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TRANSFORMATIONS IN THE FOOD INDUSTRY: REDUCING TRANS FAT IN THE DIET

Robert M. Reeves, President
Institute of Shortening and Edible Oils

The Dietary Guidelines for Americans 2005 were jointly announced on 1-12-05 by the Departments of Health and Human Sciences (HHS) and Agriculture (USDA). These guidelines have been updated every five years since 1975 as a means for health, nutrition and medical professionals to provide advice to Americans regarding the promotion of health and reducing the risk of chronic disease through nutrition and physical activity.

The Dietary Guidelines offer recommendations in several important areas including weight management, physical activity, food safety and consumption of macronutrients (e.g., fat, carbohydrates, protein). Although dietary fat management is addressed in the Dietary Guidelines, this paper will focus particularly on the current actions being taken by the food industry to reduce trans fat in the diet.

The Dietary Guidelines 2005 make the following recommendations on fat consumption: (1) consume less than 10% calories from saturated fats and less than 300 mg/d of cholesterol and keep trans fat consumption as low as possible; (2) keep total fat intake between 20-35% of calories (mostly poly- and monounsaturated fats); (3) make meat, poultry, dry bean and milk product choices "lean," "low fat," or "fat free;" and (4) limit intakes of fats and oils high in saturated and/or trans fats.

In making its recommendations on dietary fat intake, the Dietary Guidelines authors reviewed many recent scientific documents and studies. One of the most often-quoted scientific references is the Institute of Medicine/National Academies of Science Report on Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids, published September 5, 2002. It states "most Americans need to decrease their intakes of saturated fat and trans fats, and many need to decrease their dietary intake of cholesterol." The report further points out that the food industry has an important role in decreasing trans fat content in foods since about 80% are accounted for in foods containing partially hydrogenated oils while the remaining 20% are supplied by ruminant animals (i.e., beef and dairy products).

The reduction of trans fats in foods has been influenced by many factors. One major factor is the passage of a regulation by the Food and Drug Administration on 7-11-03, which will require the inclusion of trans fats within the nutrition facts panel of the food label by 1-1-06. The agency is also considering the use of nutrient content claims such as "trans fat free" and "reduced trans fat" to further guide consumers in their choice of foods.

The food industry is also assuming its responsibility to the American public by providing them with foods that are lower in trans fats which can fit into a daily diet. American consumers are becoming more health conscious and are increasingly interested in food products of improved healthfulness. Consumer advocacy groups have also called for the labeling of trans fats and their reduction in the diet.

The efforts by the food industry to reduce dietary trans fats have largely resulted in food manufacturers seeking reformulated food ingredients that are lower in or devoid of trans fat. Restaurants are similarly switching to deep frying oils or ingredients with reduced trans fat. Some retail food markets have even attempted to market only foods containing "low" or "no" trans fats.

There are many challenges that food manufacturers have faced during the development of new trans fat alternatives. Any replacement ingredient must provide the functional characteristics of the material being replaced. In other words, the alternative ingredient must provide the functionality of flakiness, firmness of texture, crispness or desired appearance in the finished product in order to provide attributes desired by consumers. The stability or shelf life of the finished product must also be maintained to ensure consumer acceptability.

Another major factor involved in the development of trans fat alternatives is the assurance to purchasers that such products will be available in adequate commercial quantities. For example, a major restaurant chain must be assured that any new food product or frying medium will be available in sufficient quantities to satisfy anticipated demand. In some cases, this may mean very large commercial quantities. Similarly suppliers of trans fat alternatives (e.g., vegetable oils derived from oilseed varieties having unique fatty acid profiles) may require commitments from restaurant chains or food manufacturers to purchase sufficient amounts of the alternative ingredient to justify the major capital investment necessary to bring the alternative product to the marketplace. Newer oilseed varieties currently being considered for commercial development,

particularly concentrating on oil of increased stability, thus having less need for partial hydrogenation, may take six to seven years to commercially develop.

Most newer technologies required to develop many trans fat alternatives are very costly. These costs are ultimately passed on to consumers in the form of higher food prices. If foods become too expensive, consumers may not purchase them regardless of their nutritional value or functionality. Therefore the food industry is making every effort to minimize the cost of trans fat alternatives.

Another challenge to suppliers of trans fat alternatives is the logistics of physically providing them to end users. There is no single solution to solving food manufacturer needs in a variety of products. Multiple ingredient alternatives require multiple inventories and often times multiple suppliers. Also a major source of a trans fat alternative may be limited to only one or perhaps a few regional supply sources, placing major demands on supply systems attempting to service geographically diverse and numerous receivers of such products. Significant "lead time" may be required from the time of ordering to the time of delivery.

There are currently four main sources of trans fat alternatives: naturally stable oils/fats, interesterified oils/fats, "modified" partially hydrogenated oils and trait-enhanced oils from newer oilseed varieties.

The more common oils or fats that are currently available and relatively stable, requiring little or no partial hydrogenation for most food product applications thus containing no trans fats include palm, corn and cottonseed oils. Also used to a lesser extent are palm kernel, coconut, high oleic canola, high oleic safflower, mid and high oleic sunflower, and low linolenic soybean oils and animal fats (e.g., beef tallow, lard).

A second source of low trans oils/fats for use as a shortening is a blend of oils and fats that have been interesterified. The interesterification process rearranges the fatty acids in a fat molecule resulting in customized melting characteristics.


A third method that may be used to reduce trans fats is by modifying the process of partial hydrogenation. Alteration of the variables influencing the hydrogenation process (e.g., time, temperature, catalyst) can result in a partially hydrogenated product of significantly reduced trans fat content.

The fourth method of reducing trans fats in the diet is to use oils from "trait enhanced" oilseed varieties specifically designed to have increased stability. These newer oilseed varieties are usually developed to have either lower amounts of relatively unstable fatty acids (e.g., linolenic) or higher amounts of more stable fatty acids (e.g. oleic). Such oilseed varieties currently available or soon to be introduced commercially include mid oleic sunflower and soybean, low linolenic soybean and canola, and high oleic sunflower and canola. Such varieties may be derived from either traditional plant breeding practices or biotechnological methods.

The search for oils that may be used in trans fat alternative products has had certain effects on the edible oils marketplace. Palm oil imports in 2003-04 were about 220,000 metric tons, in 2004-05 they were about 408,200 metric tons (375,000 in food use), and estimates are that about 600,000 metric tons will be imported in 2005-06 to meet market demand. Other relatively stable oils that will be available in commercial quantities in the future include low linolenic soybean (2005-2008), low linolenic, mid oleic soybean (2009-2012), high stearic soybean (2008-2012) and high stearic canola (2008-2012). Low linolenic acid soybeans are expected to be the next variety of significant consequence with about 80 million pounds of oil available by Fall of 2005 and about 2 billion pounds available in 2008. The mid oleic soybean variety is expected to be commercially available in 2007 (40 million pounds) with an expected availability of 2 billion pounds by 2010.

In summary, the food industry has faced several major challenges in bringing to the marketplace acceptable food products that are lower in or free of trans fats. They include: (1) insuring the availability of trans fat replacements in adequate quantities to satisfy the marketplace, (2) achieving the functional characteristics of the product being replaced (i.e., texture, crispness, appearance, stability), (3) minimizing the costs of trans fat replacements, and (4) managing the logistics of preparing trans fat replacements (e.g., utilizing existing manufacturing facilities and delivering them efficiently to food processors). The food industry has been working diligently to meet these challenges in order to provide trans fat alternatives that will meet the objectives of the Dietary Guidelines 2005. A variety of such products are currently available in the marketplace and many others are on the horizon.

TRANSFORMATIONS IN THE FOOD INDUSTRY: Reducing Trans Fat in the Diet



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Washington, D.C.
February 24, 2005**

U.S. DIETARY GUIDELINES 2005

Recommendations on Fat Consumption

- Consume less than 10% calories from saturated fats and less than 300 mg/day of cholesterol and keep trans fat consumption as low as possible.
- Keep total fat intake between 20-35% of calories (mostly poly- and monounsaturated fats).
- Make meat, poultry, dry bean and milk product choices "lean," "low fat," or "fat free."
- Limit intakes of fats and oils high in saturated and/or trans fats.

U.S. DIETARY GUIDELINES 2005

(Continued)

Selected details of fat consumption recommendations:

- “Most Americans need to decrease their intakes of saturated fat and trans fats, and many need to decrease their dietary intake of cholesterol.”
- Food industry has important role in decreasing trans fat content in foods since partially hydrogenated oils account for 80% of total intake.

ADDITIONAL INFLUENCES TO REDUCE TRANS FAT IN U.S. DIET

- FDA labeling regulation (effective 1-1-06)
- FDA consideration of nutrient content claims ("trans fat free," "reduced trans fat")
- Industry desire to improve healthfulness of foods
- Recommendations of health advisory groups (WHO, IOM/NAS)
- Consumer sensitivity to health issues
- Consumer advocacy groups

NEW FOOD LABEL – Nutrition Facts Panel



Nutrition Facts

Serving Size 1 Tbsp (14g)

Servings Per Container 32

Amount Per Serving

Calories 100 Calories from Fat 100

% Daily Value*

Total Fat 11g **17%**

Saturated 2g **10%**

Trans Fat 2g

Polyunsaturated Fat 3.5g

Monounsaturated Fat 3.5g

Cholesterol 0mg **0%**

Sodium 115mg **5%**

Total Carbohydrate 0g **0%**

Protein 0g

Vitamin A 6%

* Percent Daily Values are based on a 2,000 calorie diet.

INDUSTRY ACTIONS TO REDUCE TRANS FAT CONTENT

Food Manufacturers:

- Reformulation of products

Restaurants:

- Switch to frying oils and food ingredients low or free of trans fats

Retail Food Stores:

- Concentrate sales of “low/free” trans-containing products

CHALLENGES TO OIL/FAT INDUSTRY REGARDING TRANS FAT ALTERNATIVES

- 
- Functionality
 - Availability
 - Economics
 - Logistics

FUNCTIONALITY

- Replacements must provide functional characteristics of materials being replaced
(firmness of texture, flakiness, crispness, appearance)
- Shortening's functionality determined by level of both saturated fat and trans fat
- Product's shelf-life stability must be maintained

AVAILABILITY

- Major consumer markets (restaurants) require significant source availability.
- New trait-enhanced oils require commitment by food industry to use such oils.
- Time needed to develop trait-enhanced oilseed varieties.

ECONOMICS

- New technology costly
(interesterification, modified partial hydrogenation, special fatty acid composition oils).
- Trans fat replacements must be price competitive
(consumer may not buy new products if expensive).
- Premiums for trait-enhanced oils?

LOGISTICS

- No single solution – multiple ingredient alternatives, multiple inventories, multiple suppliers
- Regional supply bases, not national (no geographically diverse suppliers)
- Utilization of existing manufacturing facilities

TRANS FAT REPLACEMENT TECHNOLOGY

(Replacement of 3-4 Billion lbs. PHSO)

- Naturally stable oils/fats
(palm, palm kernel, coconut, corn, cottonseed, animal fats)
- Interesterification (re-arrangement of fatty acids)
 - chemical and enzymatic methods
- Modified partial hydrogenation
(alteration of variables: time, temperature, catalyst)
- Trait-enhanced oils
(fatty acid modification through plant breeding:
e.g., mid-oleic sunflower and soybean, low linolenic soybean and canola, high oleic sunflower and canola)

STABLE OILS/FATS CURRENTLY AVAILABLE

- 
- Animal Fats
 - Canola (high oleic)
 - Coconut
 - Corn
 - Palm
 - Palm Kernel
 - Soybean (low linolenic)*
 - Safflower (high oleic)
 - Sunflower (mid and high oleic)

* Available in limited quantities

PALM OIL IMPORTS

- 2003-04 Imports = 220,300 metric tons
- 2004-05 imports = 408,200 metric tons
(Food Use approx. 375,000 metric tons)
- 2005-06 imports = 600,000 metric tons?

STABLE OILS AVAILABLE IN FUTURE

Projected Availability

- Soybean
(low linolenic, $< 3\%$)
2005- 2008
- Soybean
(low linolenic, $< 3.5\%$;
mid oleic $\geq 50\%$)
2009 – 2012
- Soybean
(high stearic, $> 30\%$)
2008 - 2012
- Canola
(high stearic, $> 30\%$)
2008 - 2012

LOW LINOLENIC SOYBEANS PROJECTED AVAILABILITY*

<u>Year</u>	<u>Acres</u>	<u>Production (Bu)</u>	<u>Oil Production (Lb)</u>
2005	200,000	8M	80M
2006	1M	40M	400M
2007	3M	120M	1.2B
2008	5M	200M	2B

* Includes Dupont, Monsanto, Iowa State Varieties

MID OLEIC SOYBEANS PROJECTED AVAILABILITY

<u>Year</u>	<u>Acres</u>	<u>Production (Bu)</u>	<u>Oil Production (Lb)</u>
2007	100,000	4M	40M
2008	1M	40M	400M
2009	3M	120M	1.2B
2010	5M	200M	2B

KEY MARKETPLACE CHALLENGES

- Availability of TFA replacements
- Meeting existing product's functionality requirements (texture, taste, appearance, stability)
- Costs of TFA replacements
- Utilizing existing manufacturing facilities/efficient distribution of replacements

SUMMARY

- U.S. food industry working diligently to provide trans fat alternatives that will meet objectives of Dietary Guidelines 2005.
- Variety of products currently available.
- More products on the horizon.