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A resource about dairy-based nutrition
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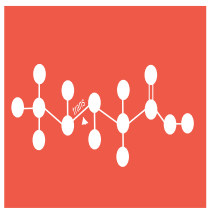
This review summarises current research regarding the health effects of dairy-derived and industrially produced trans-fatty acids and presents the findings in context of the South African diet.

A publication for health professionals

Health implications of trans-fatty acids in dairy


Trans-fatty acids (TFAs) are a class of unsaturated fatty acids with at least one carbon–carbon double bond in the *trans* configuration. These acids may be naturally present in foods, as in the case of dairy products, or occur as a result of the partial hydrogenation of vegetable oils during commercial preparation of food. Endogenous formation through oxidative stress is also possible.[1] Vaccenic acid (*trans* 11-18:1) and conjugated linoleic acid (i.e. *trans* 10, *cis* 12-18:2) are the predominant ruminant-derived TFAs, whereas elaidic acid is the major industrially produced TFA.

Owing to the adverse effects of TFA intake on cardiovascular disease[2,3] and the association with other health risk factors (e.g. inflammatory markers,[4] body size, shape and composition,[5] dementia[6] and allergy[7]), many interventions to reduce exposure have been introduced internationally. This ranges from global guidelines and local legislation to individual dietary counselling.[8] As natural forms of TFAs (so-called ruminant TFAs) have different health effects compared with industrially produced TFAs, South African regulations make a clear distinction between the two types.

This review aims to summarise current research that compares the health effects of dairy-derived and industrially produced TFAs and to present findings in a practical context for South Africa.

Health effects of ruminant and industrial trans-fatty acids

With regard to the cardiovascular effects of TFAs, a systematic review of observational studies indicated a positive relationship between industrially produced TFAs and coronary heart disease but not for ruminant TFAs. This finding supports differentiation between ruminant and industrial TFAs. However, the researchers could not rule out the possibility that the non-association of ruminant TFAs was, at that stage, due to lower intakes.[9] In a similar vein, a systematic review and meta-regression of randomised controlled trials that specifically investigated the relationship between the dose of ruminant TFAs and cardiovascular risk, concluded that intakes that constitute up to 19% of dietary energy do not have an adverse effect in healthy adults.[10] The research of Da Silva and colleagues[11] provided some explanation, in that subjects (obese and non-obese) who had plasma phospholipids associated with ruminant TFAs had higher adiponectin and lower blood pressure. This suggested beneficial effects on cardiometabolic health. In contrast, elaidic acid, the major form of industrially produced TFA, was linked to glycaemia and elevated levels of triglycerides and total cholesterol in the obese subjects. In a later study, these researchers also found that ruminant TFAs decreased inflammatory markers in vascular endothelial cells.[4]

Against the background of this ongoing uncertainty, Gebauer et al.[12] designed a double-blind randomised controlled trial to specifically compare the effect of the same quantities (about 9 g per day) of vaccenic acid (a ruminant-derived TFA) and industrially produced TFA. In this highly controlled, large-scale feeding study, the base diet included 34% of energy from fat, with low TFA levels (about 0.1% energy from mixed TFAs). This was compared with three other diets: one with 3% energy from vaccenic acid, one with 3% energy from mixed isomers of partially hydrogenated vegetable oils, and one with 1% energy from *cis*-9, *trans*-11 conjugated linoleic acid. The added energy from TFAs isoenergetically replaced the energy from stearic acid. Results showed similar effects of vaccenic acid (ruminant TFA) and industrially produced TFAs on total cholesterol, low-density lipoprotein cholesterol, apolipoprotein B, and the ratio between total cholesterol and high-density lipoprotein cholesterol.

For other conditions that may be linked to TFA consumption, Hansen et al.[5] reported that ruminant TFAs were not significantly associated with effects on body size, shape or composition. Similarly, Wu et al.[7] showed that early-life exposure to vaccenic acid (ruminant TFA) was inversely related to eczema, suggesting a beneficial effect. It follows that the link between TFAs and health requires a clear distinction between the sources of TFAs, and also between different health outcomes. In addition, the concentration (dosage) and duration of exposure, as well as the rest of the diet, lifestyle and context, are important. Furthermore, individual factors, such as sex and weight status, may modulate the effects of TFAs. It should further also be noted that the TFA content of milk is variable, as it is dependent on the cow's diet.[13]

Practical implications

Internationally, TFA intake is currently recommended at 0.6–2% of total energy intake. The World Health Organization is in the process of finalising global guidelines for saturated fat intake and TFA consumption. Nonetheless, for a 8400 kJ (2000 kcal) diet, a recommendation of 1% of energy from TFAs translates to 84 kJ, which will be provided by 2 g of TFA. In countries where legislation to reduce industrial TFAs in products such as baked goods, deep-fried foods and packaged snacks has been implemented effectively, ruminant-derived TFAs may now be the main form of TFAs in food, and intakes may need to be monitored. This scenario is unlikely to be relevant in the current South African context.

In South Africa, efforts should continue to focus on reducing the intake of industrially produced TFAs for the following reasons:

- In all likelihood, dairy-derived TFAs still represent a minor component in the diet of most South Africans.
- Changing the composition of industrially produced foods is an easier short-term intervention than changing food choices.
- Discouraging dairy intake would be at the expense of the nutritional value and proven health benefits of dairy. Dairy provides many gap nutrients in the South African diet and reduces the risks of non-communicable diseases. The country is burdened by non-communicable diseases and food insecurity with associated under-nutrition.
- Whole dairy foods (i.e. associated with the dairy matrix) may have different effects from isolated components (e.g. isolated TFAs).
- A consistent health promotion message, based on the food-based dietary guidelines, is needed.
- It is not possible to plan a balanced diet that excludes all TFAs.

Even if three servings of full-cream dairy (e.g. 50 g of cheese [33% fat], 250 mL full-cream milk [3.25% fat] and 175 mL yoghurt (3.25% fat]) were consumed per day, the dairy-derived TFA content would amount to less than 0.5% of a 8400 kJ diet. The definitive nutritional and health benefits of dairy foods – particularly when fat-reduced versions are chosen – offset the potential risk of ruminant-derived TFAs in the diet, especially in the amounts generally consumed in South Africa and considering the effect of the dairy matrix.

Milk, *amasi* or yoghurt therefore remain important components of an optimal diet for South Africans.

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