Trans fat can be a hidden health risk

Although the public debate on the use of industrially manufactured trans fat in foods has abated, a possible amendment to the regulations is now being prepared. From a health point of view, reducing the intake is desirable, but it is difficult for consumers to make informed decisions to avoid trans fat. Here, key aspects of trans fat for consumers, advisory experts and authorities are elucidated.

Marianne Molin
marianne@amh.no
Nancy Odden
Lisa Ha
Trine Næss Henriksen
Katinka Stray Frazier
Anette Skarpaas
Martin Frank Strand
Ane Cecilie Westerberg

A high intake of trans fat increases the risk of cardiovascular diseases (1). In the systematic review of evidence in the *Nutritional advice to promote public health and prevent chronic diseases*, published by the Norwegian Directorate of Health, the causal link between the intake of trans fat and development of coronary heart disease is categorised as «convincing» (2). An intake of trans fat corresponding to 2 % of the total energy intake (energy percentage, E %), or approximately 5 grams of trans fat per day for an adult, increases the risk of cardiovascular diseases by approximately 23 % (3). Intake of trans fat has also been linked to other health outcomes, such as total mortality, type 2 diabetes and various forms of cancer, but for these, the causality is not equally convincing (2, 4).

A systematic review from 2009 shows that even replacing trans fat with saturated animal fat reduces the risk of cardiovascular diseases (5). Norwegian authorities recommend reducing the intake of trans fat to a maximum of 1 E % (6), which in adults corresponds to an intake of 2.5 grams per day.

What is trans fat?

Trans fat is formed naturally through bacterial transformation of unsaturated fatty acids in the rumen of ruminants. In meat and dairy products, the content of trans fat constitutes less than 3–4 E % (7). Trans fat is also produced industrially by blowing hydrogen gas through liquid vegetable or marine oils under high pressure. In this process, called hydrogenation, the structure of the unsaturated fatty acids modifies, and the double bonds are saturated with hydrogen. In full hydrogenation, all the double bonds are saturated and converted to single bonds, resulting in a saturated fatty acid. In partial hydrogenation, up to 60 % of the fat can be trans fat (8, 9) (Figure 1). Trans fat is used in food items because such fat is firmer and spreads more easily than the original vegetable or marine oils. Such products may also be cheaper because of their longer shelf life (by being less exposed to rancidification).

Sources of industrial trans fat in our diet

Previously, margarine used to contain up to 30 % trans fat, and was the dominant source of trans fat in the Norwegian diet. In the mid-1990s, the food industry was requested to reduce its use of partially hydrogenated fat in margarine. As a result, only insignificant amounts of trans fat are found in margarine since the late 1990s (10).

Today, industrially manufactured trans fat is found in biscuits, cakes and other baked goods, puff pastry products, «microwave popcorn» and various semi-finished products. In deep-frying oils the content of trans fat varies, and formation of trans fat may occur during reuse of such oils (11). Today, the two major hamburger chains in Norway, Burger King and McDonalds, use deep-frying oils containing a maximum of 0 grams and 1.5 grams of trans fat per 100 grams of oil, respectively (Vibeke Bryhn-Hansen, Quality Manager at Burger King, and Hilde S. Øverby, Quality Manager at McDonalds, personal communication).

Is the intake of trans fat a problem in Norway today?

The report *Development of the Norwegian diet 2012* states that the intake of trans fat has been greatly reduced (12). According to figures from consumer surveys, the intake has been reduced from 5 E % on average in 1958 to less than 1 E % today. This decline is largely accounted for by the reduction in the amount of trans fat in margarine (10). Meat from ruminants and full-fat dairy products are therefore currently the main sources of trans fat in foods produced in Norway (12). In a study from 2006, the average intake of trans fatty acids in Norway was estimated at 0.6 E % (13). This estimate was based on data on intake from a nationwide dietary survey (Norkost 97), the content of trans fatty acids stated in *The Norwegian Food Composition Table*, information from manufacturers and separate analyses.

Studies aiming to estimate the intake of trans fatty acids may have weaknesses that lead to an underestimation. Estimates of intake in consumer surveys include only foods purchased for the household, and not foods purchased in petrol stations, in kiosks or cafés or other catering establishments (14). *The Norwegian Food Composition Table* provides no data for a number of products supplied to the Norwegian market, and the information on the content of trans fat in the foods described in the table is also incomplete – for 150 of the 1 305 foods described (11.5 %) there is a lack of data on trans fat (7). This applies for example to foods that may contain a high proportion of trans fat, such as «microwave popcorn» and a number of types of biscuits and other baked goods (15). In addition, it is a known fact that the intake of foods considered to be «unhealthy» or which contain a lot of fat is often underreported in dietary surveys (16).

At the conference on diet and cardiovascular disease in Oslo on 24–25 January 2013, the Danish researcher Steen Stender presented the content of trans fat in various biscuit products purchased in November 2012 from a variety of shops in Oslo. The content of trans fat differed considerably between imported and Norwegian-made biscuits and cakes. For example, a daily intake of 100 grams of one of the imported biscuits (7 grams of trans fat per 100 gram of product) would result in trans fat accounting for 3 E % in the diet (Steen Stender, personal communication). If these products are consumed by children, the energy percentage will be significantly higher. Cakes and biscuits are subsumed in the category «processed grain and flour products», which is the group of foods that have seen the fastest growth in imports over recent years. In 2011, a full 25 % of the consumption in this category was in the form of imports (17).

The real intake of trans fat may therefore be higher than what is indicated by the estimates, especially in sub-groups of the popu-

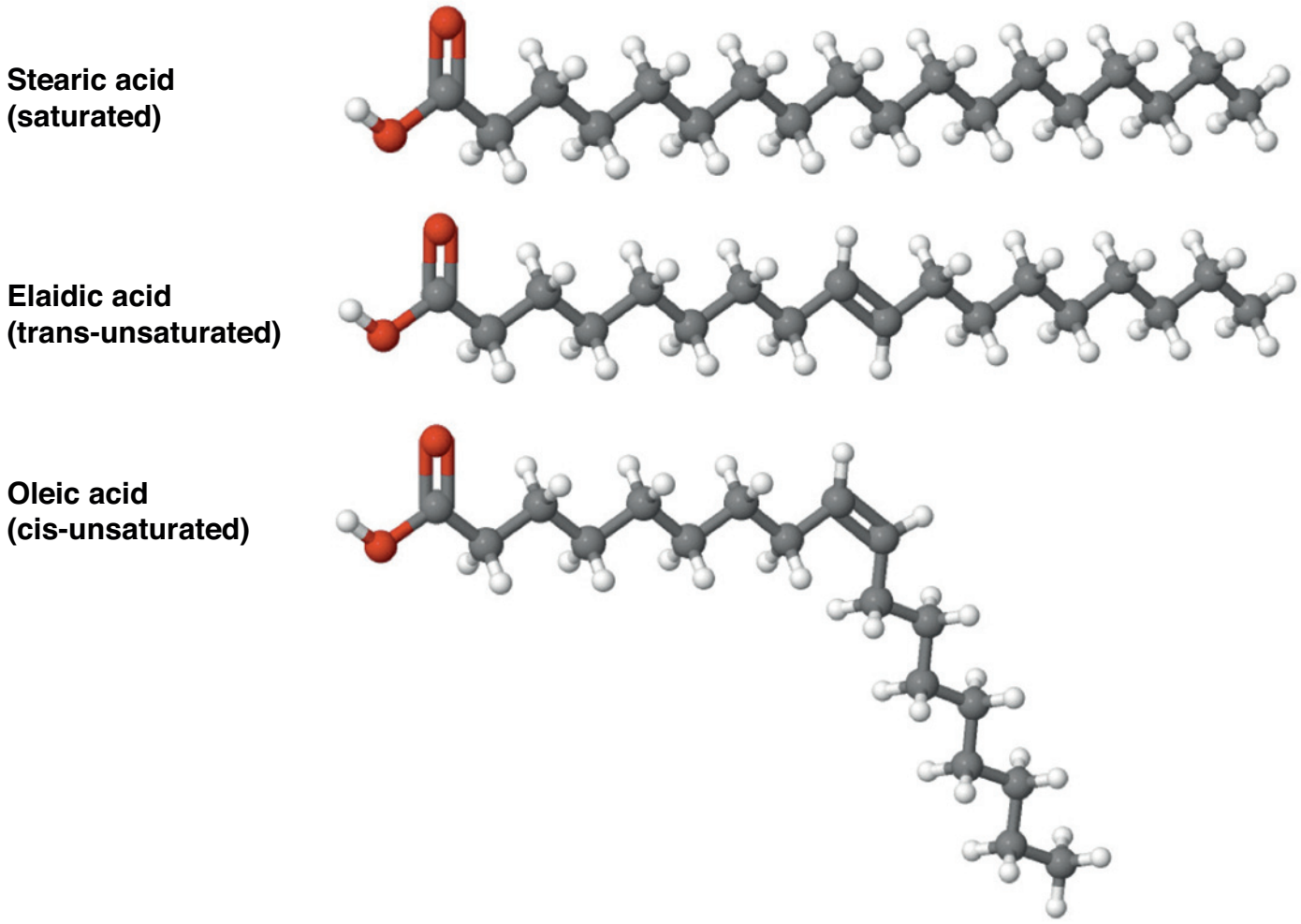

Figure 1 *Illustration of a saturated, a trans-unsaturated and a cis-unsaturated fatty acid with 18 carbon atoms in the hydrocarbon chain. The arrangement of the hydrogen atoms next to the double bonds will have an effect on the spatial structure of the fatty acid. With an arrangement of the hydrogen atoms on the same side of the double bond, the bond will be in the so-called cis position, while a spatial structure in which the hydrogen atoms are arranged on the opposite side of the double bond will provide a bond in trans-configuration. In contrast to cis-unsaturated fatty acids, with the typical «kink» in the molecule, trans fats will more closely resemble saturated fats with a more rectilinear structure*

lation for whom ready-made meals, cakes and snack products predominate in the diet (15). A low average intake of trans fats at the population level does not exclude a high intake in sub-groups of the population, as long as products with a high content of trans fat are available on the market.

In general, it has been shown that people with a high level of education and high income tend to have a diet which is more health-promoting than is the case among people with less education and low income (18). One of the key priorities of the health authorities is to counterbalance social inequalities in health, meaning differences in health that consistently co-vary with level of education, income or profession (19, 20).

Absence of regulation of trans fat content and consumer information

In 2004, Denmark introduced a statutory limit of 2 grams of industrially produced trans fat per 100 gram of total fat in foods produced in or imported to Denmark. Switzerland, Austria and Iceland have also introduced a maximum limit of trans fat content (21, 22). No corresponding regulations have been introduced in Norway. According to the Norwegian regulations on nutritional declaration of foodstuffs, a declaration of nutrients in packaged foodstuffs is mandatory only if the branding, advertising or other presentations promote health claims. Otherwise, the manufacturers are free to decide whether or not they want to declare the content of total fat, monounsaturated fat, polyunsaturated fat and/or trans fat (23). According to the labelling regulations, it must be stated on the product whether oils or fats are hydrogenated (24). The regulations do not require any specification of whether this fat is partially hydrogenated and contains trans fat, or whether it is fully hydrogenated and thus free from trans fat. Only when the manufacturer has voluntarily declared that the product is «free from trans fat» or labelled it as containing, for example, «fully hydrogenated vegetable fat», can the consumer be certain that the product contains no trans fat.

In order to be labelled with the «keyhole» (a joint Nordic nutrition label), a product cannot contain more than 2 grams of trans fat per 100 grams of total fat. This labelling is consequently reserved for products containing little trans fat (25).

Advantages and disadvantages of regulation

By introducing a maximum limit to the content of trans fat in products and an instruction to declare this content, the authorities can help ensure a lower intake of trans fat in the population.

Such a set of regulations will imply that the manufacturers will need to find substi-

tutes for trans fat. Most likely, some may be replaced by saturated fat. The introduction of regulations would also include requirements on enforcement and possible sanctions for violations. In addition, increased costs are likely to be imposed on the manufacturers, since all products must be analysed to establish their content of trans fat. Estimates made by CAIRN (Canadian Agricultural Research Network) show, however, that an introduction of mandatory declaration of products containing more than 2 % trans fat will be economically beneficial for society and have the greatest effect if it is combined with a maximum limit on permitted content. The expenses associated with implementation and follow-up of the regulations will be considerably lower than the financial savings resulting from the health benefits gained (26).

Regulation of trans fat in Norway as well?

The Norwegian Food Safety Authority is preparing new regulations on food information to replace the existing regulations on declaration of foodstuffs and these will come into force on 13 December 2014 (27). According to the hearing-round draft version, introduction of these regulations will entail mandatory declaration of the total amount of fat as well as the proportion of saturated fat, but so far, mandatory declaration of the content of trans fat is not foreseen. However, this issue will be considered in a study of the use of trans fat in foods. The extent to which trans fat is used in the Norwegian diet will also be surveyed (27). The objective is to assess possible consequences of measures that will enable consumers to make correct and healthy choices. In a recent report to the Storting, *Public Health Report: Good health – a shared responsibility*, submitted by Jonas Gahr Støre, Minister of Health and Care Services on 26 April 2013, the government proposes to reduce the amount of industrially manufactured trans fat in foodstuffs to a maximum of 2 %, thus following Denmark's example (28).

Consequently, Norwegian authorities may in the near future enable consumers to avoid or deselect foodstuffs containing trans fat. By introducing a maximum limit for permitted trans fat, all groups in the population can be reached, and this will help counterbalance health inequalities that are caused by social conditions. Moreover, introducing requirements on labelling will enable consumers to make informed choices. If introduced, this requirement should also encompass imported foodstuffs as well as unpackaged goods served in restaurants and other catering establishments.

In spite of a relatively modest intake of products with a high content of trans fat in the population as a whole, certain groups may still have a consumption that exceeds the amount recommended by the authorities. In order to reach all population groups, we therefore support the proposal in the *Public Health Report* to introduce a ban on high amounts of industrially manufactured trans fat in Norwegian as well as imported foodstuffs. To help influence the authorities' decision-making process, consumers as well as those of us who are involved in preventive health care should send a clear message welcoming this ban.

Marianne Molin (born 1973)
is Associate Professor at the Department of Nutrition, Atlantis Medical University College, and has a PhD in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Nancy Odden (born 1973)
is Associate Professor at the Department of Nutrition, Atlantis Medical University College, and has a PhD in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Lisa Ha (born 1973)
is Associate Professor at the Department of Nutrition, Atlantis Medical University College, and has a PhD in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Trine Næss Henriksen (born 1985)
is Assistant Professor at the Department of Nutrition, Atlantis Medical University College, and has a master's degree in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Katinka Stray Frazier (born 1976)
is Assistant Professor at the Department of Nutrition, Atlantis Medical University College, and has a master's degree in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Anette Skarpaas (born 1980)
is Assistant Professor at the Department of Nutrition, Atlantis Medical University College, and has a master's degree in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Martin Frank Strand (born 1979)
is Associate Professor at the Department of Nutrition, Atlantis Medical University College, and has a PhD in molecular biology from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

Ane Cecilie Westerberg (born 1981)
is Head of Studies at the Department of Nutrition, Atlantis Medical University College, and has a PhD in nutrition from the University of Oslo.
The author has completed the ICMJE form and declares no conflicts of interest.

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