Flour Fortification: Overview and Benefits to Europe

Presented by Scott J. Montgomery
Flour Fortification Initiative Director
Former Cargill Executive

3 October 2012
Agenda

- Europe’s wheat production and consumption
- Wheat’s nutrition
- Flour fortification:
  - Definition
  - Process
  - Progress
  - Standards
  - Success
Europe’s Wheat Industry

<table>
<thead>
<tr>
<th>45 million</th>
<th>Tonnes of soft wheat and rye processed in the European Union each year</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 million</td>
<td>Tonnes of flour produced annually</td>
</tr>
<tr>
<td>3,800</td>
<td>Flour milling companies</td>
</tr>
<tr>
<td>65%</td>
<td>Average use of capacity</td>
</tr>
<tr>
<td>45,000</td>
<td>People employed in flour milling</td>
</tr>
<tr>
<td>600+</td>
<td>Types of flours to meet consumer demands</td>
</tr>
<tr>
<td>€ 15 billion</td>
<td>Turnover</td>
</tr>
</tbody>
</table>

Source: The European Flour Milling Association, Facts and Figures  
http://www.flourmillers.eu/default.asp?structureID=320
European Union Protein Supply

Wheat provides 24 grams of protein a day for 23% of total

Total: 105 grams per capita per day

- Animal products: 59%
- Wheat: 23%
- Other plant products: 18%

European Union Kilocalorie Supply

Wheat provides 22% of total calorie intake

Total: 3,456 kilocalories per capita per day

- 49% Other plant products
- 29% Animal products
- 22% Wheat

Food and Agriculture Organization of the United Nations Food Balance Sheets for 2009.
Wheat Availability in Food Supply

Grams per capita per day

http://faostat.fao.org/site/609/default.aspx#ancor
Wheat Availability in Food Supply

Grams per capita per day

Food and Agriculture Organization of the United Nations Food Supply. Figures represent a default composition of wheat, flour of wheat, macaroni, bread, bulgur, pastry, starch of wheat, breakfast cereals, and wafers.

http://faostat.fao.org/site/609/default.aspx#ancor
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Wheat’s Natural Nutrients

Whole grain wheat contains:
- Calories
- Protein
- Carbohydrates
- Dietary fiber
- Vitamins and minerals

Most vitamins and minerals are in the bran and the germ which are discarded during milling.
Essential Nutrients

Wheat and maize lose nutrients in the milling process.

Most flour is milled at 75% extraction

Adapted from “Wheat in Human Nutrition” by W.R. Aykroyd and Joyce Doughty
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What is Flour Fortification?

Fortification adds vitamins and minerals to flour during the milling process so that it is more nutritious.
Fortification Process

- Millers order a vitamin and mineral premix based on their country standard (usually includes at least iron and folic acid).
- Premix is added to flour in the milling process.
- Millers conduct quality assurance testing.
FFI is network of partners working together to make flour fortification standard milling practice so that people worldwide are smarter, stronger and healthier.
Wheat Flour Fortification Legislation
August 2012: 74 countries require at least iron and/or folic acid in wheat flour
Flour Fortification Progress

Since 2004:

- Fortified flour from industrial mills increased from 18% to 30%
- Number of countries with documented national regulations for mandatory wheat flour fortification increased from 33 to 74. The combined population of these 74 countries is more than 2 billion
Global Consensus

- World Health Organization statement (2009)
- UNICEF (annual support)
## Flour Fortification Standards

Table 1. Average levels of nutrients to consider adding to fortified wheat flour based on extraction, fortificant compound, and estimated *per capita* flour availability

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Flour Extraction Rate</th>
<th>Compound</th>
<th>Level of nutrient to be added in parts per million (ppm) by estimated average per capita wheat flour availability (g/day)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;75² g/day</td>
</tr>
<tr>
<td>Iron</td>
<td>Low</td>
<td>NaFeEDTA</td>
<td>40</td>
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<tr>
<td></td>
<td></td>
<td>Ferrous Sulfate</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Electrolytic Iron</td>
<td>NR³</td>
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<tr>
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<td>Low or High</td>
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<td>5.0</td>
</tr>
<tr>
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<td>Low or High</td>
<td>Cyanocobalamnin</td>
<td>0.04</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Low or High</td>
<td>Vitamin A Palmitate</td>
<td>5.9</td>
</tr>
<tr>
<td>Zinc⁴</td>
<td>Low</td>
<td>Zinc Oxide</td>
<td>95</td>
</tr>
<tr>
<td></td>
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Results of Insufficient Folate Status

- Leads to neural tube defects (NTDs) such as spina bifida and anencephaly
- Most of these birth defects are preventable.

Spina bifida is malformation of the baby’s spine. It causes permanent disability.

Anencephaly is malformation of the baby’s brain. It is always fatal.

Centers for Disease Control and Prevention:
http://www.cdc.gov/ncbddd/folicacid/faqs.html
Success of Fortification For NTD Prevention

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<th>Meta-analysis published in 2010:</th>
<th></th>
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<td>8</td>
<td>Included 8 studies published between 2002 to 2008 by 8 different authors</td>
</tr>
<tr>
<td>5</td>
<td>Reflected studies using sub-national data in 5 countries: Argentina, Canada, Chile, South Africa, USA</td>
</tr>
<tr>
<td>&lt;1</td>
<td>“Risk ratio” for each study was &lt;1, indicating that fortifying flour with folic acid did prevent neural tube defects</td>
</tr>
<tr>
<td>31 – 78%</td>
<td>Neural tube defect reductions ranged from 31% to 78%</td>
</tr>
<tr>
<td>46%</td>
<td>Overall reduction in risk of neural tube defects was 46%</td>
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Impact of flour fortification with folic acid on total NTD prevalence

Abdollahi 2010, Chen 2004, Arguello 2004
Impact of flour fortification with folic acid on spina bifida prevalence

Impact of flour fortification with folic acid on anencephaly prevalence

Anencephaly prevalence per 1,000 births

-50% -16% -41% -48% -57%
Cost:Benefit Ratio for Preventing Spina Bifida

Chile

South Africa

United States
Mandatory Legislation

- Equalizes costs for millers
- Sets appropriate standards
  - Best iron compound
  - Levels of other vitamins and minerals
- Can be more easily monitored
Global Best Practices

To plan a flour fortification program, consider:

• Local culture and cereal consumption
• Nutritional needs
• Industry analysis
• Creation of a multi-sector National Fortification Alliance
• Legislation
Thank You

For more information:
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info@ffinetwork.org