Healthy Oils and the Elimination of Industrially Produced Trans Fatty Acids in the Americas

Initiative for the Prevention and Control of Chronic Diseases
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# TABLE OF CONTENTS

Foreword .......................................................................................................................................... v
Acknowledgments ............................................................................................................................. vii

**ELIMINATION OF INDUSTRIALLY PRODUCED TRANS FATTY ACIDS IN THE AMERICAS: INTERSECTORAL ACTION FOR THE PREVENTION AND CONTROL OF CHRONIC DISEASES** ......................................................................................................................... 1

- Situation Analysis ............................................................................................................................. 3
- Phasing Out TFA: PAHO/WHO Regional Activities ........................................................................ 4
- PAHO/WHO Trans Fat Free Americas Task Force .......................................................................... 5

**BACKGROUND PAPERS**

- TFA consumption in Latin America. *Alfonso Valenzuela* ................................................................ 15
- TFA consumption and CHD events in the Americas. *Dariush Mozaffarian* ................................. 29

**CASE STUDIES**

- Decline of TFA in Costa Rica. *Uriyoán Colón Ramos, Rafael Monge-Rojas,* and *Hannia Campos Nuñez* ...................................................................................................................................................... 37
- Argentina’s experience in phasing out TFA. *Marcelo Tavella* ..................................................... 47

**APPENDIX**

- Act to prohibit trans fat in food prepared and sold in restaurants in Puerto Rico............. 53
FOREWORD

In September 2006, in response to concerns of member states about the growing burden of noncommunicable diseases in the Americas, the Pan American Health Organization’s 47th Directing Council approved a Regional Strategy and Plan of Action for 2006–2015 on an Integrated Approach to the Prevention and Control of Chronic Noncommunicable Diseases (CNCD), which included diet, physical activity, and health. One of its four lines of action, health promotion, includes several initiatives that aim to create environmental conditions that make it easier for individuals to eat a healthy diet and engage in active lifestyles.

In the area of diet, for instance, numerous actions need to be undertaken that may vary from country to country. In early 2007—taking advantage of the momentum and support for actions to prevent and control CNCDs—immediate action was needed to address a substantial health threat in the Americas: the recognition of the negative effects of industrially produced trans fats (TFA) in our food supply, on behalf of public health professionals as well as the food industry. Consequently, assuming a leadership role in phasing out TFA represents a public health and a moral obligation.

Continuing to tell people to avoid TFA in their food is not sufficient; there needs to be an institutional change to support healthy food choices. That is why I convened a Task Force to work toward “Trans Fat Free Americas” (TFFA) whose members were appointed for a two-year period. The group’s task could not be clearer: summarize the science, estimate the size of the public health problem, and collaborate with other sectors to eliminate TFA from our food supply.

I am pleased to present in this publication which contains background information and current and future activities related to the TFFA Task Force. Every country regardless of its resources can help prevent and control chronic diseases and bring to fruition the elimination of TFA in the Americas.

Mirta Roses
Director
Pan American Health Organization
ACKNOWLEDGMENTS

We wish to acknowledge the contribution of the PAHO/WHO Task Force for a Trans Fat Free Americas, particularly Drs. Hannia Campos, Uriyoán Colón Ramos, Rafael Monge-Rojas, Dariush Mozaffarian, Marcelo Tavella and Alfonso Valenzuela for their valuable contributions. Special thanks to Ms. Maria Pico for her technical support and to Mrs. Esperanza Bennett in the production of this publication.
Elimination of industrially produced trans fatty acids in the Americas: Intersectoral action for the prevention and control of chronic diseases
SITUATION ANALYSIS

Over the last 10 years, chronic noncommunicable diseases (CNCDs) such as cardiovascular and respiratory diseases, cancer, and diabetes, among others, have affected the lives of some 338 million persons, according to estimates. In fact, these diseases account for the greatest share of early death and disability in the developed and developing world and the threat is growing. Equally alarming are the effects on worker productivity, a country’s economy, and the cost to families.

In 2005, CNCD worldwide claimed the lives of an estimated 35 million people (1). In Latin American and the Caribbean, they accounted for 67% of the 3,537,000 deaths among those below the age of 70 years in 2000 (2). The estimated medical health care costs of treating diabetes and hypertension for the year 2005 is US$ 39.1 billion (3).

There are several myths about chronic diseases, among them that they affect only high-income countries and are consequences of self-indulgence in unhealthy lifestyles. In fact, the burden from these diseases is greatest in developing countries, where 80% of deaths due to chronic disease occur (1). Moreover, vulnerable populations such as the poor lack the knowledge and resources to adopt healthy lifestyles, increasing their likelihood of developing chronic diseases and becoming further impoverished as a result.

Another myth is that little can be done about chronic diseases, yet clear, cost-effective interventions are available to prevent these diseases. In Australia, Canada, Japan, England, and the United States, with scaled up chronic disease interventions, deaths from heart disease have fallen by up to 70% in the past three decades. An important contribution to this achievement has been mass media campaigns and an increased awareness of the health risks of unhealthy foods among the policy-making community and health care professionals that can influence food consumption choices.

The risk for chronic diseases has increased as the population’s dietary patterns have shifted to increased consumption of processed foods rich in fats and sugars and with a high content of industrially produced trans fatty acids (TFA). TFA are a semisolid fat, obtained after heating vegetable oils in the presence of hydrogen and nickel. This process results in a hardened oil with a long shelf-life that is easy to transport; it is widely used in margarines, commercial cooking, and manufacturing processes. While advantageous to the food industry, TFA has an adverse effect on human health, as it increases the risk of cardiovascular diseases and sudden cardiac death by increasing levels of bad cholesterol, lowering good cholesterol, and causing inflammation of the lining of arteries.

Evidence abounds that removing TFA from the food supply is not only beneficial to human health and a cost-effective intervention for preventing cardiovascular disease (4) but also, from an industry viewpoint, a feasible intervention. Efforts to phase out TFA are under way, including regulatory measures in several European countries and voluntary decisions by some industries in the United States (e.g., Kraft Foods, Wendy’s), Europe (e.g., Unilever), Brazil, Argentina, and, most recently, New York City (5).
PHASING OUT TFA: PAHO/WHO REGIONAL ACTIVITIES

The Pan American Health Organization/World Health Organization (PAHO/WHO), recognizing that chronic diseases pose a great burden and in response to its member countries’ endorsement of the Regional Strategy and Plan of Action for an Integrated Approach to the Prevention and Control of Chronic Diseases, which includes diet, physical activity, and health 2006–2015 (PAHO Resolution CD47.R9), is taking leadership on the issue of phasing out TFA to improve diets and promote healthier lifestyles in the Americas.

PAHO, through the Unit of Noncommunicable Diseases, convened a Task Force, Trans Fat Free Americas (TFFA), whose members were appointed by the Director to serve as PAHO advisers for a two-year period. The TFFA Task Force was asked to evaluate the impact of TFA in human nutrition and health and to discuss practical ways to phase out TFA from the food supply, including regulatory and voluntary actions and the feasibility of recommending healthier alternative fats. The Task Force is composed of 21 expert members who are senior staff within ministries of health, state health departments, nongovernmental organizations, and teaching and research institutions from 11 countries in Latin America and the Caribbean (Argentina, Brazil, Costa Rica, Chile, Guatemala, Jamaica, Mexico, Peru, Puerto Rico, Uruguay, and Venezuela), the United States (the Centers for Disease Control and Prevention, Harvard University, National Institutes of Health, and Department of Agriculture), and Canada (Health Canada and Public Health Agency of Canada). They have committed to work at a national level to incite a wide range of actions to eliminate TFA.

Before the Task Force several governments had taken or were considering a wide range of actions to eliminate TFA. The most notable was Denmark’s legislation in January 2006 that limited TFA to 2% of total fat in all foods in the marketplace, including imported and restaurant foods, effectively eliminating industrial TFA from their food supply. Canada, in 2005, became the first country to regulate mandatory nutritional labeling of TFA. In 2006, a Canadian Task Force proposed reducing the consumption of TFA to the “lowest level possible” and recommended that TFA not exceed 2% of the total fat content in vegetable oils and soft, spreadable margarines and 5% in all other foods. In the United States, a detailed cost–benefit analysis of the health benefits of TFA reduction compared with the expense of labeling processed foods led to the mandated inclusion of TFA content on food labels and the recommendation that individuals keep trans fatty acid consumption as low as possible. A Multisectoral Committee on Fats and Oils of Costa Rica proposed reducing TFA intake in Central American countries and the Dominican Republic and recommended including TFA on nutrition labels. In January 2006, Chile followed suit and was joined in August of that year by countries of the MERCOSUR pact agreement (Argentina, Brazil, Paraguay, and Uruguay). Finally, in Brazil, a new proposal to regulate marketing of foods with high levels of saturated fat and trans fat, among other nutrients, is currently under public discussion. Thus, government action on TFA is feasible and can produce significant benefits, but such efforts are not yet widespread or coordinated.

Similarly, the food industry has taken some steps toward eliminating TFA. McDonald’s has eliminated TFA in some countries (Denmark, France, Russia, and Argentina) and substantially reduced TFA in Brazil. Global corporations such as Unilever and Kraft Foods have declared goals to eliminate TFA in all their products and have started the process. In Argen-
tina and Brazil, some food industries, induced by public health action, have begun to switch from partially hydrogenated oils to nonhydrogenated unsaturated oils at no additional cost to consumers; for example, TFA-free bread and other bakery products have been introduced at similar cost to the previously TFA-laden products. In Costa Rica, the largest local vegetable oil and margarine industry voluntarily phased out TFA, resulting in a dramatic fall in TFA consumption and in population biomarkers of TFA intake. In Uruguay, sunflower oil with high oleic acid content is being produced and marketed as a substitute for partially hydrogenated oils used in fried food. These actions demonstrate that significant reduction in TFA use is both feasible and practical. Unfortunately, many food industries, manufacturers, and restaurants have not taken steps to eliminate TFA.

**PAHO/WHO TRANS FAT FREE AMERICAS TASK FORCE**

The first meeting of the PAHO/WHO Trans Fat Free Americas Task Force took place on 26–27 April 2007 in Washington, D.C. In addition to the participation of Task Force members, nongovernmental organizations, research institutes, and consumer associations were invited to attend as observers.

**Task Force’s Conclusions**

Industrially produced TFA, commonly known as trans fats, are defined by the Codex Alimentarius Commission as “unsaturated fatty acids that contain one or more isolated (nonconjugated) double bonds in a trans configuration.” TFA are formed during the partial hydrogenation of liquid vegetable oils, resulting in semisolid fats used in margarines, cooking oils, and many processed foods, which are attractive to industry because of their long shelf-life, better stability during frying, and increased solidity and malleability for use in baked goods and sweets. TFA are also formed naturally in small amounts by the action of microorganisms present in the ruminant (e.g. cows, sheep, goats) stomach; however, this form of TFA accounts for a small amount (< 0.5% of total energy intake) of total trans fats consumed. Although data for all countries are incomplete, it is estimated that consumption of TFA may approximate 2% to 3% (4.5–7.2 grams/day (g/d)) of total calories consumed in the United States, 3% (7.2 g/d) in Argentina, 2% (4.5 g/d) in Chile, and 1.1% (2.6 g/d) in Costa Rica.

There is conclusive evidence indicating that consumption of TFA increases the risk of coronary heart disease and possibly raises the risk of sudden cardiac death and diabetes. This evidence has prompted global concern given the large burden of disease and disability posed by cardiovascular diseases. The 2002 WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (WHO Technical Report Series, TRS, 916) concluded that there was convincing evidence that intake of TFA increased the risk of developing cardiovascular diseases. Furthermore, the TRS 916 Expert Consultation recommended that TFA consumption not exceed 1% of daily dietary energy intake and proposed efforts to increase the amount of mono- and polyunsaturated fats in the food supply and in human diets. Consequently, member states adopted the World Health Assembly resolution in 2004 endorsing the global strategy on diet, physical activity, and health, which placed the elimination of TFA as a key point for action by governments.
The health impact of removing industrially produced TFA from the food supply was estimated by Task Force investigators from the School of Public Health, Harvard University. They calculated the risk reduction associated with a potential TFA reduction of 4.5 g/d (2% of daily energy) and 9 g/d (4% of energy). Effects on the risk of coronary heart disease (CHD) were based on (i) only the effects of TFA on total and high density lipoprotein cholesterol concentrations (determined from randomized controlled trials, and (ii) the relationship between TFA intake and clinical CHD events in prospective longitudinal studies. The first model is considered conservative because it does not account for the full range of health effects of TFA on other risk factors such as endothelial cell function, inflammation, and insulin sensitivity. The results demonstrate that sizeable reductions in CHD events (non-fatal myocardial infarctions and CHD deaths) would be achieved by eliminating industrial TFA. In the Americas, excluding the United States and Canada, a 4.5-g/d reduction in TFA consumption (2% of daily energy) would translate to 30 000 to 130 000 CHD events prevented; a 9-g/d reduction would prevent 62 000 to 225 000 CHD events.

Task Force Conclusions and Recommendations to PAHO/WHO:

1. Industrial TFA in the food supply should be eliminated in the Americas and unsaturated fats should be the preferred alternative, including the n-3 polyunsaturated fatty acids, given their cardiovascular protective effect. As a substitute, saturated fats should be used only when indispensable to a specific application; this should be uncommon considering advances in food technology.

2. While voluntary actions from industry are welcome, regulatory action is needed to most rapidly and effectively protect population health in the Region. Furthermore, a regulatory framework would “level the playing field” for all industry—local and international, small and large—and provide equal benefits to all sectors of society (particularly rural and poor populations). Based on the evidence on cost, technical advances, and supply issues, the elimination of industrial TFA is feasible and achievable; the implementation of this goal over time should be based on local conditions.

3. The key recommended regulatory measure is to adopt, by legislative action, a threshold limit of <2% of total fat as TFA in vegetable oils and soft, spreadable margarines and <5% for all other foods, as proposed by the Canadian Task Force on TFA. In addition, other potential regulatory measures include: (a) food labeling to disclose the TFA content of foods throughout the Region; (b) the establishment of standards for product health claims; and (c) disclosure of types of dietary fats and oils, including TFA, in foods served in restaurants, food-aid programs, school food programs, and by other food service providers.

4. The Task Force is committed to working with industry leaders to identify common ground for action and to expedite the process of phasing out TFA and promote the adoption of healthier oils and dietary fats in the food supply of the hemisphere. To that end, the Task Force will propose a plan of action to stakeholders, governments, and industry to be implemented after consultation with the various sectors.

5. National governments are particularly encouraged to support the efforts of small food industries and services in their attempt to eliminate TFA and substitute healthier oils and fat alternatives.
6. The Task Force recommends that PAHO/WHO: (a) lead the effort in phasing out TFA; (b) assist member states in developing policy and nutrition public health capabilities, as well as laboratory and human resources to adequately measure progress and impact; (c) in the medium term, place the Trans Fat Free Americas policy and strategy as a priority in its Regional health agenda; (d) provide technical assistance to governments in the development of regulations and legislation to eliminate TFA; and (e) encourage member states to bring to the attention of the Codex Alimentarius Commission relevant recommendations made by this Task Force.

7. A number of issues require investigation to refine some of the actions suggested, but such efforts should not delay action to eliminate industrial TFA. Suggested research topics include (a) defining the optimal combination of n-3 and n-6 polyunsaturated fatty acids and monounsaturated fatty acids to replace, TFA depending on available sources of fats and oils; (b) improving the characterization of sources and amounts of TFA consumed by different populations in the Americas; and (c) developing appropriate sampling methods and specific biomarkers for surveys of exposure to, and the biological effects of, TFA.

The Task Force on Trans Fat Free Americas proposed that the PAHO Executive Committee consider this Report and submit it for consideration at PAHO’s Pan American Sanitary Conference Meeting in October 2007.

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On 24 September 2007, PAHO/WHO convened a meeting with representatives from the manufactured food industry, fast food restaurants, and oil producers, recognizing that several companies have taken or are considering a wide range of voluntary actions to eliminate TFA from their products that are widely available in the Region, which is an indication of their willingness to respond to consumer health concerns that will also serve to increase consumer confidence and enhance their brand reputation.

The food industry is an important partner that can facilitate that consumers’ healthy choices be the easiest choices by:

- limiting the levels of saturated fats, TFAs, sugar, and salt in existing products;
- developing and providing affordable, healthy, and nutritious choices to consumers;
- providing consumers with adequate and easy to understand product and nutrition information; and
— practicing responsible marketing particularly with regard to the promotion and marketing of foods high in saturated fats, TFA, sugar, or salt, especially to children.

At this meeting, the Task Force Chair presented the Task Force’s conclusions and recommendations and each company briefly discussed current and future initiatives to phase out TFA, their alternatives, and potential barriers. Industry representatives in attendance included Burger King Corporation, Cargill Inc., ConMéxico, Grupo ARCOR, Kraft Foods, Kellogg Company, McDonald’s Corporation, Nestle, PepsiCo, Sadia, Watt’s S.A. and Yum! Brands, Inc.

Most industry representatives estimated that TFA elimination will take place by the end of 2008. It was noted, however, that completely phasing out TFAs will require additional action to eliminate them in oils used for home cooking and in bakery products, which account for about two-thirds of TFA consumption in the Region. Representatives also discussed the need for standardization of regulatory norms in the Southern hemisphere, heightened consumer awareness and education on TFA and diet and health-related issues, and their commitment to ongoing collaboration with PAHO in other areas to improve health outcomes.

**Proposed Next Steps**

1. Convene a meeting with the oil producers to discuss healthier oil alternatives and a timetable.
2. Convene a meeting of regulatory agencies to harmonize the regulatory norms and nutrition labels.
3. Hold further discussions with industry to explore opportunities for collaboration to improve health and nutrition, including joint public campaigns regarding healthy lifestyles.

**At a Glance: Global and Regional TFA Activities**

- 24 September 2007, Washington, DC: PAHO/WHO regional meeting with food and nonalcoholic beverage companies and major oil industry representatives;

**Examples of Country TFA Efforts to Date**

After the meeting of the Trans Fat Free Americas Task Force and the issuance of their conclusions and recommendations, various countries took steps to ban TFA:

1. Puerto Rico

In September 2007, the Legislature of Puerto Rico passed Law 120 of 2007 that bans TFA from all foods prepared and sold at food establishments, including restaurants, fast food restaurants, food establishments that operate as a franchise, home delivery food services, and all types of mobile units (see Appendix). This law took effect 1 January
2008. This effort was headed by the Secretariat Auxiliary of Health Promotion, Puerto Rican Society of Cardiology, together with the Commission of Women’s Issues and its president, Senator Lucy Arce.

2. Chile

Many food products are now free of TFA and Chile’s Regulation of Food Health (Reglamento Sanitario de Alimentos) is working to ensure that this does not inadvertently result in an increase in the use of saturated fats by mandated inclusion in nutrition labels.

3. Bahamas

In January 2008, a meeting on TFAs convened with key stakeholders (representatives from the Ministries of Health, Finance, Agriculture, and Education; fast food restaurants; the media; and the Chronic Disease Research Centre) to develop a plan of action to phase out TFAs.

4. Brazil

ANVISA (National Health Surveillance Agency), a consumer regulatory entity, created a working group on Processed Foods and Quality of Life whose first task is to discuss reducing TFA, sodium, and sugar in food. Members of this working group include representatives of the food industry and restaurants.

5. Uruguay

Uruguay has also made great progress toward phasing out TFA. The Task Force’s conclusions and recommendations have gained support from the Minister of Health, Dr. María Julia Muñoz, who convened a Task Force charged with preparing a work plan to phase out TFA by 2009.

6. Costa Rica

In November 2007, the Costa Rican Institute for Research and Education in Nutrition and Health (INCIENSA) opened a National Laboratory on TFA that will follow the same protocol for both food and biological samples as those of the Laboratory of the Department of Nutrition at Harvard University.
REFERENCIAS


BACKGROUND PAPERS

1. Trans Fatty Acid consumption in Latin America
   Alfonso Valenzuela

2. TFA consumption and CHD events in the Americas
   Dariush Mozaffarian
INTRODUCTION

The experimental, clinical, and epidemiologic evidence of a direct link between consumption of saturated fat and increased risk of cardiovascular diseases (1–3) has led consumers to consider oils derived from vegetables, and industrial products derived from them (i.e., margarine and shortening), as healthier substitutes than animal fats and even butter (4). However, during the technological manipulation of vegetable oils, to transform them into more stable products, for easy handling, for industrial and household use, and better organoleptic characteristics, the process of hydrogenation is applied. The main side effect of this process is the formation of geometric and positional isomers of the unsaturated fatty acids, primarily fatty acids that are trans isomers or trans fatty acids (TFA) (5). The current wisdom is that, among their other effects, TFA negatively alter the lipid profile, substantially increasing the risk of cardiovascular diseases and their secondary effects (6).

TFA consumption is well established in developed countries, all of which have begun to adopt policies and regulations to drastically reduce the TFA content of processed foods (7). This is not so in Latin America. We lack up-to-date studies on TFA and, in most cases, have only estimates of TFA consumption based on information from incomplete or outdated tables and figures, sometimes from other countries or regions with different consumption habits. Fat intake varies widely within each country or group of countries. It is determined by the geographic availability of fats; in some countries, it is animal in origin, while in others it is vegetable or a mixture of the two. Moreover, some countries have no regulations governing the fat composition of foods, especially the TFA content. This paper discusses the source of the TFA in our diet, the current alternatives for reducing TFA content in food, and TFA intake in Latin American countries where this information is available.

FORMATION OF TFA

Unsaturated fatty acids have two types of isomeric structure. In one of them, the double bond(s) is located at a different position in the hydrocarbon chain. This is known as positional isomerism and may result in the formation of “conjugated fatty acids,” which are uncommon in nature. The other isomeric type is geometric isomerism. Here, the spatial structure of the double bond changes (8). When a double bond is formed between two carbon atoms, they form a flat structure that allow hydrogen or carbon atoms to continue the chain replacing each of the carbon atoms
in the double bond, remaining on the same side of the plane formed by the double bond or on the opposite side. When hydrogen or carbon atoms are on the same side of the plane formed by the double bond, cis geometric isomerism occurs. When they are on different sides of the plane, a trans (meaning across) geometric isomerism is created. Trans isomerism results in a linear structure around the double bond, unlike cis isomerism where the substituting atoms are located on the same side of the molecule, resulting in highly flexible structures. In their natural form, most unsaturated fatty acids are characterized by cis isomerism (more than 95%). All metabolic and structural functions of fatty acids are associated with cis isomers (9). Thermodynamically, however, trans isomers form more stable structures than cis isomers; therefore, if the double bond is temporarily broken by physical (temperature, pressure) and/or chemical (pH, metallic catalysts) influences, it will be restructured as a trans isomer (5). The cis → trans isomerization forms more rigid molecular structures with a higher melting point than cis isomers with an equal number of carbon atoms. Figure 1 shows the geometry of unsaturated cis and trans fatty acids around the double bond.

**Figure 1. Cis – trans isomerism of fatty acids**

![Cis and trans isomers of fatty acids](image)

**ORIGIN OF TFA IN FOOD**

TFA are not foreign in our diet. Humans, during their different stages of development (hunter-gatherer, farmer, and, later, industrial worker), have consumed TFA from different origins and in different quantities depending on the period, geographic location, and type of diet (10). Industrialization, which began in the late 19th century, introduced technologies that made possible the mass production and commercialization of edible vegetable and animal oils and processes for preserving and chemically transforming them (11). Current dietary TFA consumption has a biological and industrial origin; the latter are found in margarine, shortening, home and industrial cooking oil, bakery goods, and a wide range of snack foods. Substantial TFA amounts come from the so called “invisible fats,” the raw material used to manufacture more complex foods.
Biological Origin of TFA: Biohydrogenation

TFA occur naturally in meat, milk, and dairy products from ruminants but in smaller quantities than are found in processed foods. In ruminants, the partial biohydrogenation of unsaturated fatty acids occurs from the action of microorganisms (bacteria and protozoa) present in the rumen; the fats are deposited in different tissues of the animal. The oleic, linoleic, and linolenic acids found in the grains, leaves, stems, roots, and fodder eaten by ruminants are chemically reduced (hydrogenated) and isomerized, becoming di- and monounsaturated derivatives with trans isomerism. One of the diunsaturated derivatives formed is conjugated linoleic acid (CLA) (12). CLA is a fatty acid with cis and trans isomerism, for which a variety of physiological properties have been described but that remain unclear (13). Another fatty acid formed in significant quantities is vaccenic acid (C18:1 11t), which is largely responsible for the TFA content of the products obtained from ruminants (14). The meat, fat, and secretion products (milk and dairy products) of ruminants contain small amounts of TFA. Meat can contain 1 g of TFA/100 g, fat 5–6 g/100 g, butter 2–7 g/100 g, and whole milk 0.07–0.1 g/100 g (15). Some 1% to 5% of the trans isomers that we habitually consume are biological in origin (16).

Industrial Origin: Hydrogenation in the Manufacturing Process

Industrial hydrogenation began in the early 20th century, stemming from the work of the German chemist Wilhelm Normann (17), who in 1903 obtained a patent from the British Patent Office to convert unsaturated fatty acids to saturated compounds. The patent was acquired by Joseph Crossfield & Sons, an English company that began producing hydrogenated and partially hydrogenated oils in Europe in 1906. Later, Procter & Gamble, a U.S. company (Cincinnati, OH), obtained the patent rights and in 1911 developed the first U.S. product from the hydrogenation of cottonseed oil, named “Crisco” (18). However, the process of hydrogenation did not become widespread until 1950, when industry became interested in manufacturing margarine from hydrogenated oils to find a less expensive, more stable substitute for butter with a higher melting point, and, in many cases, with better organoleptic characteristics. Years later, Europe, especially the Nordic countries, began producing hydrogenated products from fish oil, an industrial practice that was introduced to Latin America—particularly Chile, Peru, Ecuador, and Panama—in the 1970s, owing to the abundance of fishing activities in these countries.

The principal raw materials used in the industrial hydrogenation process are vegetable and marine oils. Because of their susceptibility to oxidation, the conversion of liquid and unstable products to solid or semisolid products that are stable and easier to handle makes them very good substitutes for animal fats (“rendering” products), in particular butter (19). Hydrogenation is done under pressure and at high temperature in the presence of a metallic catalyst (usually nickel), bubbling hydrogen gas into the oil. Under these conditions, the double bonds of the unsaturated fatty acids undergo several structural changes: The double bond can be hydrogenated and converted to a single bond (saturated); the location of the double bond can be changed (formation of positional isomers); and the double bond can change its spatial configuration giving rise to TFA. When the hydrogenation process is intensive (full hydrogenation, in industrial terminology), the result is a 100% saturated product with a high melting point that has no cis and trans isomers. When hydrogenation takes place under controlled conditions (partial hydrogenation), a mixture of saturated,
monounsaturated, and small quantities of polyunsaturated fatty acids is obtained, with cis and trans isomers. The TFA that forms in the greatest proportion during partial hydrogenation of vegetable oils is the C18:1 10\((20)\). In marine oils, a much more complex variety of trans isomers is formed, due to the high degree of polyunsaturation of its fatty acids (up to six double bonds) and the size of the chain (up to C20 and C22) (21).

In addition, the refining processes to which the oils are subjected to improve their organoleptic characteristics, which include high-temperature deodorization (200°C to 230°C) in a vacuum, are another source of TFA formation (22). This means that virtually all household oils have small amounts of TFA (0.1% to 1%) (23). Frying, industrial as well as domestic, that involves temperatures up to 180°C for extended periods, is another source of TFA formation when the oils used are relatively polyunsaturated (24). The impact of TFA formation from frying is particularly significant in institutional diets and in the fast food industry. Figure 2 summarizes the biological and industrial origin of TFA in the diet.

**Figure 2. Origin of trans isomers**

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<thead>
<tr>
<th>Biological origin</th>
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<tr>
<td>Milk and its derivatives</td>
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<td>Meats from ruminants</td>
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<th>Technological origin</th>
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<tr>
<td>Hydrogenation of vegetable and/or marine oils</td>
<td></td>
</tr>
<tr>
<td>Deodorization of vegetable and/or marine oils</td>
<td></td>
</tr>
<tr>
<td>Thermal treatments (deep frying process)</td>
<td></td>
</tr>
</tbody>
</table>

**HOW TO REDUCE TFA INTAKE**

In light of the nutritional recommendations to reduce TFA intake, it is expected that consumption of these isomers, primarily those of industrial origin, will decrease in the coming years. Currently, the decline has been mainly due to the introduction to the global market of fats and margarines (shortenings) free of TFA, labeled as “VTF” (virtually trans free), marketed in several Latin American countries. It should be noted that the development of this type of margarine was a direct response from the food industry to growing pressure from the scientific community that has demonstrated—with experimental, clinical, and epidemiologic evidence—that TFA consumption negatively affects cardiovascular health (25).
The methodology developed to reduce the TFA content of hydrogenated products involves the use of oils with a high degree of saturation in their natural state (e.g., palm or palm kernel oil) or previously hydrogenated vegetable oils (soybean, sunflower, cotton, corn) until reaching a high degree of saturation (full hydrogenation). In both cases, the TFA concentration is minimal or nonexistent. These oils are mixed with refined vegetable oils that are relatively unsaturated (sunflower, soybean, corn) that also possess in their natural state minimal amounts of TFA (26). This mix undergoes the process of transesterification (27), which consists of exchanging fatty acids among the triacylglycerides that make up the two types of oils (highly hydrogenated and nonhydrogenated) (28). This process can be chemical or enzymatic. The chemical process is less expensive but produces triacylglyceride mixtures with varied composition, because the process involves random exchange of fatty acids. The enzymatic process, which is gaining prominence in developed countries, is more expensive but makes it possible to obtain products with a very specific composition and properties that meet the producer’s requirements (29). Figure 3 shows the procedure for obtaining VTF margarine through the transesterification of hydrogenated and nonhydrogenated oils.

Currently, in many countries, the TFA content of margarines is mandatory information on these products’ nutrition labels. However, the TFA content in products manufactured with partially hydrogenated oils—as is the case with bakery goods, cookies, crackers, cereals, snack foods, french fries, etc.—is not always disclosed, and in some cases this hidden content is rather high—even higher than in margarines that are not VTF. In this regard, the U.S. Food and Drug Administration (FDA) ruled that effective 1 January 2006 the TFA content must be disclosed in nutrition labels of all foods manufactured with partially hydrogenated

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**Figure 3. How to obtain hydrogenated products that are free of TFA**

Vegetable oil (only cis isomer) → Mix and transesterification → Product with an intermediate melting point (free trans isomer) → VTF, “Virtually trans free”

Highly hydrogenated oil or palm oil (free of trans isomer)
oils. In some Latin American countries, this information is already required in the nutrition labels of food containing a certain percentage of these types of oils, although the situation varies widely, as is explored in the following section.

As an alternative to transesterification, an alteration has been made, by genetic selection or modification, to the composition of some oils classified as commodities as are soybean, sunflower, etc., resulting in oils that are free of TFA with high thermal stability. These oils are suitable for use in manufacturing VTF margarine and shortening and for frying and industrial and home baking. This is the case for soybean oil with a high oleic acid concentration and a low linolenic acid concentration (mid-oleic/low-linolenic SBO), soybean oil with a low linolenic acid content (low-linolenic SBO), soybean oil with a minimal concentration of linolenic acid (ultra-low-linolenic SBO), sunflower oil with more oleic acid content (mid-oleic SFO), sunflower oil with a high oleic acid content (high-oleic SFO), fractionated palm oil and palm kernel oil with a low saturated fatty acid content, etc. Today, the oleochemical industry offers different processes and a wide variety of products for the development of fats with low TFA content and the manufacture of food with minimal TFA content.

TFA Consumption in Latin America: Some Country Examples

Estimating TFA intake is always controversial, since it varies with the method used: food frequency questionnaires, information on food availability or consumption, estimates of TFA content from adipose tissue or from milk, estimates derived from theoretical equations in the literature, availability of tables with different foods’ TFA content (most of which are not available in Latin America), or, in the best case, from specific analyses of the TFA content of foods consumed by a sample population (7, 30). The principal dietary sources of TFA are margarine, oils, and industrial fats (shortening) used in the preparation of bakery goods, bread-making, snacks, etc. They are the sources of “hidden or invisible fat,” which contains partially hydrogenated vegetable and/or marine oils; the sources of this fat vary from country to country and are difficult to evaluate and quantify. Various estimates of TFA intake have been made. In the United States, for example, it has been estimated that intake ranges from 7.6 to 8.1 g/d (31), with some reports putting the figure at around 14 g/d, considering that industrial fats may have a TFA content of up to 30% and some margarines may have more than 40% (32). In other countries, such as Germany and England, intake is lower (4.9–6.6 g/d) (33), and it is determined from a high percentage (35%) of TFA derived from meat and dairy products from ruminants (34). However, in less developed countries, such as India, intake has been estimated to be much lower (less than 3 g/d) (34).

In the case of Latin America, this information is very spotty, since a systemized evaluation of TFA intake, from different origins, is nonexistent in most countries. Furthermore, many countries do not have the necessary technology to adequately analyze these isomers, or, if it exists, it is the property of entities—generally industries—that use the information for self-serving purposes. Another factor that complicates this information is geography and agriculture, and in some cases marine sources, which for many countries influences the availability of the various sources of fats, whose use is chiefly determined by the economics of the country. Below is a compilation of information on the production and estimated intake of fats and TFA for some Latin American countries for which this information is available.
Argentina

Argentina is Latin America’s second largest producer and leading exporter of oleaginous products (seeds and oils), with sunflower, soybean, and olive oil its principal products. It also produces large quantities of bovine sebum (fat from rendering) used in the manufacture of margarine and shortening. In 2002, the per capita availability of fats per day was 106.1 g, or 36.9 kg/year. Some 61% of this availability is fat of animal origin and 39% is from vegetable sources. Argentina is the largest consumer of bovine meat in the Region. Some 45% of its fat products are exported to countries around the world in the form of sebum, crude oils, and refined oils, yielding a real per capita intake of 58.3 g/d, or 21.3 kg/year. Margarine and shortening are manufactured from rendered beef fat and, in lesser proportion, hydrogenated vegetable oils. Mandatory reporting of TFA content in products containing fats began in 2006, although there are no estimates of the population’s intake. There are studies on the TFA content of widely consumed products such as crackers and cookies (8.9 kg/month per household), whose TFA content ranges from 3% to 13%. In recent years, there has been a sharp increase in the consumption of sunflower oil with a high content of oleic acid. Numerous products claim to be “trans-free” and are locally produced. Academic institutions, regulatory agencies, and industry have the analytical capacity to determine TFA content. Increased public awareness about the negative health effects of fat intake are being spearheaded by PROPIA (Program for the Prevention of Heart Attacks in Argentina) through media campaigns, conferences, and workshops. PROPIA is also at the forefront of the Good Fats for Latin America Program. ASAGA (Argentine Fat and Oil Association) is an important professional and academic group, an affiliate of the American Oil Chemist’s Society (AOCS), that disseminates technical information on fats. ASAGA publishes the journal Aceites y Grasas (Oils and Fats), which has a wide circulation in Latin America.

Source: Ms. Lorena Lazo (PROPIA); FAO Food Balance Sheets 2002; Secretariat of Agriculture, Livestock, Fisheries, and Food of Argentina.

Brazil

Brazil is the largest producer of oleaginous products in Latin America and the sixth in the world. The main product is soybean oil (90%), followed by cotton oil (4%), and palm oil (2%). Animal fat is produced and consumed, although specific information is not available. In 2003, per capita fat intake per day was 27.9 g, or 10.2 kg/year. Both the amount and proportion of fats consumed vary widely from region to region in the country; the Central West region has the highest fat intake (35.1 g/d) and the Northeast region, the lowest (22.1 g/d); 76% of intake is attributed to vegetable oils and 24% to animal fats. Hydrogenated products are manufactured primarily from soybean oil. Disclosure of TFA content is mandatory on product labels containing fats, although there are no population intake estimates. There are studies on the TFA content of widely consumed products (rolls, cookies, coffee cake, ice cream, margarine from vegetable oil, etc), whose TFA content ranges from 2.2 to 4.5 g/100 g. A large quantity of products, all of them of national origin, advertise that they are “trans-free.” Academic institutions, research institutes, and public regulatory agencies in the country have the laboratory capacity to determine TFA levels. There is widespread information on TFA content and its health impact in journals with a high circulation, newspapers, and radio and television programs. Oleos e Gorduras (Oils and Fats) of Brazil is the
AOCS affiliate. It distributes technical information on fat products, although it addresses few of the health issues related to TFA intake.

Sources: Dr. Ana Beatriz Vasconcellos, General Coordinator of Food and Nutrition Policies, Ministry of Health, Brazil; Dr. Jorge Mancini, Professor, University of Sao Paulo; Dr. Daniel Barrera, Professor, UNICAMP, President of the Brazilian Society of Oils and Fats.

Chile

Chile is not a major producer of fats as raw material for human consumption, which means that it does not supply its own needs. Some 95% of its oils, mainly soybean/sunflower oil (usually an 80%:20% mix) are imported from Argentina, and in a lesser percentage, Bolivia. Some 50% of the imports are refined and ready for consumption, and 50% are refined in the country’s six industrial refineries. There is limited production of modified rapeseed (canola) oil (5.0% to 5.5%), destined mainly for the salmon-processing industry as a substitute for fish oil. In 2003, per capita fat intake was 29.2 g/d, or 10.7 kg/year. For industrial hydrogenation, soybean or sunflower oil, or a mixture of the two, is used. Roughly 30% of the hydrogenation is for the manufacture of table margarine, 90% of which meets the requirement for the “trans-free” label (less than 0.5 g of TFA per portion). An indication of the TFA content on nutrition labels has been mandatory since November 2006. The remaining 70% of industrial hydrogenation products are obtained from salmon oil (highly available), mixtures of salmon and soybean oil, or rendered animal fat imported from Argentina. These hydrogenated fats are for industrial use (invisible fat), and there are no regulations requiring an indication of their composition. There are no estimates of TFA intake, but there are studies on the consumption of french fries and snack foods. TFA content is determined by academic and research institutions, private laboratories, and industry. Fast food chains have begun to use oils with a high degree of thermal stability, such as sunflower oil with a high oleic acid content (in Chile, super-high-oleic) in their “on-site” frying, but industrial frying continues to use partially hydrogenated fats whose TFA composition varies, since it often changes with the availability of raw materials and current prices. The health authorities have called attention to the risk of TFA intake and recommend products low in TFA. Consumer groups constantly monitor the labeling of fats, calling attention to potentially misleading labels for margarine and shortening, but they have little impact on the consumer. The press and journals with a high circulation frequently report on the health risks of TFA. The issue is occasionally discussed on radio and television. The Corporación Chilena de Grasas y Aceites (Chilean Fats and Oils Corporation; CORCHIGA), an affiliate of AOCS, represents the main companies involved in the manufacturing and processing of fat products. Its influence on regulatory agencies and the media is limited.

Sources: Mr. Fernando de la Barra, Engineer (Industrial Specialties), CORCHIGA; Dr. Alfonso Valenzuela, INTA, University of Chile.

Costa Rica

Costa Rica produces soybean, sunflower, and corn oil, which account for 95% of the fat intake from vegetable oils. Information on the intake of animal fats is not available, as consumption is very low. The hydrogenated products used by the food industry are mostly imported from the United States. Per capita fat intake is 36.7 g/d and TFA intake is estimated at 2.6 g/d. There are
products that include TFA content on their nutrition labels, but the information is not mandatory. There are studies on TFA intake and food tables that include TFA content.

Source: Dr. Rafael Monge, Costa Rican Institute for Research and Education on Nutrition and Health (INCIENSA).

Colombia
Colombia is an important producer of palm and palm kernel oil and as such constitutes the principal fat that is habitually consumed. Colombia also produces soybean oil. Sunflower oil, produced nationally or imported, is available on a limited basis. The industry uses beef and pork fat as raw materials in food manufacturing. Per capita fat intake is estimated at 63 g/d. No estimates of TFA intake are available and there are no regulations in this regard. Consequently, it is not mandatory to disclose the TFA content of foods, and there are no studies on TFA consumption.

Source: Sylvana Dadan, Nutritionist, Universidad del Bosque and FEDEPALMA.

Peru
Peru produces soybean, cotton, and sunflower oil, which constitute the principal sources of fat intake. The country is a major producer of fish oil, which is hydrogenated for use in manufacturing margarine and shortening. Fat intake is estimated at 29.5 g/d and TFA intake at 2.0 g/d. Labeling of TFA content on food products is not mandatory, and there are studies on TFA present in some products. Quantification of TFA content is conducted by private laboratories and the Fishing Research Institute in Callao.

Source: Milagros Agurto, Nutritionist, Universidad Científica del Sur.

Puerto Rico
Puerto Rico is not a producer of fats and its consumption for the most part comes from imports from the United States, due to its status as a Commonwealth. The most commonly consumed oils are soybean, corn, and canola oil. Animal fat is mainly from pork, and the sources of hydrogenated products are beef fat and vegetable oils. Per capita fat intake is 80–100 g/d, although there is no estimate of TFA intake. The TFA content is indicated on product labels according to U.S. regulations, since 100% of these products come from the United States. There are no studies on the TFA content of widely consumed products, although it can be deduced from the products’ nutrition labels.

Source: Dr. Waldert Rivera, Department of Health, Puerto Rico.

Uruguay
Uruguay primarily consumes sunflower, rice, and soybean oil. Of this, 62% is nationally produced and 38% is imported from Argentina (mainly soybean oil). The estimated per capita fat intake is 44 g/d, or 16.1 kg/year. Margarine is mostly imported from Argentina and brings along its nutritional label of origin. There is no information on TFA intake, although it is mandatory to disclose TFA content. Studies have been conducted on the TFA content of various popular food items. The analysis of TFA content is carried out by universities (University of the Republic, School of Chemistry). Print and visual media provide public information about the effects of
TFA. The Honorary Commission for Cardiovascular Health has been involved in outreach to physicians and nutritionists on the effects of TFA.

*Source:* Dr. Maria Antonia Grompone, Department of Chemistry, University of the Republic.

**Venezuela**

Venezuela consumes corn, sunflower, soybean, canola, and, to a lesser extent, peanut oil. Most margarine is imported, although palm oil is used for national production of margarine. In 1999, per capita fat intake was 70 g/d, or 25.6 kg/year. There is no information on TFA intake, and food labels are not required to disclose fat content. Only imported products, mostly from the United States, indicate the TFA content on their labels. A single academic entity has the technology for determining TFA content. There are no studies of the TFA content of widely consumed foods. No public information on TFA is available in the print or visual media. ASOAGRA is the Venezuelan affiliate of AOCS, but its information and public awareness activities are very limited.

*Source:* Dr. Virgilio Bosch, Lipidology Section, Institute of Experimental Medicine, Central University; Engineer Morelia Gonzalez, Executive Secretary of ASOAGRA.

Figure 4 summarizes the information presented in this section.

**Figure 4. Fat intake in several Latin America countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>Edible Oils (N)</th>
<th>Edible Fats (N)</th>
<th>Hydrogenated Products</th>
<th>Fat Intake g/d</th>
<th>Est. TFA g/d</th>
<th>Information on Label</th>
<th>Study on TFA Content/Intake</th>
</tr>
</thead>
<tbody>
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<td>Argentina</td>
<td>SUNFLOWER (N)</td>
<td>BEEF (N)</td>
<td>VEGETABLE</td>
<td>106.2</td>
<td>7.2</td>
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<td>YES, FOR SEVERAL FOODS</td>
</tr>
<tr>
<td></td>
<td>SOYBEAN (N)</td>
<td></td>
<td>ANIMAL FAT</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>OLIVE (N)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>SUNFLOWER (N)</td>
<td>BEEF (N, I)</td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>PALM (N, I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chile</td>
<td>SUNFLOWER (I)</td>
<td>BEEF (N, I)</td>
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<td>29.2</td>
<td>4.6</td>
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<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CORN (I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Colombia</td>
<td>CORN (I)</td>
<td>BEEF (N)</td>
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<td>63</td>
<td>NA</td>
<td>NO, IN PROGRESS</td>
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<td>PALM (N)</td>
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<td>ANIMAL FAT</td>
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<tr>
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</tr>
<tr>
<td>Costa Rica</td>
<td>SUNFLOWER (N, I)</td>
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<td>VEGETABLE</td>
<td>36.7</td>
<td>2.6</td>
<td>YES, NOT MANDATORY</td>
<td>YES, COMPOSITION TABLE</td>
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<tr>
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<td>CORN (N)</td>
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</tr>
<tr>
<td>Peru</td>
<td>SOYBEAN (N)</td>
<td>BEEF (N)</td>
<td>VEGETABLE</td>
<td>29.5</td>
<td>2.0</td>
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<td>YES, VERY LIMITED</td>
</tr>
<tr>
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<td>ANIMAL FAT</td>
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</tr>
<tr>
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<td>COTTON (N)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>CORN (I)</td>
<td>PORK (I)</td>
<td>VEGETABLE</td>
<td>80-100</td>
<td>SPECIFIED</td>
<td>YES</td>
<td>NA</td>
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<td>SOYBEAN (I)</td>
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<td>ANIMAL FAT</td>
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<td>BY PRODUCT</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>CANOLA (I)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>SOYBEAN (N)</td>
<td>BEEF (N)</td>
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<td>44</td>
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<td>YES</td>
<td>YES, FOR SEVERAL FOODS</td>
</tr>
<tr>
<td></td>
<td>SUNFLOWER (N)</td>
<td></td>
<td>ANIMAL FAT</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RICE (N)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>SUNFLOWER (N)</td>
<td>NA</td>
<td>NA</td>
<td>70</td>
<td>NA</td>
<td>NO, EXCEPT FOR IMPORTS</td>
<td>NA</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>CANOLA (N, I)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PEANUT (N)</td>
<td></td>
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</tr>
</tbody>
</table>

N: NATIONAL PRODUCT  I: IMPORTED PRODUCT  NA: NOT AVAILABLE
CONCLUSIONS

The general conclusion is that TFA adversely affects cardiovascular health, and its consumption poses a potential risk for increasing the incidence of heart disease, which is the leading cause of death in the Western world and Latin America. Recently, the Nutrition Committee of the American Heart Association (AHA) published a revised version of *Diet and Lifestyle Recommendations, 2006* (35), whose recommendations include, among others, a saturated fat intake of less than 7% of total energy intake (the previous recommendation was less than 10%). It also recommends substituting hydrogenated fats with liquid oils, emphasizing the exception of tropical oils (palm and palm kernel oil, in the case of Latin America). Although currently there are no recommendations on maximum TFA intake, the AHA Committee endorses the recommendations of the FDA’s Nutrition Committee to reduce TFA intake as much as possible, the desirable level being 1% or less of energy intake. It is expected that mandatory labeling of TFA content in many products that contain fats will guide consumers and result in changes in their consumption habits in terms of TFA intake.

TFA levels in the Latin American diet are expected to be reduced due to pressure from consumer groups, government regulations, and the response of the fat industry, which in some countries has managed to substantially reduce the use hydrogenation, resulting in virtually TFA-free products. Fast food companies, whose headquarters are mainly in the United States, have also joined this initiative. In its report of 29 December 2006, the Center for Science in the Public Interest (CSPI) reported that the major fast food chains have begun to drastically reduce the TFA content of their products in the United States. Thus, it is anticipated that 2008 “will be the year of the virtual elimination of industrial TFA.” It is also anticipated that these companies’ initiatives will spill over to their affiliates in Latin America. The countries should make the utmost individual and societal efforts to enable Latin America to be declared a TFA-free region.
REFERENCES


INTRODUCTION

Trans fatty acids (TFA) are unsaturated fatty acids with at least one double bond in the trans configuration. They are formed during partial hydrogenation of vegetable oils, a process that converts vegetable oils into semisolid fats for use in margarines, commercial cooking, and manufacturing processes. From the perspective of the food industry, partially hydrogenated vegetable oils are attractive because of their long shelf-life, stability during deep frying, and semisolidity that can be customized for palatability of baked goods and sweets. The average population consumption of industrially produced TFA ranges between 2% and 4% of total energy intake (1, 2), although some individuals may consume much larger amounts. Major dietary sources of TFA include vegetable shortening used for cooking and baking, deep-fried fast foods, bakery products, packaged snack foods, margarines, and breads. Smaller amounts of naturally occurring TFA (~0.5% of total energy) are consumed in meats and dairy products from cows, sheep, and other ruminants, produced by the action of bacterial flora in the ruminant stomach; the health risks and public health relevance of these naturally occurring TFA appear to be limited compared with industrially produced TFA (3). For the purpose of this analysis, all estimates refer to the effects of industrially produced TFA.

IMPACT OF TFA ON RISK OF CORONARY HEART DISEASE IN THE AMERICAS

Consistent evidence indicates that TFA consumption increases the risk of coronary heart disease (CHD) (and possibly also sudden cardiac death, diabetes, and obesity) (3). The impact of industrially produced TFA on CHD events, and therefore the potential impact of programs to remove TFA from the food supply, can be calculated for a given population. The estimated health impact can be calculated based on (i) the population rate of CHD, (ii) the effect of TFA on CHD risk, and (iii) the average reduction in TFA consumption in the population. Such estimates are calculated here for some major countries or Regions of the Americas (referring here to Mexico, Central America, and South America).

CHD events were defined as CHD death or nonfatal myocardial infarction. Annual population rates of CHD death were calculated based on country- or Region-specific rates.
of CHD mortality in 2002 (4). Numbers of nonfatal myocardial infarctions were then estimated based on CHD mortality and the proportions of CHD deaths versus nonfatal myocardial infarctions in the United States (5). Rates were converted to absolute numbers of events using country-specific population estimates as of July 2006 (6). Because reliable data are not available for population-wide TFA consumption in each country or region, risk reductions were calculated for both a 2% energy reduction and a 4% energy reduction in TFA consumption (representing the likely lower and higher ranges of TFA intake in the Americas).

The impact of TFA on CHD risk was estimated based on two lines of evidence: (i) the effects of TFA on blood levels of total cholesterol and high density lipoprotein (HDL) cholesterol in a meta-analysis of randomized controlled trials (3); and (ii) the multivariable-adjusted relationships of TFA intake with clinical CHD events in a meta-analysis of prospective observational studies (3). The first estimate represents the well-characterized effects of TFA on total and HDL cholesterol levels in controlled trials but does not account for the effects of TFA on other risk factors, such as other lipoproteins (e.g., lipoprotein(a)), inflammation (e.g., C-reactive protein, interleukin 6, tumor necrosis factor activity), endothelial cell function, and insulin sensitivity. Thus, this estimate is conservative and likely to underestimate the full health impact. The second estimate is based on observed associations of TFA consumption with clinical events in prospective cohort studies and thus may better capture the full health risk; however, this estimate is based on observational analyses and may be limited by residual confounding (which may overestimate the effect) and errors in the estimation of dietary intake (which would underestimate the effect). Thus, the true effect is likely to be larger than the first estimate and could be somewhat smaller than the second estimate.

RESULTS

Considering the effects on total cholesterol, HDL cholesterol, and data from prospective studies, a 2% energy reduction in TFA intake (~4.5 g/d for an individual consuming 2 000 kcal/d) would prevent approximately 30 000 to 130 000 CHD events annually in Mexico, Central America, and South America (Figures 1 and 3). A 4% energy reduction would prevent approximately double this number, or from 60 000 to 260 000 CHD events each year (Figures 2 and 4). The absolute numbers of events prevented are higher in countries or regions with larger populations (e.g., Brazil), but substantial numbers of events would still be prevented in less populous countries and regions, in some cases due to relatively high population rates of CHD (e.g., in Central America).

These estimates are based on replacing TFA with cis polyunsaturated or monounsaturated fats (the averaged effect). The precise balance of different cis unsaturated fats would depend on the oils used for replacement—for example, unhydrogenated soybean oil, canola oil, vegetable oils with high oleic acid content, etc. Some TFA may also be replaced by saturated fats—for example, from tropical oils or animal fats. According to government measurements of products in Canada (7), product reformulations to reduce TFA content (driven largely by TFA labeling) have nearly universally replaced some or all of the TFA with cis unsaturated fats (and in some cases also replaced some saturated fat with cis unsaturated fats). A small number of
Figure 1. Estimated numbers of CHD deaths and nonfatal myocardial infarctions that would be prevented in countries or regions of the Americas by a 2% energy reduction in TFA consumption in the population (~4.5 g/d), based only on effects of TFA intake on total cholesterol and HDL cholesterol levels (i.e., not considering other potential adverse effects).2

Figure 2. Estimated numbers of CHD deaths and nonfatal myocardial infarctions that would be prevented in countries or regions of the Americas by a 4% energy reduction in TFA consumption in the population (~9 g/d), based only on effects of TFA intake on total cholesterol and HDL cholesterol levels (i.e., not considering other potential adverse effects).2

2 Estimates are based on the average effects of replacement with cis unsaturated (polyunsaturated or monounsaturated) fats. Potential additional benefits for other CHD events (angina, coronary revascularization), sudden cardiac death, and diabetes are not included.
Figure 3. Estimated numbers of CHD deaths and nonfatal myocardial infarctions that would be prevented in countries or regions of the Americas by a 2% energy reduction in TFA consumption in the population (~4.5 g/d), based on observed relationships of TFA intake with CHD events in prospective observational studies.²

Source: Data taken from references 3, 4, and 6.

Figure 4. Estimated numbers of CHD deaths and nonfatal myocardial infarctions that would be prevented in countries or regions of the Americas by a 4% energy reduction in TFA consumption in the population (~9 g/d), based on observed relationships of TFA intake with CHD events in prospective observational studies.²

Source: Data taken from references 3, 4, and 6.

² Estimates are based on the average effects of replacement with cis unsaturated (polyunsaturated or monounsaturated) fats. Potential additional benefits for other CHD events (angina, coronary revascularization), sudden cardiac death, and diabetes are not included.
products have replaced TFA with saturated fatty acids (with no change in the total content of combined saturated fat and TFA). While health benefits of the latter strategy would be reduced compared with replacing TFA with cis unsaturated fats, estimates based either on total cholesterol and HDL cholesterol changes in randomized trials or on observed associations with clinical events in prospective studies indicate that a net health benefit would still occur. In developed countries, most TFA is consumed in preprepared foods, packaged foods, and other foods consumed outside the home (3). In developing countries, a substantial proportion of TFA may be consumed as cooking fat used in the home (2). Thus, government policy (e.g., choice of cooking fats to be produced and subsidized) may play a greater role than corporate or restaurant product reformulations in determining what fats or oils replace partially hydrogenated oils in developing compared with developed countries.

Potential additional benefits of reducing TFA for sudden cardiac death, other CHD events (e.g., angina, coronary revascularization), or diabetes were not considered in the estimates of health benefit shown in Figures 1–4. Partial hydrogenation also largely destroys alpha-linolenic acid, the plant-based n-3 fatty acid present in many vegetable oils (e.g., soybean oil). While the cardiovascular benefits of alpha-linolenic acid are not conclusively established (8), replacing partially hydrogenated fats with unhydrogenated oils containing alpha-linolenic acid could further reduce risk.

**SUMMARY**

On the basis of population rates of CHD and the evidence for effects of TFA on CHD risk, modest population reductions in TFA consumption (2% to 4% of energy intake) would prevent substantial numbers of CHD events in the Americas. Conservatively, more than 30 000 CHD deaths and nonfatal myocardial infarctions would be prevented each year; the upper range of estimated benefits suggests that up to a quarter million CHD events could be prevented annually. These estimates contain some uncertainty related to potential variability in regional rates of CHD, methods used to estimate TFA health effects, actual population TFA consumption, and oils used to replace TFA. Conversely, little rationale exists for having industrially produced TFA in the food supply, and experiences in Denmark, the Netherlands, Canada, and New York City indicate that industrial TFA can be largely eliminated without affecting food taste, price, or availability. To prevent cardiovascular and metabolic disease, few situations in public health nutrition offer such large potential gains with so few shortcomings. Aggressive measures—including voluntary corporate initiatives, government policies, and, if necessary, regulatory actions—are indicated to eliminate industrial TFA in the Americas.

**REFERENCES**


CASE STUDIES

1. Decline of TFA in Costa Rica
   Uriyoán Colón Ramos, Rafael Monge-Rojas, and Hannia Campos Nuñez

2. Argentina’s experience in phasing out TFA
   Marcelo Tavella
Decline of TFA in Costa Rica

Uriyoán Colón Ramos,1 Rafael Monge Rojas,2 Hannia Campos Núñez3

During the 1970s, health indicators showed a remarkable change in Costa Rica, where infectious disease mortality rates decreased dramatically, and cardiovascular disease (CVD) mortality rates increased. Since then, CVD—especially acute myocardial infarction (MI)—has become the main cause of death among adults of both genders (Figure 1). The situation is similar in other Latin American and Caribbean countries.

Figure 1. Acute MI adjusted mortality rate, Costa Rica, 1970–2006

Given the elevated CVD mortality rate in Costa Rica and considering the scientific evidence linking trans fatty acids (TFA) to the risk of CVD, the Ministry of Health and, simultaneously, the American Soybean Association, launched a campaign in the 1980s to substitute palm oil shortening, the main source of saturated fat in the diet at the time, with

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unsaturated vegetable oils—namely, soybean oil (1). The campaign was successful, and during the 1980s and 1990s soybean oil became the best-selling cooking oil among Costa Ricans, while the use of palm oil decreased considerably (Figure 2) (2). However, despite the new trends in cooking oil use, mortality rates due to acute MI continued to rise and peaked in 1995 for women and in 2000 for men (3), when a downward trend started for both men and women. We hypothesize that this downward trend could be attributed to the voluntary elimination of TFA from the food supply that has taken place in Costa Rica since the middle to late 1990s.

![Figure 2. Trends in fat and vegetable oil intake, Costa Rica, 1989–2001](image)


A wealth of information on diet and heart disease is available in Costa Rica through the Costa Rican Heart Disease Study. The study was designed to examine the effect of diet on the risk of heart disease. The study matched 2,300 case survivors and 2,300 controls for age, gender, and area of residence.

Costa Rica was particularly suitable for this study, because it has a centralized health care system and available census information; participation among healthy free-living individuals was high, allowing for the study to be conducted with great validity. In addition, the general Costa Rican population has a relatively high level of education compared with other Latin American countries, which permitted consistent application of all questionnaires. Most importantly, Costa Rica offered a wide range of levels of consumption of palm and soybean oils, allowing for the analysis of various fatty acids, including TFA, both in the diet and in adipose tissue.

In Costa Rica, industrially made TFA were produced by hydrogenating unsaturated oils—namely, soybean oil. The process of partial hydrogenation renders a more stable and a semi-solid product, which is desirable for deep-frying and baking, among other uses. Consistent with studies worldwide, results of the Costa Rican Heart Study published in 2003 indicated a positive association between adipose tissue TFA and the risk of MI. This association was attributed mainly to the TFA isomer 18:2. After adjusting for established risk factors and
other confounders, the results showed that subjects in the 5th quintile of total adipose tissue TFA had nearly four times greater risk of having an MI than subjects in the 1st quintile of total adipose tissue TFA (Figure 3) (4).

Figure 3. Odds ratios (OR) of MI by quintiles of total TFA in Costa Rican men and women, 1994–1999


Adipose tissue TFA amounts reflected those found in the diet (Figure 4).

Figure 4. TFA distribution in adipose tissue and in Costa Rican diet

The main source of 18:2 TFA during the period of the study (1994–1998) was partially hydrogenated soybean oil. A large proportion of the population used this oil for cooking, replacing it for the highly saturated palm oil (4). Although the main source of TFA in this country was liquid soybean oil, other important sources included margarine and fats used in baked goods. As shown in Figure 1, CVD mortality in Costa Rica did not change when consumers substituted palm shortening with partially hydrogenated soybean oil.

Between 1995 and 2007, the Costa Rican Heart Study measured the content of TFA in the oils produced in Costa Rica. Data showed that the percent of total TFA (18:1 and 18:2) in soybean oil decreased from 20% to 1.48% during this period (5, 6). The largest decrease was observed shortly before the year 2000 (Figure 5).

**Figure 5.** Decrease in TFA content in soybean oil sold in Costa Rica, 1995–2007

![Graph showing decrease in TFA content in soybean oil](image)


Margarines, another important source of TFA in the Costa Rican diet, have also been subjected to manufacturing modifications since 2002 and currently are considered free of TFA or “trans-free.” Soft tub margarines and margarines used for pastries are the only products that contain a relatively high amount of TFA, at approximately 3% (6); nevertheless, according to the U.S. Food and Drug Administration, these products are also considered trans-free, because they contain less than 0.5 g of TFA per portion (Figure 6).

Currently, all domestic cooking oils and margarines are labeled as TFA-free. It is possible that this reduction in the content of TFA in the diet was partly responsible for the trend toward reduction in CVD observed in Figure 1.

Results from the Costa Rica Coronary Health Study Heart Study show that TFA intake as well as TFA in the adipose tissue of soybean oil users significantly declined after the change in TFA content initiated by the industry (Figures 7 and 8) (7).

A recent analysis (7) comparing the association between TFA and MI in Costa Rica showed that, after the year 2000, when the amount of TFA in soybean oil was reduced,
Figure 6. Trends in total TFA content in Costa Rican margarines, 2002–2007


Figure 7. Decrease in TFA intake among Costa Rican soybean oil users

Source: Colon-Ramos U, Baylin A, Campos H. The relation between trans fatty acid levels and increased risk of myocardial infarction does not hold at lower levels of trans fatty acids in the Costa Rican food supply. J Nutr. 2006; 136: 2887-92.
Figure 8. Decrease in adipose tissue TFA content among Costa Rican soybean oil users

Source: Colon-Ramos U, Baylin A, Campos H. The relation between trans fatty acid levels and increased risk of myocardial infarction does not hold at lower levels of trans fatty acids in the Costa Rican food supply. *J Nutr.* 2006; 136: 2887-92.

there was no longer an increasing trend of TFA intake and MI, probably because the range of consumption of TFA among soybean oil users remained relatively low after the year 2000 and therefore did not exhibit a wide range of TFA in the adipose tissue (Figure 9).

All these changes were due to voluntary action on the part of the food industry in Costa Rica. At the time of the change, there was neither policy decree nor pressure from consumers or the media to change the profile of the cooking oil. Scientific evidence about the negative effects of industrially made TFA has fostered policy regulation in several European and North American countries, but little is known about how it has been used in Costa Rica and other developing countries.

A qualitative policy study was conducted to examine the process of the use of scientific evidence on TFA to influence nutrition policy in Costa Rica (8). Using a snowballing technique to obtain a nonbiased sample, the study interviewed representatives from the Ministry of Health, the food industry, and the scientific community involved in nutrition and/or TFA research in that country.

The qualitative study reckoned that the cooking oil industry reduced TFA in soybean oil after considering the global movement to eliminate these fatty acids from all oils (the main soybean oil producer belongs to the American Oil Chemists Society, where the topic was discussed). Some qualitative evidence also suggests that meetings between representatives of the soybean oil industry, investigators of the Costa Rican Heart Study, and representatives from the Ministry of Health may have played a role in precipitating the reduction of TFA in soybean oil. However, the cooking oil industry does not support this observation.

The study also construed that a major barrier to implementing a TFA nutrition policy in Costa Rica was that the topic competed with many other health issues and did not figure in the political agenda. Moreover, the topic of TFA was not considered as relevant or
as urgent as other topics. People interviewed for this qualitative study perceived that there were only very few studies on the topic. In addition, there was a lack of consensus among respondents and no information about which policy strategy would be optimal. Some favored nutrition labeling, whereas others favored an absolute mandate specifying a maximum allowable amount of TFA in foods. There was also a lack of trust among those in different sectors (i.e., the Ministry of Health, the food industry, and the research and academic community), which impeded further conversations and/or interactions on the topic as well as barriers to communicate scientific findings across sectors.

The qualitative study recommended a task force on TFA that would compile scientific information on the topic and present it to key individuals and stakeholders across different sectors. It also recommended interactive arenas to help advance a better understanding of the other sectors’ motives, time constraints, and economic and career incentives and to promote collaboration. Lastly, it recommended commissioned research to help decide which policy strategy would be optimal for Costa Rica.

In 2006, the first Central American and Dominican Republic Task Force on Healthy Fats met in Costa Rica. This meeting included scientists from the Harvard School of Public Health, food industry representatives, Costa Rican government officials, and representatives from the Ministries of Health of various Latin American countries. This task force was organized by the Costa Rican Research and Teaching Institute in Nutrition and Health (INCIENSA), the Pan American Health Organization (PAHO), the Institute of Nutrition of Central America and Panama (INCAP), and the Ministry of Health of Costa Rica with the following objectives: (1) to create awareness among decision makers in Central America and the Dominican Republic about the importance of decreasing TFA intake, (2) to report technological advances of the food industry on reducing TFA, and (3) to provide guidelines for creating public policy intended to promote the use of trans-free oils and fats.

The meeting resulted in a resolution endorsed on 16 November 2006 during the 25th meeting of the Central American Council of Health Ministers. Costa Rica was assigned the
task of executing a proposal to decrease TFA intake in the Central American Region and the Dominican Republic. The proposal is a key element to improve the health of the Region’s population and it is being reviewed and negotiated by the Central American Customs Union.

Among the actions Costa Rica implemented to decrease TFA intake is the creation of a table of the TFA composition of commonly eaten foods in Costa Rica. The table, prepared in a partnership between INCIENSA and the Harvard School of Public Health, constitutes an important input to Policy 7 under the Costa Rican 2006–2010 National Food and Nutrition Policy. This document is crucial for the consideration of nutrition policy regulations in the country.

Additionally, in September 2007, the Ministry of Health of Costa Rica conducted four workshops for managers of restaurants and fast food centers on the topic of TFA and healthy fats. Currently, one of the leading transnational fast food chains is selling only trans-free products.

The change in the TFA content of soybean oil and margarines observed in Costa Rica is a result of scientific studies and multiple meetings between the principal investigator of the Costa Rican Heart Study, high-level executives from the fat and cooking oil industry, the Ministry of Health of Costa Rica, and INCIENSA over the course of 13 years (Figure 10). At present, efforts are focused on having transnational fast food chains and bakery and pastry

![Timeline highlights of actions carried out in Costa Rica to achieve a country free of TFA, 1994–2007](source: Unpublished)
industries use only trans-free oils and margarines. Fortunately, the first steps taken toward this goal have been very successful and the coalitions formed between the food industry, research and academic groups, and government and public health officials have proved fruitful.

REFERENCES


Argentina’s Experience in Phasing Out TFA

Marcelo Tavella1

In the winter of 1990, the Program for the Prevention of Heart Attacks (known by its Spanish acronym, PROPIA) was created in Argentina under the aegis of the National University of La Plata, the Scientific Research Commission of Buenos Aires Province, and the Ministry of Health of Buenos Aires Province. From its inception, the Program followed the philosophy and methodology of the model used in Finland’s North Karelia Project.

The city of Balcarce, situated in the province of Buenos Aires, was chosen as Argentina’s National Demonstration Area (1, 2). The baseline study determined the food consumption of the population. With the objective of establishing the chemical composition of the foods widely consumed by area inhabitants, a research study was conducted on the lipid composition of those foods (3) and consumption was evaluated via analysis of the composition of adipose tissue (4).

The results were surprising. Trans fatty acids (TFA) were in most foods being consumed, while omega-3 fatty acids were virtually absent. In the “cookies and crackers” category, a segment for which Argentina is the world’s largest consumer, one of the most interesting findings was the constant presence of elaidic acid in the most widely consumed products. The “cereal bars” category, widely consumed by young people, was not exempt from using partially hydrogenated vegetable oils (5).

The strategic planning for interventions necessary to modify these realities included technological research as a starting point. The first step was to ensure that the food industry had lipids available to substitute for TFA. In 2001, the National University of La Plata and Dow Agrosciences of Argentina signed a collaboration agreement to join efforts toward this end. Four years later, Argentina had a sunflower oil with a high oleic acid content. This relatively inexpensive oil with tremendous heat resistance was key to convincing the food industry to replace partially hydrogenated vegetable oils (6).

A small cookie/cracker manufacturer in the city of La Plata was the first company to make the change. Thanks to reporting in science journals and the media, the news slowly reached the major companies in what can only be described as a “domino effect.” Granix, the Labor Cooperative of Bahia Blanca, Fargo, McCain, Arcor, Pepsico, Kraft Foods, General Mills, McDonalds, Nestle, and Unilever, to name a few, replaced TFA with high-oleic-acid sunflower oil. The public health impact has been enormous: in a very short time, Argentina has managed to replace some 40% of the 30 000 tons of TFA produced annually in the country. Furthermore, as a result of the systematic publicity about TFA via television, radio, and the press, food companies are putting “trans fat free” on their product labels to gain a commercial advantage. MERCOSUR (the Southern Common Market)—the customs union

1 Dr. Marcelo Tavella, Director of PROPIA, National University of La Plata, Argentina.
made up of Argentina, Brazil, Paraguay, and Uruguay—announced that, as of July 2007, all food labels must include information on TFA content.

Despite all these successes, we are continuing our efforts in basic and applied research and in creating public policies that encourage healthy changes in the food industry. The National University of La Plata recently signed an agreement with Advanta Corporation to begin studies on the use of oils rich in stearic acid, especially in the preparation of foods that require solid lipids. At the same time, the Senate of Buenos Aires Province gave partial approval to a law lowering provincial taxes on food companies that remove TFA from their products.

As a result of our experience in this area, in 2005 the United Nations University (UNU) asked us to develop a project to assess the impact of the measures applied in Argentina as well as their replication in several countries of the hemisphere. Uruguay, Chile, Mexico, and the Central American countries (through INCAP) have joined the project. The availability of TFA in each country is currently being studied, using the Global Strategy on Diet, Physical Activity, and Health, adopted by the World Health Organization (WHO) in 2004, as a guide.

In 2006, as part of the UNU Project, Cuernavaca (Mexico) became the site of the first course on fat and oil nutrition and its implications for human health and the food industry. The objectives of the course were to improve knowledge about local strategies to control intake of TFA, and participants ranged from consumer organizations to representatives of the food industry. The course will be repeated in other Latin American countries.

With the objective of supporting the project at the hemispheric level, in 2007 PAHO/WHO created the Task Force on Trans Fat Free Americas. The enormous complexity of removing TFA from processed foods makes an interdisciplinary approach absolutely necessary. Although basically a medical issue, the control of TFA requires the involvement of many disciplines. Only by working in coordination with experts from different branches of knowledge can we continue to address these priority issues for human health.
REFERENCIAS


APPENDIX

ACT TO PROHIBIT TRANS FAT IN FOOD PREPARED AND SOLD IN RESTAURANTS IN PUERTO RICO.
APPENDIX

(S. B. 1825)
(No. 120)
(Approved September 13, 2007)
AN ACT

To establish the “Act to prohibit the content of hydrogenated vegetable oil, known as trans fat, in any food prepared and sold in restaurants in Puerto Rico,” to establish exemptions; and for other purposes.

STATEMENT OF MOTIVES

The U.S. Food and Drug Administration has required that food manufacturers include trans fatty acids in the nutrition information and facts labels. Scientific evidence shows that the consumption of saturated fat, trans fat, and dietary cholesterol increases levels of low-density lipoprotein (LDL, or bad cholesterol), which increases the risk of coronary heart disease or cardiopathic ischemia. In addition to increased levels of low-density lipoprotein (LDL, or bad cholesterol), trans fat decreases levels of high-density lipoprotein (HDL or good cholesterol) and increases triglycerides, as proven by different studies conducted and published by the Harvard School of Public Health and the Mayo Clinic in the United States; this makes trans fatty acids more harmful than saturated fats. According to the National Heart, Lung, and Blood Institute of the National Institutes of Health, more than 12.5 million Americans have coronary heart diseases, and more than 500,000 die each year. This makes coronary heart disease a leading cause of death in the United States today.

Unlike other fats, most trans fatty acids are formed when liquid oils are converted into solid fats that are used in the preparation of certain products such as shortening and hard margarine. However, a small amount of trans fat is found naturally in some foods, primarily in some animal-based food. Basically, trans fat is made when hydrogen is added to vegetable oil in a process called hydrogenation. Hydrogenation increases the shelf-life and flavor stability of foods containing these fats.

Trans fat can usually be found in food processed with partially hydrogenated vegetable oils, such as vegetable shortenings, some margarines (especially hard margarines), crackers, candies, snack foods, and fried and baked foods.

Trans fat and fatty acids increase the LDL cholesterol level in the blood, thus increasing the risk for coronary heart diseases. Dietary cholesterol also contributes to heart disease. Unsaturated fats such as monounsaturated and polyunsaturated fats are beneficial when consumed in moderation; thus, they are strongly recommended. It is advisable to choose foods low in saturated fat, trans fat, and cholesterol as part of a healthful diet and lifestyle.
Studies conducted by the Department of Health of Puerto Rico show that 64% of the population is obese or overweight, so this is an issue of public health. Also, it is estimated that 129 of every 100 000 inhabitants dies of coronary disease every year, which makes it the leading cause of death in Puerto Rico. Statistics in the United States show that deaths caused by type 2 diabetes have increased considerably in recent years as well as those caused by coronary diseases and cancer.

Overweight and obesity continue to be the most easily prevented causes of mortality and morbidity in Puerto Rico. According to the Behavioral Risk Factor Surveillance System (2005), on our Island there is a 12.5% prevalence of diabetes, 31.2% prevalence of hypertension, and 63.3% prevalence of obesity and overweight. This gives Puerto Rico a poorer health status than any state in the United States. In addition, cardiovascular diseases are the leading cause of death in Puerto Rico; therefore, it is necessary to set forth a public policy geared toward urgently addressing these risk factors.

Puerto Rico joins this effort in seeking to eliminate the consumption of hydrogenated vegetable oils, one of the risk factors that contribute to cardiovascular diseases. In Puerto Rico, the initiative of the fast food chain Denny’s, among others, of voluntarily implementing a policy to discontinue the use of trans fats in their establishments, and the promotion of and the steps taken by the Puerto Rican Society of Cardiology, the College of Physicians and Surgeons, the College of Nutritionists, and the American Heart Association, to the approval of legislation prohibiting hydrogenated vegetable oils, represent the most important actions geared toward achieving a better and healthier quality of life of our citizens.

For such reasons, it is necessary to adopt a public policy to eliminate the consumption of the fats known as trans fats, since they cause a significant increase of the risk of suffering coronary diseases. The 2005 Dietary Guidelines for Americans, published by the United States Department of Agriculture with the collaboration of the Department of Health and Human Services, recommended limiting the intake of these fats as much as possible. Likewise, in 2003, the World Health Organization (WHO) and the American Heart Association, in the guidelines published in June 2006, stated that trans fat intake should be kept below 1% of the daily energy intake.

The abovementioned data warrant that this Legislature prohibit the use of hydrogenated vegetable oils in food prepared and sold for human consumption in order to improve the nutritional and health status of our people.

BE IT ENACTED BY THE LEGISLATURE OF PUERTO RICO:

Section 1.- Title:
This Act shall be known as the “Act to prohibit the content of hydrogenated vegetable oil, known as trans fat, in all foods prepared and sold in restaurants in Puerto Rico.”

Section 2.- Public Policy.-
It shall be the public policy of the Commonwealth of Puerto Rico to promote the improvement of the nutritional and health status of all citizens by prohibiting the use of hydrogenated vegetable oil in food prepared and sold for human consumption.
Section 3.- Definitions.-
For the purposes of this Act, the following terms shall have the meaning stated below:

a. Food containing hydrogenated vegetable oil: these foods should be labeled to indicate that they contain hydrogenated vegetable oil. It does not include food whose content of hydrogenated vegetable oil is lower than 0.5 grams per serving, according to the manufacturer’s label.

b. Establishments engaged in the sale of food: this includes restaurants, cafeterias, fast food restaurants, mobile food units, or any other business devoted to selling food for consumption.

c. Fast food establishments: this includes establishments that sell, serve, and instantly dispense prepared food and have a limited menu.

d. Traditional Puerto Rican cuisine businesses: any establishment, whether or not it is open to the public, nonprofit or for profit, in which traditional or autochthonous Puerto Rican food is served or sold.

Section 4.- No food containing hydrogenated fats shall be stored, distributed, held for service, used to prepare any product from a menu or served in establishments engaged in the sale of food or mobile food units, except for food provided to patrons in the original sealed package of the manufacturer.

Section 5.- School lunchrooms of the Department of Education, Day Care Centers, and Homes for the Elderly must eliminate any hydrogenated vegetable oil from the food prepared and served from their menus after the approval of this Act.

Section 6.- Required Labeling
The establishments engaged in the sale of food or mobile food units shall have available the original labeling of all food products:

a. Containing fat, oil, or semisolid fat;

b. That, when purchased by the establishments engaged in the sale of food or mobile food units, are required to be labeled by federal and Commonwealth laws;

c. That are being stored, distributed, held for service, used in the preparation of any product from a menu, or served in establishments engaged in the sale of food or in mobile food units.

Section 7.- The Department of Consumer Affairs is hereby empowered to adopt the necessary regulations to enforce the terms of this Act, and to such purposes, it shall approve regulations within one hundred and twenty (120) days of the approval of this Act. However, the food industry is hereby granted a term of six (6) months, as of the approval of the regulations, to eliminate the use of trans fats from the preparation of food.

Section 8.- Traditional and artisan cuisine business, other than those that are part of a business chain, whose higher sales volume does not exceed 500 thousand dollars annually and that are located in the coastal zones of the Island and in other places with a high concentration of
local and international tourist visits are hereby exempted from the application of this Act. However, they shall be obliged to place a notice stating the use of trans fats in the preparation of food.

Section 9.- Penalties.-
In the case of violations of the terms of this Act and its regulations, the Secretary of Consumer Affairs shall impose administrative fines to violators, in the amount of five hundred (500) U.S. dollars for the first violation. In the case of subsequent violations, he/she may impose fines up to the amount of one thousand (1,000) dollars for the second violation and up to two thousand (2,000) dollars for subsequent violations. The administrative fines shall be paid by certified check or money order to the Secretary of the Treasury; 50% of the revenues, on account of said fines, shall be directed to the Puerto Rico Food and Nutrition Commission and the Office of the Assistant Secretary for the Promotion of Health of the Department of Health, for the purpose of developing educational campaigns geared toward encouraging healthy eating habits and promoting health in the population.

Section 10.- This Act shall take effect immediately after its approval, except for the provisions of Section 7, which grants one hundred and twenty (120) days for the adoption of the necessary regulations, and of Section 9, which shall take effect ten (10) months after the approval of this Act.