>
<td>Minimize seed exposure/consumption</td>
</tr>
<tr>
<td>Carrots</td>
<td>Falcarniol (carotatoxin)</td>
<td>Minimize exposure; cook</td>
</tr>
<tr>
<td>Quinoa</td>
<td>Saponins (toxic glycosides)</td>
<td>Wash, dry</td>
</tr>
<tr>
<td>Cabbages, broccoli, green pepper, eggplant</td>
<td>&gt;50 Mutagens/Carcinogens (note;80% mutagens → carcinogens)</td>
<td>Minimize “raw” exposure</td>
</tr>
<tr>
<td>Cassava (tapioca)</td>
<td>Cyanogenic glycosides: linamarin and lotaustraline</td>
<td>Soak and cook</td>
</tr>
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## Calls to Action: We All Have a Stake!

<table>
<thead>
<tr>
<th>If we are ...</th>
<th>We can ...</th>
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| food industry | ▪ provide affordable, accessible and healthy processed foods  
▪ develop new technologies for preserving food and enhancing quality  
▪ maintain quality and safety standards  
▪ educate the public about food processing  
▪ develop effective food labeling  
▪ develop tasty, convenient alternatives to perishable foods  
▪ define and support food processing research |
| consumers     | ▪ demand information on food processing & health  
▪ provide feedback to food industry  
▪ encourage public/private partnerships to enhance food quality & reduce food waste |
| agriculture   | ▪ develop procedures for enhancing food quality and evaluating food safety  
▪ invent technologies for increasing accessibility to healthy process foods |

Adapted from: Weaver CM et al; *Am J Clin Nutr* 2014;99(6):1525-42
Fresh and Processed Foods are Important in a Healthful Dietary Pattern