Partially Hydrogenated Oils: The Basics and The Latest News

Lucky Inturrisi
Cargill Refined Oils AP
Agenda

• Background
• Review latest events influencing PHO
• PHO 101
• Technologies for Trans Reduction and no PHO
Agenda

• Background
  • Review latest events influencing PHO
  • PHO 101
  • Technologies for Trans Reduction and no PHO
Nutrition & Consumer Awareness – Saturated / Trans Fat

Trans Fatty Acids
Good or Bad?

Trans fatty acids have raised recent controversial discussions. Two different opinions have been included for reader discretion.

- The Trans in Alive
- Trans Fatty Acids: Functional Techno (IFT)

By Stephen Byrnes, PhD, RNCP

This article is one part of a series of articles, which is a revision of an older article that we had previously posted on our site. You can find the original article here. Additionally, please see the rebuttal to this article, by Dr. Michael Janson.

Myth #6: Saturated fats and dietary cholesterol cause heart disease, atherosclerosis, and/or cancer, and low-fat, low-cholesterol diets are healthier for people.
Nutrition & Consumer Awareness

Ban Trans Fats
The campaign to ban partially hydrogenated oils
Trans Fats – Their Health Implications

• Many scientific studies have strongly supported the adverse effects of trans fat on the risk of heart disease.
• Major impact of trans fats is on blood cholesterol.
• A diet high in trans fats:
  increases LDL ("bad") cholesterol
  and
  decreases HDL ("good") cholesterol
Agenda

• Background
• Review latest events influencing PHO
• PHO 101
• Technologies for Trans Reduction and no PHO
Where does the FDA stand?

• On 7th November 2013, the U.S. Food and Drug Administration announced that they had tentatively determined that partially hydrogenated oils (PHOs), are not “generally recognized as safe” (GRAS) for use in food.

• The FDA determined that as of June 18, 2018, PHOs are no longer generally recognized as safe (GRAS).

• It means that as of June 18, 2018 PHOs no longer have approved regulatory status in the U.S., unless FDA approves PHO as a food additive. It does not mean that FDA has determined that PHOs are “unsafe”.

• Although FDA has provided industry a reasonable period of time to reformulate, it may not be able to prevent private litigation – similar to current class action labeling suits – from being filed.
How are others responding?

Ban *trans* fat at all Parks

Retailers ban *trans* fat by 2015

Some states and cities ban or restrict PHO

Reduced *trans* fats in food marketed to kids
Additional Pressures to Eliminate Trans Fat

- Nutritional labeling
- Increased litigation
- Cost and availability
- Special interest groups and Social Media

PHO: The Basics and The Latest News
Impact of oil type on purchase

PHO among the LEAST POPULAR fats and oils with consumers

Less Likely to Purchase

- Olive Oil: 5%
- Sunflower Oil: 9%
- Canola Oil: 14%
- Coconut Oil: 18%
- Peanut Oil: 18%
- Soybean Oil: 18%
- Vegetable Oil: 21%
- Interesterified Oil: 27%
- Palm Oil: 27%
- Partially Hydrogenated Oil: 47%
- Hydrogenated Oil: 48%
- Lard: 62%

PHO: The Basics and The Latest News
Activities in Asia Pacific

Customers asking to remove PHO from formulations

Labelling of trans fat

Singapore restricts trans fat levels

Reduced trans fats in frying oils

Trans fats to be labeled starting July, with violators facing fines, says FDA

TAIPEI, Taiwan — Manufacturers will be required to declare the amount of trans fats in their products on nutrition labels starting July 1 this year, according to the Food and Drug Administration (FDA) yesterday.

Artificial trans fats come from partially hydrogenated oils, which occur when manufacturers add hydrogen to vegetable oil to make a more solid substance. Partially hydrogenated oils are used by food manufacturers to improve the texture, shelf life and flavor stability of foods. They are a key ingredient in a wide range of processed food, from snacks, pastries and pizzas to microwave popcorn.
## Trans Fat Actions

<table>
<thead>
<tr>
<th>Country</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Labelling of <em>trans</em> fat</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Labelling of <em>trans</em> fat</td>
</tr>
<tr>
<td>Singapore</td>
<td>&lt; 2% <em>trans</em> fat of fat (regulation)</td>
</tr>
<tr>
<td>Australia / N.Z.</td>
<td>Labelling of <em>trans</em> fat when making claims; Voluntarily limiting trans fat in oils</td>
</tr>
<tr>
<td>USA</td>
<td>Labelling of <em>trans</em> / Proposed ban on PHO</td>
</tr>
<tr>
<td>Canada</td>
<td>Labelling of <em>trans</em> fat; Voluntarily limiting trans fat in oils to 2% of the fat and 5% of the fat in all other foods.</td>
</tr>
<tr>
<td>Denmark</td>
<td>&lt; 2% <em>trans</em> fat of fat (regulation)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>&lt; 2% <em>trans</em> fat of fat (regulation)</td>
</tr>
<tr>
<td>Austria</td>
<td>&lt; 2% <em>trans</em> fat of fat (regulation)</td>
</tr>
<tr>
<td>Iceland</td>
<td>&lt; 2% <em>trans</em> fat of fat (regulation)</td>
</tr>
<tr>
<td>Argentina</td>
<td>Limits trans fat in processed foods to 2% of the total in veg oils and margarines for direct consumption and 5% in other foods.</td>
</tr>
<tr>
<td>Brazil</td>
<td>Requires labeling of trans fat</td>
</tr>
<tr>
<td>Chile</td>
<td>Labelling of <em>trans</em> fat</td>
</tr>
<tr>
<td>India</td>
<td>Limit of 10% TFA (to be lowered to 5% - draft) by weight and labelling.</td>
</tr>
<tr>
<td>Korea</td>
<td>Mandatory labelling of trans fat for biscuits, confectionery, ice cream, bread, chocolate, jam, edible oil and beverages.</td>
</tr>
</tbody>
</table>
Agenda

- Background
- Review latest events influencing PHO
- PHO 101
- Technologies for *Trans* Reduction and no PHO
What are Saturated and *Trans* Fats?

**Fatty Acid**

- Saturated Fatty Acid
  - Red = oxygen
  - Green = carbon
  - White = hydrogen

- Unsaturated Fatty Acid
  - Cis Unsaturated
  - Trans

**Double Bonds**

- H
  - | | -C =C-
  - H

**Glycerol Backbone**

**CH2 - Fatty Acid**
How Are *Trans* Fatty Acids Formed?

- **Animal Fats - approximately 5% TFA**
  Naturally found (in small amounts) in milk, dairy products and meats

- **High Temperature Deodorisation - ≤ 1%**
  Dependent on time, temperature and degree of unsaturation

- **Hydrogenated Fats (10 - 50% TFA)**

- **Frying process**
The result is the conversion of a \textit{cis} double bond to saturated and \textit{trans} double bond.
What Happens During Hydrogenation?

**Cis unsaturated**
Hydrogen is on the same side of the bond.

**Trans unsaturated**
Hydrogen is opposite sides of the bond.

Saturate
No double bonds
Trans and Saturate Formation During Hydro
• Background
• Review latest events influencing PHO
• PHO 101
• Technologies for *Trans* Reduction and no PHO
Trans Reduction and PHO Removal Strategies - Considerations

• When the fat is required to contribute structure, that structure is traditionally fat crystals from Saturates or Trans

• Each strategy has implications including
  • Raw material cost
  • Availability
  • Conversion and processing issues

• Expectations must be reasonable; for many applications other than those requiring liquids, trans reduction may result in some increase in saturates

• A shift to remove trans fats may have technological consequences for customers
Technologies for Low or “No” Trans Products

PHO Removal

• Trait Enhanced Oils: e.g. High Stability Oils and High Stearic Oils
• Fractions of palm oil and palm kernel oil
• Interesterification blends of non-hydrogenated oils
• Interesterification blends with high saturated fat base oils (incl. fully hydrogenated)
• Blending fully hydrogenated hard fats having no trans fat with non-hydrogenated oils
• The use of gelling or texture building agents (incl. Mono & Diglycerides or Diglycerides or Starches)
• A combination of some or all of the above.