

Elimination of the *trans* fatty acids from the global food supply

KEYWORDS: Food policy, *trans* fatty acids, *trans* fats, partially hydrogenated vegetable oils, health.

ABSTRACT

Partially hydrogenated vegetable oils (PHOs) are a major source of industrial trans-fatty acids (iTFA). Although their intake is identified as a considerable preventable risk for developing cardiovascular disease, these fatty acids are still found in foods in some regions, including in certain European countries. In many cases, voluntary self-regulation of the industry has been shown to be an efficient strategy, while this is not the case in all countries. Various policy options for removing iTFA from diets are being discussed, together with current global trends and activities regarding this topic, and challenges for the food industry. Food producers should acknowledge that the greatest health-related improvements come when PHOs in foods are replaced with mono and/or poly-unsaturated fatty acids, and not fats high in saturated fatty acids – such as tropical vegetable oils.

INTRODUCTION

Trans-fatty acids (TFAs) are characterised by at least one non-conjugated carbon-carbon double bond in the *trans* configuration. Certain TFAs are naturally produced by the bacteria in the rumen and found in small quantities in the meat, milk and dairy products of ruminants. However, higher levels can occur in foods during processing (industrial TFAs; iTFA) (1,2). In the previous century, the process of the industrial hydrogenation of vegetable oils was introduced to improve oil properties; beside enhancing their sensory profile and texture, hydrogenated oils are also characterised by improved stability and solidity of the oil, subsequently increasing the final product's shelf life while decreasing the need for its refrigeration, and with a higher tolerance to repeated heating. In addition, hydrogenated oils tend to be cheaper than animal fats and for a long time were thought to be a healthier alternative to animal fats, such as butter and lard, which contain a higher quantity of saturated fatty acids (3). With the growing use of industrial hydrogenation, partially hydrogenated vegetable oils (PHOs) have become a major source of iTFA in people's diets in many countries.

The first scientific data correlating TFAs with raised plasma low-density lipoprotein (LDL) and decreased high-density lipoprotein (HDL) levels were published in the early 1990s (4,5). Metabolic studies' results were later substantiated by epidemiological studies, showing a positive correlation

between TFA intake and risk for cardiovascular disease (CVD) (6-10). Available evidence suggests that TFAs increase the risk of CVD more than any other dietary source of energy (11); an increase of 2% in total energy derived from TFAs is shown to be associated with an increase in risk of death from any cause by 34% and coronary heart disease deaths by 28% (12,13), most likely due to a rise in LDL cholesterol levels while lowering HDL cholesterol levels (14). Further, evidence suggests that TFA intake is also associated with central adiposity, diabetes, Alzheimer's disease, breast cancer, impaired fertility, endometriosis and cholelithiasis (15). Research has not identified any positive nutritional role of iTFA beyond being a potential energy source. Further, all available evidence indicates that eliminating them from the food supply has positive health effects. This resulted in a recommendation that dietary intake of iTFA be as low as possible within the context of a nutritionally adequate diet (2,16), then reflected in the reformulation of many processed food products and development of new food-processing technologies. While in the past margarine was produced using the partial hydrogenation of industrial fats, modern production has switched to *trans*-esterification which does not form iTFA. As responsible manufacturers began to reformulate their food products and stopped using PHOs, policymakers developed various approaches to address this challenge.

EXISTING POLICY APPROACHES TO REDUCING iTFA INTAKE

Based on the available evidence of the risks of consuming iTFA, public awareness of this topic has also been growing, putting pressure on food manufacturers to lower their content in foods and to policymakers to regulate this problem. In general, the existing policies can be divided into those related to food labelling, and those directly limiting the content of iTFA in the food supply.

Labelling approach

One possible way to tackle the problem is to enact mandatory labelling of either TFAs or PHOs. In 2005, compulsory labelling of TFAs was introduced in prepacked foods in Canada, while the United States (USA) followed shortly after (17) (note: both Canada and the USA have now switched to a food composition approach, as described in the next section). While mandatory labelling of the amount of TFAs in the Nutrition Facts Panel provided consumers with important information to support informed

dietary choices, it remained unclear how this information would actually be interpreted and how it would affect consumer behaviour. For example, in Canada the regulation stated that TFA nutrition information must be displayed on a food label in grams (Figure 1) (18). It should be also mentioned that food producers were simultaneously able to use voluntary claims, but different thresholds were applied in different countries. To continue with the previously mentioned Canadian example, a "trans-fat free" nutrient content claim could be made for foods containing less than 0.2 g of TFAs per serving (19). Such claims are actually some of the most common on Canadian food labels, with a prevalence of up to 37% in specific food categories (20). However, in some jurisdictions, for example in the European Union, the use of such voluntary nutrient content claims is prohibited.



Figure 1. Example of the Canadian Nutrition Facts Panel providing information on the amount of TFAs per serving (source: (18)).

In addition to the mandatory labelling of TFA levels on food labels and the parallel use of nutrient content claims, another policy approach relates to the labelling of partially hydrogenated vegetable oils (PHOs) as a major source of iTFAs in processed foods. In the European Union, for instance, mandatory labelling of PHOs on pre-packed foods was introduced in the 1990s. Currently, PHOs must be labelled on ingredient lists as "partially hydrogenated fat/oil" (21), but currently there are no general EU limits on TFA levels in foods. However, the efficacy of such an approach is questionable (22,23). When using such an approach, consumers first need to identify PHOs on the list of ingredients on the food label, and then recognise such ingredient as potentially hazardous due to its TFA content. The consumer's ability to do this is limited, as also suggested in a recent study conducted within our research project "Trans fats in foods" on a sample of Slovenian, British and Australian consumers (2018; *unpublished data*).

While the labelling approach has been shown to promote food reformulation, specifically when coupled with consumer education, media attention and advocacy, it is unlikely to lead to the full elimination of iTFAs in the food supply (14). Moreover, "trans fat free" claims should not be allowed on food labels without establishing additional nutritional criteria because such claims could be misused to boost the market appeal of foods with a questionable nutritional profile, i.e. high in energy, saturated fat, sugar or salt. Another major limitation of the labelling approach is that it does not cover non-prepacked foods, which comprise a considerable share of people's diets in many populations.

Food composition approach

Several countries' experiences show that iTFAs can be taken out from the food supply very effectively through regulation that addresses the composition of foods. The WHO also recognised mandatory national limits as the most effective way of cutting *trans* fat from the food supply (14). In general, two very different approaches are in use: the first limits iTFA levels, while the second limits the use of PHOs as an ingredient in the food manufacturing process.

Denmark was the first country to introduce legislative limits on iTFAs in 2004, prohibiting the sale of foods containing more than 2 g of industrial TFAs per 100 g of fats, applying to both domestic and imported products. It should be noted that the margarine industry in Denmark had gradually eliminated those fats from its products even before the legislative ban was enacted (17). Similar rules were later introduced in some other European countries (Austria, Iceland, Hungary, Norway, Latvia and Slovenia) (Figure 2) and also outside Europe – for example in Chile, Ecuador, Singapore and South Africa (14). Somewhat less strict regulations (mostly referring only to oils and fats) were introduced in Switzerland, Argentina, Colombia, Iran and India (14).



Figure 2. Some European countries have limited the amount of iTFAs in foods via national regulations (note: regulation not yet in effect in all cases).

Quite a different approach has been taken in North America. In 2013, the US FDA published a preliminary report stating that PHOs were no longer Generally Regarded as Safe (GRAS), while in 2015 it was decided that PHOs would no longer be allowed in foods (24). The food industry had a three-year compliance period (ending in June 2018) to phase out industrial TFAs. A similar approach was used by Health Canada, where PHOs were reclassified as a contaminant/adulterating substance in food; the rule will take effect in September 2018 (25).

POLICY TRENDS

According to large systematic analyses, the global average consumption of TFAs was estimated to be 1.4% of total

energy in 2010, ranging up to 6.5% of total energy in different countries (26), namely much higher than the 1% limit, currently suggested by the WHO. Intakes were generally higher at younger ages; the highest intake was observed in North America, Latin America and North Africa/Middle East (26). Interestingly, notable differences can be observed within Europe itself. While some European countries have almost completely eliminated TFAs from the food supply (using either the regulatory or voluntarily approach), some Central Eastern and South Eastern European countries have seen an increase in the amount of industrially produced TFAs (27, 28). Concerning results were reported by Stender et al. (28) who examined the TFA content in prepacked biscuits, cakes and wafers from 20 European capitals and showed that in some countries the availability of such foods with added PHOs had increased several-fold from 2012 to 2015, as did the TFA levels (28). The use of PHOs in processed foods was also recently confirmed in a large study of the Slovenian food supply, with biscuits, snacks and cakes being among the categories with the highest frequency of PHO usage (29). Slovenia is the latest EU member state to introduce a national regulation to limit iTFA amount in foods; the rule is to take full effect in April 2019 (30) and is expected to affect several South Eastern European countries, where major producers of foods high in iTFAs are located (28).

The European Union's acceptance of Regulation (EU) No 1169/2011 on the provision of food information to consumers in 2011 provided not only an excellent opportunity to harmonise this issue on the EU level, but to also make the EU one of the leading global actors in lowering the presence of TFAs in the food supply (22). While the Regulation gave the possibility to introduce restrictions on iTFA levels in foods back in 2014, the key message of the European Commission's report in 2015 (31) was that additional data were needed before setting further actions. Seven years after the regulation, we may conclude that, unfortunately, the EU has been unable to assure the highest food safety standards for all EU citizens. While the elimination of iTFAs in the EU is still on the agenda, time is passing quickly and for years

challenges have been left to member states to intervene by way of national activities, with varying degrees of success. In October 2018 the European Commission opened a public consultation on the draft regulation, that would limit iTFAs to 2 percent of food's total fat content (32). The proposed implementation deadline for this rule is 1 April 2021. Lowering global exposure to iTFAs returned in 2018 also as a priority target of the World Health Organisation's strategic plan to guide the WHO's work between 2019 and 2023 (33). The "REPLACE" action package was published in March 2018 with a goal of removing iTFAs from the world food supply by 2023 (Figure 3).

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| R | Review dietary sources of industrially-produced trans fat and the landscape for required policy change. |
| P | Promote the replacement of industrially-produced trans fat with healthier fats and oils. |
| L | Legislate or enact regulatory actions to eliminate industrially-produced trans fat. |
| A | Assess and monitor trans fat content in the food supply and changes in trans fat consumption in the population. |
| C | Create awareness of the negative health impact of trans fat among policymakers, producers, suppliers, and the public. |
| E | Enforce compliance with policies and regulations. |

Figure 3. The six areas of the WHO's REPLACE action package.

The WHO called on governments to use the REPLACE action package to eliminate iTFAs from the food supply, noting very effective strategies are available to achieve this. While the action is particularly needed in low- and middle-income countries where controls on the use of iTFAs might be weaker, it could also contribute to a more harmonised approach in the fight against iTFAs, and supporting the progress made against cardiovascular disease, one of the world's leading causes of preventable death. The WHO is also preparing new guidelines called "Saturated fatty acid and trans-fatty intake for adults and children". A public consultation on the draft guidelines was very recently conducted (34) while a review by the expert group could conclude by the end of 2018. The WHO's increased activities for removing iTFAs from the global food supply are very useful not only for policymakers, but also for other stakeholders, particularly the food industry.

CONCLUSIONS AND CHALLENGES FOR THE FOOD INDUSTRY

Although intake of iTFAs is identified as an unnecessary and preventable public health risk, partially hydrogenated fats are still used in many countries,



including Europe. While the experiences of responsible food producers with the reformulation and optimisation of food processing show that PHOs can be efficiently removed from the food supply without notable sensory changes, we have seen that policies of food businesses vary considerably in different countries. While in some countries, the combination of labelling policy approach and voluntary self-regulation of the industry is revealed to be efficient (particularly when accompanied by sufficient monitoring), this has not been the case in some others. Consumer awareness and public pressure can be important stimulators for the food business to assure the highest food safety standards in food manufacturing, but the key question here is whether the decision to buy or not buy foods containing iTFAs should be handed over to the consumer at all. Considering that iTFAs are known as a major disease-risk factor, and that their use in food production can be avoided, there is no reason to continue exposing people around the globe to such a risk.

However, removing iTFAs from foods might bring a technological challenge in some food categories by way of guaranteeing food stability and meeting the sensory expectations of consumers. Replacing iTFAs (PHOs) with alternative sources of fat reduces the risk of CVD, but the greatest improvements are associated with the use of mono and/or poly-unsaturated fatty acids (15). Tropical vegetable oils are usually the most accessible alternative for removing PHOs from foods, but their use should be avoided because those oils are rich in saturated fatty acids (SFAs), which we would also like to reduce. Food producers should acknowledge that, although iTFAs will eventually be removed from the market, reducing SFAs will continue to be a major global public health priority. Conducting a reformulation that addresses these two issues simultaneously will benefit not only consumers but also food businesses themselves.

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