



A Review on Trans-fat: Sources, disorders, and alternatives.

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ABSTRACT:

Transfat is the unsaturated fat that contains one or many unconjugated dual bonds in trans arrangement i.e., triglycerides which are well off trans fatty acids (TFA). These are formed when liquid oils are turned into solids like margarine by incomplete hydrogenation called partially hydrogenated oils (PHOs). Many Research has manifested the connection between trans fatty acid with coronary diseases (CVD), breast carcinoma, reduction in the childbearing period, threats of pre-eclampsia in the childbearing period, colorectal carcinoma, Diabetes mellitus, overweight, allergy and infant vision, and nervous system-related disorders. There is a 23% increased chance of risk in coronary events if 2% vitality uptake of simple sugars with TFA and in an isocaloric diet. An event to eliminate commercially prepared TFA from public groceries is involved in the 'REPLACE' Program which is recently launched by "WHO" With the aim of worldwide exterminating up to 2023. For this purpose, null margarine is another method achieved which involves hydrogenation and interesterification processes and degradation by the microbial community. This review aims to produce a replacement for trans-fat and facts about it.

Keywords: trans fatty acids(TFA), unsaturated fatty acids, saturated fatty acids

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INTRODUCTION

During the improper hydrogenation process, in which cooking oils are transformed into margarine, fatty acids are produced by shortening the plant. A series of metabolic studies in the last 5 years has given clear verification that trans fatty acids rises the plasma levels of LDL (bad cholesterol) and minimize HDL (good cholesterol) concentrations compared to ordinary fats. TFA has no known nutritional gain and clear adverse metabolic effects exist. The only plausible root of trans isomers is milky solids and the flesh of the fourth stomach, in which bacterial isomerases are able to convert the double bonds of triglycerides in plants to the trans dimension. Bringing down all fat intake may not be the potent way to reduce trans fatty acid utilization.

SOURCES

Lipids containing trans dative bonds mainly come from the commercial route by partial hydrogenation of triglycerides containing unsaturated fatty acids into saturated fats and secondarily by bacterial conversion of unsaturated fatty acids in the paunch of the fourth stomach of animals [1, 2]. Vaccenic acid is the major ruminant TFA and elaidic acid is the main TFA isomer in industrial hydrogenation. Processed foods and oils provide approximately 80% of trans fats in the diet, compared to 20% that occur naturally in food from animal sources [1]. Breast milk may contain industrially produced trans fatty acids (TFAs), which can affect the content of essential fatty acids (EFAs). The TFA content of the mother's diet was similar in the colostrum, conventional mild, and mature milk stages: 1.64 ± 1.25 g, 1.39 ± 1.01 , and 1.66 ± 1.13 g, respectively. "Animal sources" of trans fat were defined as milk, cheese, eggs, meat, fish, and butter, and "industrial sources" of trans fat as oils and fats, biscuits, pizza, cereals, seeds, nuts, chocolate, soups, Savory snacks, food and restaurant dishes[3].

HEALTH RISKS OF TRANS FATTY ACIDS:

Due to the discovery of adverse effects on blood cholesterol profile and the increased risk of coronary heart disease from industrial trans-fat, public health recommendations have led to a reduction of total trans-fat intake to less than 1% of total energy intake (En%). Eliminate industrial trans-fat [3][4]. The most recent estimates of the population's total trans-fat intake range from 0.3 to 4.2 percent of energy intake (En%). In 22 out of 29 countries (76%), the mean trans-fat intake was below the WHO recommendation of 1 En%. These adverse effects of acute fatty acids have been confirmed in causal metabolic studies. There is an association between TFA and the incidence of non-fatal myocardial

infarction from coronary heart disease [1].

1] Cardiovascular diseases:

The World Health Organization (WHO) identified CVDs as the most common cause of worldwide death. CVDs included a group of disorders of the heart and blood vessels such as coronary heart disease, cerebrovascular disease, deep vein thrombosis, pulmonary embolism, peripheral arterial disease, rheumatic diseases, and congenital heart diseases. They are usually associated with atherosclerosis, caused by fatty deposits inside the arteries, and determining hyperlipidemia as a risk factor [5]. In the Framingham study, a significant, moderately increased risk of heart disease was found associated with the intake of margarine, which is a major source of TFAs. It is noteworthy that according to the WHO report, about 540,000 deaths yearly can be attributed to the intake of TFAs from industrial sources. Indeed, although an early study by the US Department of Agriculture showed that vaccenic acid raises both HDL and LDL cholesterol further studies found that high levels of vaccenic acid were associated with disease severity and mortality in patients with chronic heart failure [4]. studies have shown that vaccenic acid can be beneficial against CVD. Indeed, Bassett and coworkers found that butter enriched in vaccenic acid did not induce atherosclerotic plaque formation and reduced the serum cholesterol and triglyceride levels in LDL receptor-deficient mice in comparison to regular butter [5, 6].

Recently Scientists from the University of Birmingham and Acticor Biotech have found a new drug, glenzocimab, that could improve long-term outcomes for heart attack patients. Glenzocimab reduces clot formation, and laboratory findings have been impressive.

2] Fatness:

Fatness is also known as a long-lasting and nontransmissible disease and an important public health problem due to its consequences like hyperlipidemia, high blood pressure, and impaired insulin sensitivity mostly observed in this condition different information was found related to the effect of trans fatty acids which showed a positive connection between the use of tTFA and fatness[5]. Evidence from everlasting studies in primate patternsproposes that may have a substantial lipogenic effect than cis-monounsaturated fatty acids. Data from a long-term study in a primate model suggest that TFA may have a greater adipogenic effect than cis-monounsaturated fatty acids[5, 7].

3] Impaired insulin sensitivity:

Some proof shows that more consumption of trans fatty acid can lead to highly impaired insulin sensitivity. An observational study of healthy and fatty or diabetic persons showed that trans fatty acid provokes impaired insulin sensitivity in fatty or diabetic persons (individuals with established impaired insulin sensitivity) but may have fewer effects in young ones. Person's having established impaired insulin sensitivity had increased fasting insulin and impaired insulin sensitivity due to palm oil partially hydrogenated soybean oil diets in comparison with canola or soybean oil diet [5].

4] Cancer:

Cancer is the second dominant cause of worldwide death, about 9.6 million deaths were occurred [4]. according to Stender et .al trans fatty acid intake and breast and large intestine, cancer is correlated with each other [5]. TFAs have been postulated to influence breast cancer. According to Matta et.al, increased breast cancer risk is due to more dietary consumption of industrial trans fatty acids, particularly elaidic acid. The action of a cardioprotective agent of vaccenic acid individually from conjugated linoleic acid in breast carcinoma cells shows similarity with the mitochondrial-mediated apoptosis pathway [5, 7].

5] Swelling:

In the last few years, systemic long-lasting swelling was related to many diseases that resolve the dominate cause of worldwide death are cardiovascular disease, carcinoma, diabetic Mellitus, renal disorders, nonalcoholic fatty hepatic disorders, and autoimmune and mental diseases [5]. It has been confirmed that the use of trans fatty acids influences many risks factor like higher systematic swelling [5]. The latest evidence shows that trans-fat contributes to swelling. In females, more consumption of trans fatty acids was related to the higher activity of the TNF system. Person's those with a higher Quetelet index, more consumption of trans fatty acids was also related to a higher level of interleukin-6 and protein Quetelet made by the liver (CRP)[8, 9].

Swelling effects have been published in randomized, controlled trials. The person suffering from hyperlipidemia and having a soybean-margarine diet (containing trans fatty acid with 6.7percent energy) than soyabean oil diet (containing trans fatty acid with 0.6 percent energy), after one month person shows increased secretion of interleukin-6 and TNF by mononuclear cells; the secretion of interleukin-1beta was not that much affected. Due to inflammation being an individual risk factor for arteriosclerosis, rapid death from cardiac causes, diabetes, and heart attack, 29- 32 the inflammatory effects of trans fats may show their effect on blood vascular health. Depending on the positive relationship between CRP levels and the risk of blood vascular disease, 33 different CRP levels were observed with median

consumption of trans fat of 2.1 percent in comparison with 0.9 percent, of total energy consumption of 25 correlate to more risk of total 30%[9].

Figure 1: Trans Fatty acid content in different food items

Types of foods	Trans fatty acid content		
	g/typical serving	g/100 gm	%Of total fatty acids
Bakery products			
Cake	1.7	2.7	16
Doughnuts	2.7	5.7	25
Muffin	0.7	1.3	14
Cookies	1.8	5.9	26
Brownie	1.0	3.4	21
Sweet role	3.3	4.7	25
Pie	1.6	5.8	22
Fast or frozen food			
Breaded chicken nuggets	5	4.9	25
French fries	4.7- 6.1	4.2- 5.8	28- 36
Pizza	1.1	0.5	9
Burger	5.6	3.4	28
Packaged snacks			
Popcorn	1.2	3	11
Corn chips	1.6	5.8	22

REGULATION

FDA has the necessary products of ordinary edibles and a small number of dietary nutrients to register transfat on their nutriment description. Makers of nourishing supplements should mention transfat on the companion label when their commodity carries a notifiable quantity (0.5 g) of trans fat. The FDA has evaluated that by 2009, the serviceable results of this marking regulation will result in a 0.1% decline in total fat consumption by adults. In the US inhabitants, such a reduction in trans fat input would be judged to lead to a drop-down in serum LDL cholesterin as an impact of the foreseen dietetic alteration from this judgment. The FDA calculated that the helpful lipid outcome would turn in a gain of deducted life years per annum in the United States. The FDA moreover measured, by comprising annulment of both lethal and non-lethal happenings, that this decision will give yearly savings to the economy. Tiburon, California has become America's first city to ban trans fats from eateries in 2004[10, 2].

CONCLUSION:

Trans fats are better understood today than they were 20 years ago because to advances in nutrition science, but additional studies are still required to evaluate their total influence on heart disease. To satisfy consumer requirements and preferences, food producers must redesign their goods to cut back on or substitute trans fats. A healthy alternative is to limit foods high in saturated fat, trans fat, and/or cholesterol, such as whole-milk dairy products, fatty meats, tropical oils, partially hydrogenated vegetable oils, and egg yolks, and choose foods low in these substances. To meet total caloric needs, total fat intake (saturated, trans, monounsaturated, and polyunsaturated) should be modified. People who are overweight shouldn't consume more than 30% of their total calories as fat. Despite being unhealthy, trans fats shouldn't be completely excluded from the diet. Experts in nutrition and dietetics claim that removing trans fats from the diet requires significant dietary adjustments (such as removing trans-fat-containing meats and dairy products) and may instead lead to inadequate nutritional intake, posing health hazards.

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