Palm Solutions for Replacing PHVO
2014, Dr. Gerald McNeill

IOI Loders Croklaan
Let's create together
History of Good Fat and Bad Fat

1950s
Prof. Ancel Keyes
Fat is bad
Especially Saturated Fat

1970s
Phil Sokoloff
The Poisoning of America
Saturated Fat is “Poison”

Today
Chowhudry
Saturated fat is not as bad as we once thought
How did we get Trans Fats?

The Diet-Heart Paradigm
Prof. Ancel Keyes, 1961

“The U.S. diet is 40% fat, and most of that is saturated fat—the insidious kind...”

Diagram:
- Total Fat
- Saturated Fat
- Serum Total and LDL Cholesterol
- Coronary Artery Disease
How did we get Trans Fats?

"Poisoning of America"
Phillip Sokoloff 1986

- Heart attack at age 43, blamed on saturated fats including coconut, palm, butter and tallow
- $15 million advertising campaign to reduce sat fat intake
- Joined by American Soybean Association
- Informal Senate Hearing
Baked Goods and Snack Foods

**Beginning of 20th Century**

Semi solid fats used for cooking, baking and frying
- Lard
- Beef tallow
- Butter

Characteristics:
- Semi solid at room temperature
- Resistant to oxidation
- 40% - 65% saturated fat
- High melt point vs. low melt point of unsaturated fat

1950s Lard ideal texture for baked goods, excellent aerating properties for a creamy texture
The Advent of Trans Fat?

1970s: *Plant based vegetable oils*

- Cottonseed, Soybean and Rapeseed

Liquid oils suitable for frying, dressings, mayonnaise and more.

**But not baked goods! A solid fat is required.**

**Solution:**

*Partially Hydrogenated Vegetable Oil (PHVO)*

*Converts a liquid oil to solid fat*

- Resistant to oxidation;
- Lower saturated fat content;
- Similar texture to animal fat;
- Inexpensive
- Contain synthetic fatty acid called trans fat
# History of Fat

Fatty Acid Composition (wt%) of Natural Semi-Sold Fats, Soybean Oil and PHVO

<table>
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<tr>
<th>Fat/Oil</th>
<th>Trans</th>
<th>Saturates</th>
<th>Monounsaturates</th>
<th>Polyunsaturates</th>
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<tr>
<td>Coconut Oil</td>
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<td>92</td>
<td>7</td>
<td>1</td>
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<tr>
<td>Palm Kernel</td>
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<td>82</td>
<td>14</td>
<td>2</td>
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<tr>
<td>Butter Fat</td>
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<td>65</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>Beef Tallow</td>
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<td>53</td>
<td>43</td>
<td>2</td>
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<tr>
<td>Palm Oil</td>
<td>0.2</td>
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<td>39</td>
<td>10</td>
</tr>
<tr>
<td>Soybean Oil</td>
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<td>15</td>
<td>23</td>
<td>61</td>
</tr>
<tr>
<td>PHVO</td>
<td>35</td>
<td>22</td>
<td>34</td>
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</tbody>
</table>
Partial Hydrogenation Process

- High Heat
- High Pressure
- Hydrogen Gas
- Catalysts

OIL IN

Partial Hydrogenation Reactor

PHVO OUT
Palm Fractionation

The oil is fractionated immediately after refining.

- Crystallizer
- Filter Press
- Hard Solid
- Liquid
Harmful Trans Fats

*Saturated fat is not as bad as we once thought*
Mandatory Labeling of Trans Fat

- In 2006 FDA Introduced Mandatory Labeling of Trans Fats Content on Retail Food packaging.

- FDA survey of retail foods in 2013 revealed that 25% of retail goods still contain PHVO.

- The amount of PHVO in food service is unknown since labelling is not required.
Proposed Ban on PHO

- In Nov. 2013, due to an unacceptable high level of trans fat in the US food supply, FDA proposed to revoke GRAS Status of PHO (PHVO).
- By end of 2014, FDA will make announcement detailing the next steps for a PHO ban.
Exposure to Trans Fats & PHVOs

Food Products with the highest trans fat content according to the FDA:

- Cakes
- Ready-To-Use Frosting
- Coffee Creamer
- Cookies
- Pizza & Pie Crust
- Margarine and Spreads
- Savory Snacks
Essential Characteristics for PHVO Replacement

- **Saturated Fat**
  - Only fat that provides similar texture to trans fat

- **Versatile**
  - PHVO introduced new levels of functionality allowing for the “Golden Age” of bakery

- **Oxidative Stability**
  - PHVOs are highly stable and provide long self life

- **Cost**
  - Neutral cost impact

- **Widely Available**
Palm Oil
A Natural Alternative to Trans Fat

- Naturally semi-solid fat
- Crystal structure in palm oil ideal for creaming and smooth texture
  - No chemical processes required (Hydrogenation)
- Non-GMO
- Longer shelf-life
  - Contains balanced content of saturated and monounsaturated fats
  - No Linolenic acid
- Versatile: almost unlimited variety of textures
  - Textures from hard solid to liquid
Palm Oil – Versatile and Customizable

- Palm Tree
- Palm Oil & Palm Kernel Oil
- Fractions
  - Modification
  - Fractionate
  - Interesterify
  - Fully Hydrogenate

- Other Vegetable Oils

IOI Loders Croklaan
Palm Solutions for Cakes

Since cakes are a soft baked product made from aerated batter, a solid fat or shortening is needed to achieve the ideal texture and taste.

Cake shortenings are divided into 2 categories: non-emulsified and emulsified

Palm oil has a natural tendency to form small beta-prime crystals that stabilize air cells giving cakes a light texture. Liquid oils do not form crystals and cannot provide the desired texture.
Ready-To-Use Frosting Options

There are two types of frosting:
- Aerated
- Flat

Palm oil is naturally a soft solid at room temperature, and can effectively entrap air in icings. Most liquid oil solutions have no crystals provide minimal aeration to these products.
Pizza & Pie Crust

“Flaky” Texture Without Trans Fat
Flaky pastry falls into 3 main categories
- Pies
- Pizza crust
- Biscuits

*Without the natural solid fat of palm oil, liquid oils do not impart flakey texture to crusts. The oil will soak into the dough for a denser texture.*
Cookies – Solutions For All Textures

A wide range of cookies are manufactured for the North American food market. However, most can be made using all purpose shortenings. The SansTrans™ range includes several all purpose shortenings that provide a wide range of hardness and textures for many different cookie varieties.

In addition, IOI Loders Croklaan offers SansTrans™ Bakers Margarine as a substitute for partially hydrogenated margarine.

Different palm oil fractions can be blended together to provide a wide range of different cookie textures. Use of liquid oils alone do not provide enough structure for cookies, and result in oil leakage.
Microwave popcorn is the major contributor to trans fat exposure for this food category. Selecting an all purpose, high melt palm oil product like SansTrans™45 or SansTrans™48, produce the best results.

Both liquid oils and palm oil can be used in popcorn machines, but the use of liquid oils in microwave popcorn causes “wicking stains” in the bag which is undesirable for consumers. Selecting a semi-solid palm oil product eliminates wicking with excellent results.
Palm Oil – Availability
Palm Oil – Availability

Palm Oil is leading world vegetable oil production higher

Source: USDA; Jeffries Bache
Palm Oil – Sustainability

- RSPO
- Traceability / Remote Sensing

**Average yield per year (tonnes of oil per hectare)**

- Oil palm: 3.68
- Rapeseed: 0.59
- Sunflower: 0.42
- Soybean: 0.36
Summary and Conclusions

Palm oil offers a wide range of functional products to remove trans fat and eliminate PHVO.

- Drop-in solutions are developed and readily available
- Tailor made possibilities:
  - For difficult and specialty applications
- Reduced saturated fat for “healthy” products
- Widely available
- Cost comparable to commodity oils