Scientific excellence • Industry applicability • Strategic networking • Global influence

Questions on Trans and CLA of Dairy Products

July 2013

Translated from 'Questions Sur les Trans & les CLA des Produits Laitiers', No. 27b, CNIEL, 2012

Editors for this issue: Yvette Soustre & Constance Gayet

Cniel - 42, rue de Châteaudun
F-75314 Paris Cedex 09, France
nutritionsante@maisondulait.fr

Trans Fatty Acids: Definitions

1. What are trans fatty acids (TFAs)?

A trans fatty acid (TFA) is a mono- or polyunsaturated fatty acid with at least one double bond in trans geometric configuration. A trans double bond is characterized by a specific arrangement of its hydrogen atoms. They are on either side of the double bond. The trans configuration differs from cis configuration, in which the atoms are on the same side (*Appendix 1*). Some fatty acids with exactly the same crude chemical formula (e.g. C18:1) can gave different detailed formulas whether they are cis or trans, or depending on the place where their double bond(s) is (are) located (C18:1 *cis 9*; C18:1 *trans 9*; C18:1 *trans 11*): these are called isomers.

Note: that this definition is the chemical definition generally used in the regulations. Yet, some bodies (such as the ANSES in France) extend this definition in order to develop public health recommendations (*Q 14*).

2. Are there many of them?

Fatty acids consist of carbon chains of various lengths (between 4 and 26 carbon atoms) with a more or less broad range of double bonds (up to 6). Since trans double bonds may be located on any carbon atom, there is, in theory, a very large number of possible molecules. Food especially contains mainly trans isomers of oleic acid, linoleic acid and alpha-linolenic acid.

- **Isomers of oleic acid (C18:1 cis-9)**: elaidic acid (C18:1 trans-9) and vaccenic acid (C18:1 trans-11).
- **Isomers of linoleic acid (C18:2 - 9c, 12c):** C18:2 (9c, 12t); (9t, 12c); (9t, 12t); (9c, 13t); (9c, 11t).
- **Isomers of alpha-linolenic acid (C18:3 - 9c12c15c):** primarily the C18:3 - 9c11t15c.

Note that in humans there are two types of essential fatty acids (n-6 and n-3), whose precursor linoleic and alpha-linolenic acids are considered to be essential because we need them and they are only supplied by what we eat, which is not the case for trans isomers.

Questions on Trans and CLA of Dairy Products

July 2013

3. Why distinguish them from other fatty acids?

Three dimensional structures of TFAs are relatively linear in shape (similar to that of saturated fatty acids), while the three dimensional shape of cis fatty acids is curved (*Appendix 1*). A trans double bond modifies some physical and chemical parameters of the molecule (melting point, polarity, UV absorption) and affects its biochemical and physiological properties.

4. What are the primary food sources of TFA?

The TFAs in foodstuffs may be from natural or industrial origin.

- **The natural TFAs** are produced by ruminants from the unsaturated fatty acids they consume (*Appendix1*).

We find them mostly in ruminant-derived foods such as **milk, butter, meat….**

- **The industrial TFAs** are essentially produced through partial catalytic hydrogenation of oils. This is an industrial process that makes oils more solid and less sensitive to oxidation. The TFAs that are formed are then found in products containing partially hydrogenated oils like fries, biscuits, snacks, bakery products, ready meals, etc. Deodorisation of oils during the refining process or cooking (frying, grilling) may also produce TFAs in small amounts.

Note that TFAs (from natural or industrial origin) provided by food are mainly monounsaturated fatty acids (especially isomers of C18:1 9c). Yet, the fatty acid profile of milk-fats (levels of TFAs and distribution) is specific and differs from that of fats manufactured through partial hydrogenation process (*Appendix 1*).

TFAs, Food and Health

5. What is the amount of TFA in dairy products?

Dairy technology does not produce TFAs. These are naturally present in milk-fat (mainly produced by the ruminants' metabolism*). They represent 1 to 6% of total fatty acids. Content differences are due, in particular, to important seasonal variations (nature of livestock diet), geographical locations (altitude), breed, stage of lactation, etc. (*Appendix 1*)

The TFAs present in milk-fats are mainly made up of trans C18:1 (72 % on average), approximately 50% of which is trans-11 C18:1 (vaccenic acid)**. The TFA content of dairy products depends on their fat content and that of the milk. Thus, 100ml of semi-skimmed milk contains about 0.04g of TFAs; most cheeses contain less than 1% and butter less than 4%*** (*Appendix 2*).

* Cows produce TFAs by digesting the polyunsaturated fatty acids they consume. This is ruminal biohydrogenation. Milk also contains, in small amounts, TFAs absorbed directly from plants eaten by ruminants.
** Note that milk fat also contains trans palmitoleic acid, a TFA containing 16 carbons (C16:1 t9) and whose biological beneficial properties have been highlighted recently (Appendix 1). This fatty acid represents about 5% of total TFAs.
*** 3.79% summer butter, and 2.52 % winter butter (Appendix 2).

6. What about other foodstuffs?

Other food contributors of TFAs are mainly meat from ruminants, partially hydrogenated vegetable oils (hard margarines) and products containing them.

- Meat from ruminants:
Meat (like dairy products) especially contains C18:1 trans isomers, mainly vaccenic acid. In meat the amount of trans C18:1 content can range from 2% of total fatty acids for beef up to up to 10.6% for mutton. The tallow that is used as an ingredient in industrial products would contain on average 4.9% of TFAs.

- Partially hydrogenated vegetable oils and products containing them:
Virgin or refined vegetable oils contain low concentration of TFAs (0-1%). Some frying baths, partially hydrogenated oils or "hard" margarines may contain more TFAs*.
Most industrial trans isomers are isomers of elaidic acid (30% of C18:1 trans-9 and about 21% of C18:1 trans-10, in% of total C18:1trans). These fats present a completely different distribution from that of milk-fat (*Appendix 1*).

Note that in Europe, some margarine factories have preferred interesterification rather than hydrogenation, placing on the market "soft" margarines low in trans fatty acids. Efforts have also been made to reduce industrial TFA content in oils and other partially hydrogenated fats (shortenings) and products that contain them. However, some difference may remain between the products. In France, most brand products are low in TFAs.

* Levels of TFAs depend on the nature and composition of unsaturated fatty acids in the start oil, the catalyst used, the processing conditions during hydrogenation (time, temperature, pressure, agitation), the degree of hydrogenation (fully hydrogenated fats do not contain any

Questions on Trans and CLA of Dairy Products

July 2013

TFAs)… The TFAs can thus represent only 1-2% of fatty acids (new margarine tubs) compared to 40-50% for some "hard" margarines a few years ago.

7. What is the impact of TFA on human health?

Epidemiological research has provided evidence of a positive association between high intake of total TFAs and coronary heart disease.

Although the natural (ruminant-derived foods) or industrial (partially hydrogenated vegetable oils) origin of TFAs cannot be used to develop a regulatory definition, the ANSES has recommended since 2009 that this criterion should be taken into account in terms of public health.

Indeed, in studies that made a distinction between the two TFAs' origin, increased TFA consumption from industrial origin (>1.5% of the total energy intake (TEI))* has been shown to be positively associated with cardiovascular disease (CVD) risk. However, no significant association has been observed between the usual intake of natural TFAs (up to 1.5% of the TEI)**, and coronary risk. These findings were confirmed in 2011 by a meta-analysis based on the results of available epidemiological studies (9 studies including from 667 to more than 78 000 individuals).

Little research on the effects of TFAs on other diseases such as cancer or diabetes (*Appendix 1*) has been carried out and/or has lead to controversial results.***

* A 2% increase of industrial TFAs in the total energy intake is likely to increase the risk of coronary disease by 25%.
** This daily intake level would correspond to 1 litre of whole milk (or 2 litres of semi-skimmed milk) +200g of camembert +50g of butter.
*** According to the French epidemiological study E 3N published in 2008 involving 19 000 women followed for 7 years, the risk of breast cancer doubled for women with high industrial TFA levels in blood.

8. What about natural trans fats from ruminant sources?

Research specifically focused on natural TFA consumption has not reported a positive association with cardiovascular risk. This would be partly due to the relatively small amount of natural TFAs consumed (lower than 1% of energy intake on average).
According to a Danish epidemiological study recently carried out on more than 3600 individuals followed for 18 years, natural TFA consumption is not associated with increased coronary heart disease incidence even for large consumers (up to 1.5% of the TEI).

Furthermore, the effect of natural TFAs on blood biomarkers to assess the cardiovascular risk have been studied and confirm the epidemiological data. A French intervention study has shown that natural TFAs have no impact on HDL cholesterol levels, even if they are consumed in far higher doses than usual consumption*. Two other intervention studies have also demonstrated that natural TFA consumption (from about 1-2% of the TEI) has no deleterious impact on blood lipid markers associated with cardiovascular risk.

Some research suggests that natural TFA consumption may be inversely correlated with the risk of developing a cardiovascular disease. However, the existing data are not sufficient to say that natural TFAs decrease the cardiovascular risk.

The TFAs' different mechanisms of action according to their origin are not all clearly understood. However, it is proven that the different C18:1 trans isomers are not used in the same way in the body.

For example, only vaccenic acid (predominant in dairy products) is a good enzyme substrate for the enzyme delta-9 desaturase that transforms it into rumenic acid (18:2 *cis 9, trans11*), which is a potentially beneficial 'CLA'**.

* The TRANSFACT study has shown that natural TFAs do not decrease the amount of "good cholesterol" and do not increase the amount of small dense LDL particles (bad cholesterol), even in cases where the trans intakes are four times higher than those consumed by large consumers like Danish people. It is impossible to absorb such large quantities by consuming dairy products from trade; they are obtained experimentally by modifying animal feeding.
** In the human body, about 20% of vaccenic acid is said to be converted to rumenic acid.

The Special Case of CLA

9. What are CLAs?

Conjugated Linoleic Acids (CLAs) are trans isomers of linoleic acid (C18:2 9c, 12c), whose double bonds are conjugated. They follow each other on two neighbouring carbon atoms. The "conjugated" molecules have a curved shape (close to that of cis fatty acids) and not a linear shape, as it is the case with TFAs. This specific configuration gives them particular properties (*Appendix and Q 12*). The term "CLA" covers a wide range of very

different molecules (more than thirty), two of which are known to be biologically active (rumenic acid (C18:2 9c, 11t) and C18:2 10t, 12c).

10. Where are they found?

CLAs come mainly from food. The most abundant CLA is rumenic acid (80% of CLA derived from food). This acid is named after its ruminant origin. It is mainly found in milkfat (85-90% of total CLAs from dairy products) and ruminant meat (*Appendix 1*). There are also synthetic CLAs available in the form of food supplements. They generally contain 50% of rumenic acid 9c-11t and 50% of 10t-12c. CLAs may also be produced through heating and/or partial catalytic hydrogenation of vegetable oils but in small amounts.

11. What is their impact on human health?

Biological effects of CLAs (particularly those of the 9c, 11t and 10t, 12c) have been studied in detail. Many studies suggest the existence of beneficial properties of one and/or both of these CLAs such as anti-carcinogenic, anti-atherogenic, anti-inflammatory, anti-diabetogenic or anti-obesity effects. However, most research has been carried out in cellular or animal models and very little in human subjects. The interpretation of these results is thus limited.

Two different CLA sources were used in research with human cells: synthetic mixtures (of 9c, 11t and 10t, 12c) or (ruminant-derived) foods naturally enriched in CLA (through livestock feeding).

The origin (natural or synthetic) of CLAs is particularly important to assess their biological impact.

So far, no clinical studies have shown the beneficial effects of synthetic CLAs (no anti-atherogenic, anti-inflammatory or anti-obesity effects). More specific work carried out on blood lipid markers associated with cardiovascular risks even suggests that these markers may be negatively affected by synthetic CLA supplementation.

However, intervention studies carried out on the effects of ruminant CLAs and particularly on rumenic acid, have demonstrated that they do not affect the blood lipid profile. A study on more than 1 800 subjects highlighted the fact that the presence of rumenic acid in the body tissues (as a result of CLA intake from naturally enriched dairy products) was associated with the prevention of coronary events. These data are in line with the conclusions of animal model studies, which have shown that the rumenic acid could prevent atherosclerosis from developing (evidenced by the regression of vascular lesions). With regards to the ruminant CLA's impact on other diseases (obesity, diabetes, cancer), no conclusive results have been reached at this stage.*

Like in the case of TFAs, it is therefore important to take the origin of CLAs into account in studies investigating possible adverse effects on health.

* A study involving diabetic patients has shown improvement of the insulin sensitivity following a diet particularly enriched in rumenic acid from dairy sources. Studies on anti-carcinogenic effects in human deliver contradictory results and require further research, taking into account the origin of isomers. Indeed, research in vitro and in vivo suggests that rumenic acid in particular could prevent tumours from developing, depending on the tissue and organs considered (for example, colon, lung and breast tissue).

Consumption, Recommendations, Labelling

12. Do we consume trans fatty acids?

In 2009, the French Nutrition and Health Agency (AFSSA) published estimates about TFA consumption of French people.* The average TFA intakes were 2.3g/d for adults and 1.9g/d for children, which represents 1% of the TEI** in the two population groups.

The intakes are slightly higher among men than women and among boys than girls. There is little difference by age among adults.

- In terms of percentage of total energy intake, the major contributors for adults are foods that contain natural TFAs (meat and dairy products). For children, the intakes of natural and industrial trans fatty acids are equally distibuted.
- The average ruminant TFA intake represents approximately 0.6% of the total energy intakes for adults and 0.5% for children; 0.9% and 0.7% respectively for consumers with the highest intake levels (95th percentile). These values are far below the TFA intake levels that have been identified as not posing any cardiovascular risk.
- The average industrial TFA intakes represent approximately 0.4% of the total energy intakes for adults and 0.5% for children; 0.6% and 0.7% respectively for the 95th percentile.

* However, due to the lack of data (survey Inca 2) and the uncertainties about the TFA content of many products not recorded in the Table Ciqual - French

Questions on Trans and CLA of Dairy Products

July 2013

food composition table (*first price products, discount products, mass catering, craft products, etc.*), these results must be interpreted with caution.
** The total energy intake of adults: approximately 2500 kcal/d for men and 1860 kcal/d for women. Children: 1900 kcal/d for boys and 1640 kcal/d for girls.

13. What is the contribution of dairy products?

In France, in terms of percentage of total TFA intake, the proportion of ruminant TFAs (dairy products, butter and meat) is higher than that of industrial TFAs for adults, (57.4 and 42.6% respectively). The distribution in children between the two origins is equivalent (50.7 and 49.3% of total TFAs).

Cheese is the primary source of TFAs for adults (22% of total intake), and the secondary source for children (14%). Butter is the primary source for intake of TFAs in children (14.4%) and the secondary source for adults (17%). The meat group is the fourth source of TFAs among adults (10.6%) and the third among children (11%).

This is partly due to the missing data for industrial TFA content of many products* but also due to the efforts of the last few years made by the food sector to decrease the industrial TFA content in their products.

* There have been numerous analyses of dairy products and meats to fill the Ciqual table used in the estimates. These products are thus overrepresented.

14. What are the health authorities' recommendations?

Recommendations to reduce TFA consumption were adopted for the first time in 2002 in the United States*. In 2005, in France, the AFSSA recommended a maximum TFA intake of 2% of the total energy intake, without decreasing consumption of milk and dairy products. According to the latest figures, the average total TFA intakes of the French population (including those of heavy consumers) are far below that threshold, regardless of age or gender, among both adults and children. **TFAs are therefore not a concern in the French people's diet.**

In the 2009 report, the AFSSA highlighted the fact that, in order to safeguard public health, it was necessary to take into account the origin (natural or industrial) of TFAs.

The Agency concludes:

- Natural TFA intake levels of the French population (0.5-0.9% of the TEI) remain lower than those identified as not posing any cardiovascular risk**;
- As the presence of industrial TFAs in food is only motivated by technical and functional interest, the AFSSA encourages decreasing the use of industrial TFAs, in human food as well as in animal feed, to reduce the risk of exposure. Alternatives to the use of TFAs for their technical and functional properties must be considered.

* Most of the international recommendations recommend less than 2% or even less than 1% of the TEI in the form of TFA (some countries exclude CLAs, while others do not). In Denmark, since 2003, foods containing partially hydrogenated vegetable fats must not contain more than 2% of TFA. This does not apply to the TFAs from natural origin (CLA or not).
** 1.5% of the TEI represents a daily intake of 1 litre of whole milk (or 2 litres of semi-skimmed milk) +200g of camembert +50g of butter.

15. How are TFAs labelled?

In Europe, it is not possible to label TFAs at present (44). Discussions in the Codex framework are not completed. Consumers wishing to know whether they consume TFAs from industrial origin can check the list of ingredients. The mention of "partially hydrogenated/hardened oils/fats indicate the presence of industrial TFAs (knowing that most brand products *a priori* do not contain them anymore or only traces).

Note that, whether at national, community or international level, the dairy sector is not in favour of TFA labelling and if TFAs are labelled, those of dairy origin should be differentiated or exempted. Indeed, the natural TFAs from dairy origin have no negative impact on health. Inclusive labelling of TFAs would be neither reliable nor relevant information for the consumer.

Summary

The term "trans fatty acid" (TFA) includes a multitude of molecules with different properties (physical, technological, physiological…) and various effects on health. An increased TFA consumption from industrial origin may raise concerns particularly in the context of cardiovascular disease risk, but TFA consumption from dairy origin is not associated with any deleterious consequences. Research on rumenic acid (the major Conjugated Linoleic Acid (CLA) in dairy products) even suggests that this fatty acid may have beneficial effects. In many European countries, food-processing manufacturers use less and less raw material containing TFA from industrial origin. As an example, nowadays, TFA intakes of French people are much lower than maximal limits established by the health authorities. TFA consumption is no longer a public health concern in many countries.

Questions on Trans and CLA of Dairy Products

July 2013

To find out more

- *La matière grasse laitière* – Sciences des aliments n° 28 (tomes 1-2) – 2008
- M.U. Jakobsen, K. Overvad, J. Dyerberg, et al. – Intake of ruminant trans fatty acids and risk of coronary heart disease. – Int J Epidemiol, 2008. 37, 173-82.
- J.M. Chardigny, F. Destaillats, C. Malpuech-Brugere, et al. – Do trans fatty acid from industrially-produced sources and from natural sources have the same effect on cardiovascular diseases risk factors in healthy subjects? Results of the TRANSFACT Study. – Am J Clin Nutr 2008; 87(3):558-66
- Motard-bélanger, A. Charest, G. Grenier, et al. – Study on the effect of trans fatty acids from ruminants on blood lipids and other risk factors for cardiovascular disease. – Am J Clin Nutr 2008; 87(3):593-9

Questions sur Produits laitiers &

8. Qualités nutritionnelles du lait (2004) 9. Calcium laitier (2004) 10. Ostéoporose (2004) 11. Fromage, nutrition, santé (2004) 12. Lipides (2005) 13. Cholestérol et athérosclérose (2005) 14. Beurre et crème (2005) 15. L'alimentation des Français (2005) 16. Les protéines (2005) 17. Prévention de l'hypertension (2005) 18. Les laits fermentés (2006) 19. Prévention du syndrome métabolique (2006) 20. L'alimentation de l'enfant (2006) 21. Santé bucco-dentaire (2007) 22. Les vitamines des Produits laitiers (2007) 23. Qualités nutritionnelles du lait et des fromages de chèvre (2007) 24. Les autres minéraux du lait et des produits laitiers (2007) 25. Produits laitiers et cancer (2007) Hors série n°1. Les « rumeurs » autour du lait (2006) - Hors série n°2 Histoire, sociologie et image du lait (2007)
26. Le lait à l'école (2008)

For more information, a bibliography or other issues

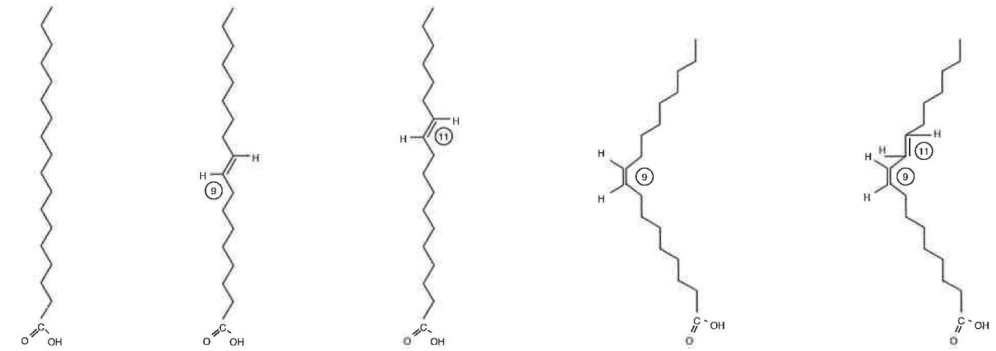
Dr Yvette Soustre – nutritionsante@maisondulait.fr
42 rue de Châteaudun – 75314 PARIS CEDEX 09 – Tel. : 01 49 70 72 24

Questions on Trans and CLA of Dairy Products

July 2013

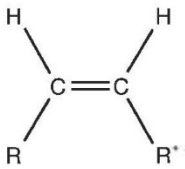
Appendix 1

18 CARBON LONG FATTY ACIDS

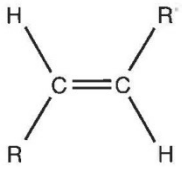


Stéarique C18 :0 | Elaïdique C18 :1 9 *trans* (n-9) | Vaccénique C 18 :1 11 *trans* (n-7) | Oléïque C 18 :1 9cis (n-9) | Ruménique (CLA) C18 :2 9cis 11 *trans* (n-7)

CIS AND TRANS CONFIGURATION

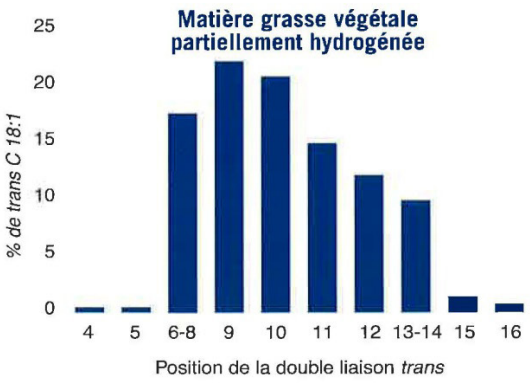


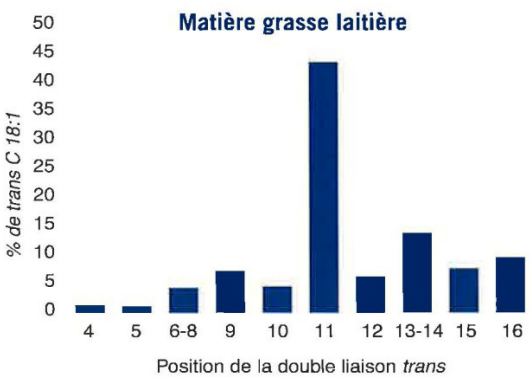
Configuration cis



Configuration *trans*

C 18:1 Trans Fatty Acid Profile of Partially Hydrogenated Vegetable oil/fat and MilkFat





Questions on Trans and CLA of Dairy Products

July 2013

Appendix 1

MILKFAT: A COMPLEX FAT

• Cow's milk contains between 3.5 and 4.3% of milk fat, composed of triglycerides that are themselves composed of several hundred combinations of short or long-chain fatty acids (C2 - C28), even and odd, saturated, mono- or polyunsaturated, cis or trans, linear or branched, ketone or hydroxy (12).

• The trans configuration of fatty acids in milkfat is to be found regardless the length of the carbon chain, but the isomers of oleic acid (C18:1 9c) are the most frequently found (97 to 98% of trans). The vaccenic acid (C18:1 11t) accounts for half the elaidic acid (C18:1 9t) for 7 to 14% and the 13t and 14t for the rest with some traces from 4t up to 16t.

• The trans fats, naturally present in milkfat, make up 1-6% of the total fatty acids. The TFA content of dairy products depends on their fat content. Semi-skimmed milk contains approximately 0.04g/100g, most cheeses less than 1g/100g and butter 3 to 4g/100g.

• The CLA levels vary between 1.7 and 7mg/g of fat depending on the product. The rumenic acid (C18:2 9c 11t) accounts for 90% of CLAs in milk-fat (i.e. 0.34 to 0.85% of the total fatty acids on average).

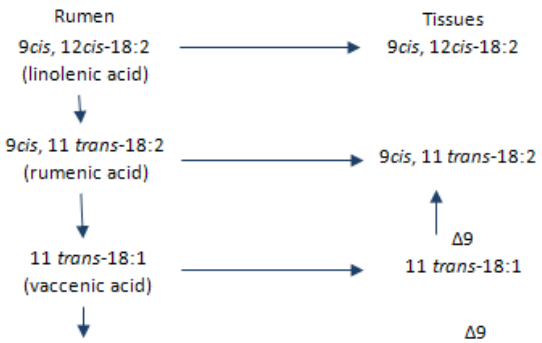
THE ORIGIN OF TRANS FATTY ACIDS FROM MILK

Rumen bacteria (e.g. in the rumen of cows, goats and sheep) convert polyunsaturated fatty acids provided by livestock feeding, i.e. linoleic acids (18:2 9c 12c) and alpha-linolenic acid (C18:3 9c 12c 15c), to vaccenic acid (C18:1 11t) through a cascade of hydrogenation and isomerisation reactions. This is called biohydrogenation. The vaccenic acid is then converted to stearic acid (18:0), which in turn will be converted to oleic in tissues. The rumenic acid (C18:2 9c 11t) is one of the first intermediaries of that bioconversion.

Moreover, during lactation, a Δ9- desaturase in the mammary gland converts a part of vaccenic acid (C18:1 11t) to rumenic acid. The Δ9- desaturase activity depends on food, which would explain the change of CLA levels in milk according to diet.

The vaccenic/rumenic conversion also occurs in other tissues. About 20% of the vaccenic acid is converted to rumenic in the human body.

Formation of trans fatty acid during biohydrogenation in ruminants



Questions on Trans and CLA of Dairy Products

July 2013

Appendix 1

Trans FATTY ACIDS AND CLA: VARIATION FACTORS

CLA and trans C18:1 composition of milk depends on two main factors:
1. the PUFA intake (18:2 n-6 or 18:3 n-3) to form CLA and trans 18:1 in the rumen
2. diets that modify ruminal hydrogenation microbial activity of these fatty acids

From the combination of these factors may arise very large variations of CLA and trans 18:1 contents of fatty acids from milk (up to 4-5% of CLA 9c11t and 10-12% of 18:1 11t). There is strong interaction between forage, starch products and lipid supplements.

The vegetable oils rich in 18:2 n-6 (sunflower, soybean) or 18:3 n-3 strongly increase the CLA content of milk.

- Spring milk is richer in CLA than winter milk, because cows' feeding is slightly different in spring and winter (the grass eaten by cows contains up to 75% of polyunsaturated fatty acids).
- A study on French butters revealed that the trans C18:1 content of total fatty acids ranges from 3.22% (winter average) up to 4.28% (spring/summer average).
- All trans 18:1 isomers are subject to these seasonal variations but with different intensity. They are coupled with slight fluctuations depending on the geographical location (different grasslands) and cattle breeds.
- CLA and trans fatty acid contents of dairy products mainly depends on the milk source; technology does not influence it.

TRANS PALMITOLEIC FATTY ACID (TRANS-C16:1n-7): AN UP-AND-COMING TRANS FATTY ACID

In humans trans palmitoleic acid is exclusively derived from an exogenous source. It is naturally produced by ruminant biohydrogenation. Trans palmitoleic fatty acid is primarily found in dairy products.

In 2010, a study involving 3 736 people highlighted an inverse association between plasma concentrations of trans palmitoleic acid and insulin resistance markers, dyslipidemia markers and the risk of type II diabetes. The authors of the study showed that increasing rates of trans palmitoleic acid are associated with the reduction of metabolic risks by acting on several factors, in particular: reduction of fat tissue, decrease in blood triglyceride levels, decrease of some inflammatory markers and increases in blood HDL-C. Individuals having a high level of plasma trans palmitoleic acid are three times less likely to develop diabetes.

This research suggests that the trans palmitoleic acid, which is a specific marker of dairy products' consumption, may play a beneficial (direct or indirect) role, by preventing metabolic disturbances from developing.

However, clinical intervention studies are still needed to confirm that hypothesis.

Questions on Trans and CLA of Dairy Products

July 2013

Appendix 2

TFA AND CLA CONTENTS OF SOME DAIRY PRODUCTS ACCORDING TO SEASON (g/100g)

	TFA without CLA	CLA included
Full-fat yogurt	0.06	0.07
	0.04	0.04
30% Cream	1.17	1.39
	0.73	0.83
Liquid cream	1.00	1.17
	0.64	0.73
Camembert	0.90	1.09
	0.44	0.49
Beaufort	0.78	0.96
	1.26	1.55
Roquefort	0.56	0.67
	1.07	1.27
Babeurre	0.06	0.07
	0.05	0.06
Fresh cheese	0.20	0.24
	0.12	0.14
Petit suisse	0.26	0.32
	0.16	0.18
Tomme vache	0.42	0.51
	0.30	0.35
Crottin	0.62	0.73
	0.65	0.75
Bûche	0.65	0.75
	0.59	0.67
Frais chèvre	0.39	0.46
	0.42	0.49
Boîte chèvre	0.42	0.49
	0.36	0.41
Cantal	0.51	0.61
	0.56	0.67
Reblochon	0.62	0.77
	0.51	0.63
Bleu	0.77	0.92
	0.54	0.63
Munster	0.66	0.78
	0.51	0.58
Saint Paulin	0.42	0.49
	0.31	0.35
Butter	3.02	3.79
	2.09	2.52

Summer Winter

The above data have been extracted from research work. They are based on the analysis of sample products and should therefore not be treated in any way as representative of all products available on the market.

Questions on Trans and CLA of Dairy Products

July 2013

Appendix 2

FREQUENTLY ASKED QUESTIONS

Does the manufacturing of dairy products produce TFAs?

The TFAs present in butter and, more generally speaking, in milk fat are of natural origin because they are provided by milk. Cows (like all the ruminants) produce them in one of their stomachs (rumen) from what they eat. Neither the manufacture of the butter nor that of other dairy products produces TFAs.

Should we reduce our TFA consumption from dairy origin?

Consuming TFAs from dairy origin does not pose any risk to health. Even if they are consumed in far higher quantities than those usually consumed in traditional food, these TFAs have no negative impact on health. Only high intakes of industrial TFAs (contained, for example, in some partially hydrogenated vegetable fats or in some products that contain them*) may be harmful.

* Partial hydrogenation of fats and deodorization of oils during their refining may produce TFAs, which can be found in manufactured products using these fats (biscuits, pastries and bakery products, ready meals, etc.)

Is the consumption of TFAs currently a major health concern in France?

The natural TFAs (mainly present in dairy products and meat) do not represent any danger to health. The food producers (in particular, brand products manufacturers) have significantly reduced the TFA content from industrial origin in most of their products (the content is generally lower than 1% or even 0%). Therefore, the TFAs are a priori not a concern anymore for most French people.

Does heating butter for domestic cooking produce TFAs?

Some Swiss researchers have recently analyzed “classic” butter, “cooking” butter and cream under “extreme” conditions. These three fats were heated to 180°C and 220°C for 20 and 60 minutes. As a result, cooking butter does not produce TFAs. Milk fat can thus be used without risk by cooking butter lovers.

* With regard to fried foods, be sure to choose appropriate oils and to respect cooking temperatures recommended by oil or fryers manufacturers. Do not burn oil. The fumes released by heating are a sign that fatty substances begin to degrade, which forms harmful substances. The recommended frying temperature should be between 150°C and 175°C. Frying baths should be regularly changed.

Are the CLAs beneficial fatty acids to prevent some diseases?

An important distinction must be drawn between TFAs from dairy origin and those from industrial origin, which do not have the same effects on health. Similarly, the CLAs are not all the same. Indeed, while some studies (with cellular or animal models) suggest that the main CLA present in milk, i.e. rumenic acid, may have positive effects on certain diseases, other studies show that high intakes of some other (especially synthetic) CLAs may be toxic. High intakes of CLA supplements (capsules, pills, enriched food) are strongly discouraged.

How can we know if we consume TFAs?

Only trans fatty acids from industrial origin have to be monitored. Consumers may check the list of ingredients on food labels. The mention of “partially hydrogenated/hardened oils/fats” indicates the presence of industrial TFAs.

(Most branded products *a priori* no longer contain them or only traces). Additional information may be requested from the manufacturer.