Trans fatty acids in Australia and New Zealand

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Introduction

Several papers,[1,2] a report from the World Health Organization (WHO)[3] and examples of regulatory action in overseas countries raised the profile of trans fatty acids (TFA) in the Australian and New Zealand media. In May 2006, the Australia and New Zealand Food Regulation Ministerial Council (the Ministerial Council) requested Food Standards Australia New Zealand (FSANZ) undertake a review of TFA in the Australian and New Zealand food supply. The FSANZ review report, "Trans Fatty Acids in the New Zealand and Australian Food Supply" (the Report) was provided to the Ministerial Council in May 2007.[4] This paper outlines some of the findings of the Report.[4]

What are TFA?

Fatty acids are either saturated (SFA), monounsaturated (MUFA) or polyunsaturated (PUFA), depending on the number of double bonds in the hydrocarbon backbone. TFA are MUFA and PUFA that have one or more double bonds in the trans configuration (i.e. hydrogen atoms adjacent to the double bond(s) are located on opposite sides). Consequently, TFA lack the characteristic bend in the hydrocarbon chain that is found in the more common cis unsaturated fatty acids (in which the hydrogen atoms adjacent to the double bond(s) are located on the same side). This difference in configuration results in different chemical, physical, and possibly biological properties between trans and cis unsaturated fatty acids.

Sources of TFA

There are two main sources of dietary TFA: ruminant and manufactured. Ruminant TFA arise from bacterial transformation of cis-unsaturated fatty acids in the rumen. Manufactured TFA principally arise from partial hydrogenation of cis-unsaturated fatty acids in edible oils. There is considerable overlap in the range of individual TFA found in ruminant and manufactured fats although the proportions of the various components vary depending on the source of the fat.

Regulatory definitions of TFA

The Australia New Zealand Food Standards Code defines any fatty acid with one or more double bonds in the trans configuration as a TFA, but the definition varies among countries. In the United States (US), conjugated TFA isomers (which have only one single bond between double bonds) are excluded, whereas in Denmark, conjugated and some ruminant sources of TFA are excluded from the regulatory definition. Therefore, the TFA content of food reported may vary among countries, depending on the regulatory definition in place. Caution should be applied when comparing estimated dietary intakes in different countries.

TFA intake in Australia and New Zealand

Country-specific TFA concentration data were derived from laboratory analysis of foods available in Australia and New Zealand from 2001 to 2006. For Australia, analyses were conducted by the New South Wales Food Authority in 2005, by South Australia Health in 2006 and by FSANZ between 2001–06. New Zealand TFA concentrations were derived from analyses conducted by Environmental Science and Research Limited in 2006,[5] and Crop and Food Research from 2002.

Dietary TFA intakes were calculated from the new TFA concentration data and food consumption from the 1995 Australian National Nutrition Survey (13,858 people aged 2 years and above) and the 1997 New Zealand National Nutrition Survey (4,636 people aged 15 years and above). Both surveys used a 24-hour food recall method. A subset of respondents provided a second 24-hour dietary recall at a later date which was used to correct for the day-to-day within-person variability (measurement error). The 'usual TFA intake' distribution of the whole population for each country was estimated separately. Total SFA and energy intakes, and the percent energy derived from TFA and SFA, were calculated.

The mean intake of TFA from all sources in Australia and New Zealand was 0.6% and 0.7% of total energy intake respectively (Table 1). This is lower than the target of less than 1% total energy derived from TFA suggested by the WHO.[3] In Australia and New Zealand, it is recommended that "a combined limit of 8–10% of energy from saturated and trans fats together would be prudent".[6] Both countries exceed this owing to the level of SFA intakes (Table 1).

Table 1: Intake (as percent of energy or grams per day) and sources of trans fatty acids (TFA) in Australia and New Zealand*, 2006 estimates.[4]

	Australia (2 years and older)		New Zealand (15 years and older)	
	% energy/day	g/day	% energy/day	g/day
SFA	13.4	31.2	15.3	37.2
TFA	0.6	1.4	0.7	1.7
Source of TFA	**Contribution to TFA intakes (%)**		**Contribution to TFA intakes (%)**	
– Naturally occurring	60		41	
– Manufactured	24		46	
– Both types**	16		13	

* Source of dietary intake data: 1997 National Nutrition Survey, NZ Ministry of Health.
** For example, foods such as quiche might contain TFA from both sources.

Health consequences of TFA intake

Effect on serum lipid levels

Mensink et al.[1] reviewed a number of studies in which humans were fed different types of fatty acid. Replacing 1% energy from carbohydrate with 1% energy from trans MUFA or SFA increased low density lipoprotein (LDL) cholesterol by 0.040 mmol/L or 0.032 mmol/L respectively, whereas replacing 1% energy from carbohydrate with cis MUFA or cis PUFA reduced LDL cholesterol by 0.009mmol/L or 0.019mmol/L respectively. From this, it can be estimated that replacing 1% energy from cis MUFA with trans MUFA would increase LDL cholesterol by 0.049 mmol/L. In addition to having an adverse effect on LDL cholesterol, TFA may contribute to the aetiology of heart disease via other mechanisms.[2]

Effect of fatty acid mixtures on lipid levels

Food contains a mixture of fatty acids. The effect of a food depends on the relative proportions of the beneficial cis MUFA and cis PUFA and the adverse TFA and some SFA. For example, Noakes and Clifton[7] found that butter, containing 3.4% TFA and 50% SFA, raised LDL cholesterol; whereas a canola-based margarine containing 10.4% TFA and only 15% SFA reduced LDL cholesterol. The balancing of favourable and unfavourable effects of fatty acids on serum lipids was first summarised by Keys et al. in 1957.[8]

Effect of mixtures on heart disease

From four cohort studies, Mozaffarian et al.[2] calculated that replacing 2% energy from carbohydrate with TFA increased the risk of non-fatal coronary heart disease by 23% (RR=1.23, 95% CI: 1.11-1.37). Using additional unpublished data, they estimated that reducing the current mean US intake of TFA from 2.1% to 0.1% of total energy would reduce coronary heart disease events by 19%, if TFA were replaced with carbohydrate, and by 22% if replaced with cis-unsaturated fatty acids.

The impact on heart disease of reducing TFA intakes in Australia and New Zealand would be much lower because current TFA intakes are lower. Using the Mozaffarian et al. model, a reduction in the rate of heart disease could range from 5–6% in Australia and New Zealand if all TFA were removed from the food supply, assuming a linear relationship. However, complete elimination of TFA, particularly ruminant TFA, is not possible at present and so the likely effect on the heart disease rate of partial removal of TFA would be smaller. Low fat ruminant-based foods are low in both SFA and TFA and contribute a number of important nutrients to the diet.

Managing TFA in the food supply

Possible risk management strategies include public education, industry codes of practice, and regulation, or a combination of these. In the US and Canada, labelling of TFA is mandatory on most foods. The US Food and Drug Administration (FDA) allows a food containing <0.5g TFA per Reference Amount Customarily Consumed to list 0g TFA in the Nutrition Facts Panel. As the Reference Amount Customarily Consumed for oils is 15ml such an oil could contain up to 3.26g TFA/100 ml in the US. The Australian Consumer and Competition Commission and the New Zealand Commerce Commission take the view that "free" means "no detectable". Foods that could be labelled as 0g TFA in the US might have declarable amounts of TFA if mandatory labelling were introduced in Australia and New Zealand.

The possible undesirable consequences of mandatory labelling need to be considered carefully because labelling may not always assist consumers to make healthier food choices; particularly when nutritional knowledge is low.[9] The use of label information by consumers may not be as straight forward or rational as expected by health professionals. The consumer research highlights that consumers actively seek information and pay attention to those aspects of greatest interest. Recent studies on the impact of TFA labelling on food products have reported some unexpected findings. A study in the US asked consumers to identify the healthier choice between similar unbranded products with similar energy and total fat contents.[10] When consumers were not provided with information about TFA content, they selected the products with the least amount of SFA as the healthiest product. However, once TFA information was provided in the Nutrition Facts Panel, the majority of consumers chose the product with no TFA despite these products having much higher levels of SFA.[10]

Restricting the TFA content of local and imported foods is another possible strategy. One example that received substantial media attention within Australia and New Zealand was the New York City "ban" on manufactured TFA, which mandates that restaurants can only serve food that complies with FDA requirements for declaring 0g for the manufactured TFA component. A website to support this initiative lists a range of "trans-free" fats that can be used as alternatives. These contain between 4-91% SFA although the website also notes that lower SFA is healthier.[11]

Given the relatively low TFA, but high SFA intakes in Australia and New Zealand, caution is required when considering possible options to avoid inadvertently misleading consumers about the heart-healthiness of foods or shifting food manufacturing back to using SFA.

Australia and New Zealand

Based on the outcomes of the review, FSANZ concluded that immediate regulatory intervention was not required and that a non-regulatory approach to further reducing the levels of TFA in the Australian and New Zealand food supply was the most appropriate action. The Ministerial Council endorsed the findings and recommendations of the Report[4] at its meeting in May 2007.

Currently within Australia and New Zealand there are a number of ongoing initiatives aimed at lowering TFA intakes. The Australian and New Zealand governments have a number of educational initiatives and recommendations, including dietary and nutrition guidelines. In addition, consistent with recommendations contained within the Report, partnerships between government, non-government and industry representatives have been established for the purpose of reducing the presence of TFA in the food supply. Industry has supported the reduction of TFA in the food supply through increasing production and use of low TFA edible oils. At the request of the Ministerial Council, a new round of food composition work is underway and an update on TFA intakes and the outcome of non-regulatory measures to reduce TFA in the food supply is in progress. The outcomes will be reported to the Ministerial Council in late 2009.

Conclusions

TFA intakes are comparatively low in Australia and New Zealand but saturated fat intake exceeds recommended intakes. It would be unfortunate if highlighting concerns about TFA lead to an increase in population SFA intake. A better goal would be "to reduce trans fat intake without increasing saturated fat intakes" because the ultimate goal of any action is to reduce heart disease incidence overall.

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Disclaimer

The views are those expressed by the authors and not necessarily those of Food Standards Australia New Zealand.

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