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## Trans fat and cholesterol content in processed food products

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#### Abstract

Every day, new food products enter the market and are mass-marketed; chips, chocolates, sweets, sugary snacks, dairy products, meats, poultry, veggies, fruits, and just about every other food imaginable. Processing actually improves the safety of food products by providing packaging that protects them from bacterial or virus contamination as well as spoilage. Fatty acids are major component in the Food & other related products. In lieu, their determination and estimation is of utmost significance. Thereafter, the present report is entitled for the analysis and determination of trans fatty acids and cholesterol in Food Products. During the investigation, it was observed that the food products and their nutritional quality in relation with other nutritional parameters was analyzed through gas chromatography. Further, it was observed that the Trans fatty acid (Elaidic Acid) level ranged from 5.9-30.0 percent, as per the composition of fatty acid present in the respected sample.

**Keywords:** Cholesterol, trans fat, fatty acid, food

#### Introduction

The rate heart patients are increasing day by day and the heart attack is a major cause of death world over. There are several reasons for heart diseases but one of the most important reasons is hypercholesterolemia. The blood stream carries cholesterol in particles called lipoproteins. Normally intake of cholesterol in diet is not very high. It is necessary to limit the intake to less than 300 mgs in a day. But much bigger source of cholesterol is body itself. About 1 mg of cholesterol daily synthesized in the body and all the 27 carbon atoms of cholesterol are synthesized from acetyl-coA. Intake of certain fats such as saturated fats, which solidifies in winter, such as coconut oil, Palm oil and hydrogenated oils (Vanaspati) raise the cholesterol level. On the other hand, taking vegetable oils known as polyunsaturated fats like safflower oil, mustard oil, and sunflower oil lower the cholesterol. Food processing is the step that our food takes before it reaches our tables. A variety of procedures and methods are used to prepare harvested crops and slaughtered cattle. They are then made into appealing and marketable meals human-made products (or other animals). The American Heart Association adopted a recommendation of limiting dietary cholesterol intake to 300 mg/day for healthy individuals in the United States, and with recommendations of restricting egg consumption to a maximum of three whole eggs per week.

Traditional refining of oil bearing plants can produce fats and oils of good quality which provide needed energy and fat soluble vitamins. Commercial refining produces fats and oils that can be of high quality and have the characteristics of bland taste, clear colour, good keeping quality and frying stability. Refining may remove nutritionally valuable carotenoids to yield oils of low colour, but retains substantial proportions of tocopherols, and does not change fatty acid or triacylglycerol compositions. Temperature, time and pressure must be carefully controlled during industrial refining. Saturated fats mostly used in the preparation of many processed foods, baked items, and fried foods makes all these food items high in saturated fats (Am. Heart Assoc, Saturated fat 2015). Saturated fats in the diet can raise overall cholesterol, bad or Low-Density Lipoprotein (LDL) cholesterol and a little amount of good cholesterol HDL (High-density lipoprotein). Additionally trans fats are formed due to partial hydrogenation of unsaturated fatty acid (like refined vegetable oil), while cooking food at high temperatures for prolong time. High concentrations of Trans are found in Vanaspati, shortening and margarine. Food products rich in trans fats are baked food, fried food, frozen goods, junk like pizza and burger etc.

Thus the present investigation was carried out to identify and limits those sample of edible fats that are rich in cholesterol and trans fat.

### Material and Methods

The majority of chromatographic methods for determining cholesterol in meat and poultry were originally developed for blood serum analysis (Abell and others 1952; Gambert and others 1979; Cohen and others 1980; Iwata and others 1987; Pelletier and others 1987; Takatsu and Nishi 1987; Eckfeldt

and others 1991; Nakajima and others 1995) [38]. Gas chromatography (GC) is a common type of chromatography used in analytical chemistry for separating and analyzing compounds that can be vaporized without decomposition. There are two phases in GC viz. stationary phase - Column (different types of column according to the compounds) and mobile phase - Gas the gases used in GC are Nitrogen, Hydrogen and Zero Air. Nitrogen goes in column and is used as carrier gas. Hydrogen is the fuel gas while zero air is used for ignition and contains 20% O<sub>2</sub>.

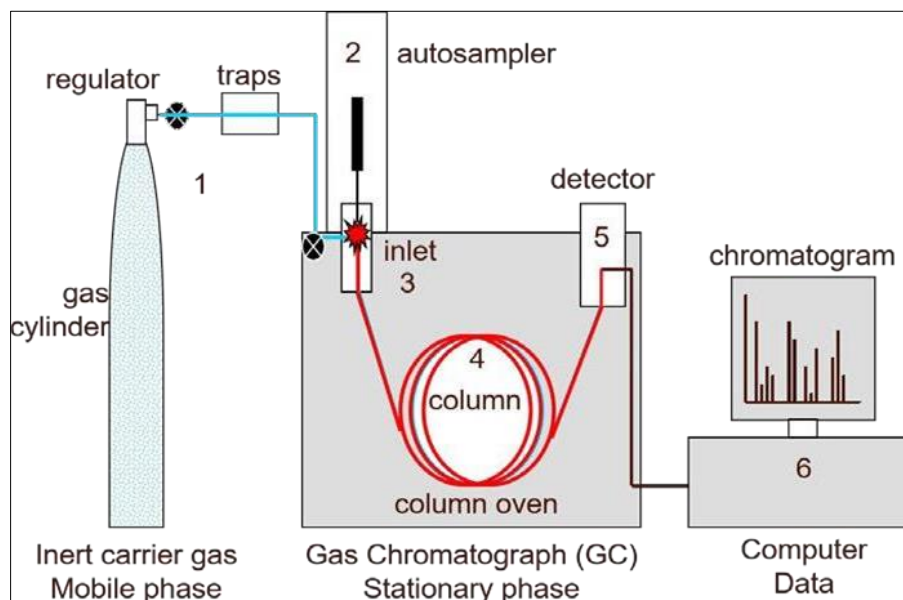


Fig 1: Diagram of Gas chromatography instrument

### Calculation

For Food Samples

- **Saturated Fatty Acid:** Sum of all saturates without double bonds.
- **Monounsaturated Fatty Acid:** Sum of all fatty acid with one cis double bond.
- **Polyunsaturated fatty acid:** Sum of all fatty acid with two & more than two cis double bonds.
- **Trans Fatty Acids:** Unsaturated fatty acid with one or more double bond in the trans configuration.
  - SFA (% wt.) = Area% × Fat%
  - MUFA (% wt.) = Area% × Fat%
  - PUFA (% wt.) = Area% × Fat%
  - Trans fat (% wt.) = Area% × Fat%

### Results and discussion

In this study food samples viz. pizza, breakfast cereals, fat spreads, meat products, chips, savory snacks, and confectionery were analyzed for trans fatty acid (TFA) and cholesterol content. Results showed that levels of trans fat in those food samples is considerably high in foods such as fries, chips because of the oil used during the time of processing methods like frying. The hydrogenated vegetable oil is used at that time as it increases the shelf life of foods, gives it good texture and flavor. The trans fatty acid content of industrially hydrogenated fats varies widely and may account for up to 60% of the fatty acid content, whereas the trans fatty acid content of beef and dairy products is considerably lower and accounts for 2%–5% of the fatty acid content (Weggemans *et*

*al*, 2004) [40]. Results and discussions for each type of food product have been discussed below.

#### (a) Baked and fried food products

Partially hydrogenated oils are simply industrially generated (artificial) trans fats, which have been linked to heart disease, strokes, and heart attacks. Vanaspati, ghee, margarine, and vegetable shortening all contain partially hydrogenated oils. These oils can be found in almost all baked goods and fried products. All the selected bakery and fried products were found to have trans fat content in the range 0.13 to 0.99 & (Table 1). Among others choco lava was found to have SFA 12.97%, MUFA&PUFA 8.32% and TFA 0.99% maximum than others. Junk and deep-fried foods not only contain heaps of salt, refined starches and added sugar, but are also loaded with trans-fatty acids (Gebreselassie and Clifford, 2016) [9]. Even if a product label says "trans-fat-free," read the ingredients because manufacturers can use the logo until the food contains 0.5 gram of Trans fat, which is the daily recommended allowance of up to 4 gram. Bakery products were found to have cholesterol content in the range 1.5 mg/100g to 2.47 mg/100g (Table 2). However, fried products are considered to have direct correlation with increase in bad cholesterol level (Hwang and Winkler-Moser, 2016) [15]. The addition of multigrain flour to a variety of bakery products has a significant impact on the nutritional value and somewhat effective in reducing cholesterol level (Bijlwan, *et al*, 2019) [6].

**Table 1:** Fatty Acids in Different Food Products

S. No	Food Samples	TFA%	SFA%	MUFA%	PUFA%
1.	Arabian mutton	0.77	3.18	3.09	4.97
2.	High Protein Peanut Butter	0.09	14.34	21.82	9.04
3.	Bingo Ma Pizzaah	0.14	14.49	12.85	3.60
4.	Ghee	4.398	66.10	25.36	4.03
5.	Pork Sausage	0.01	7.70	10.18	1.35
6.	Moongs Cheese Finger	0.10	3.54	2.52	1.72
7.	Keema Samosa	0.13	1.89	9.34	3.96
8.	Choco Lava	0.99	12.97	6.40	1.92
9.	Vegicken Dhaba Curry	0.20	6.04	8.43	17.43
10.	Smoke Flavored Dressing	0.17	5.19	6.86	16.79
11	Keema Wrap	0.20	3.05	5.15	2.26

**Table 2:** Cholesterol in Different Food Products

S. No	Food Samples	Cholesterol(mg/100g)
1	Quick Cooking Oats	0.926
2	Spicy Chicken Nuggets	0.196
3	Cheese Burrata	37.790
4	Chocochip Cookies	1.508
5	Cow Ghee	14.754
6	Protein Powder	2.597
7	Cheese Spicy Veg Roll	2.474
8	Egg Marble Cake	18.064
9	Dark Fantasy Chocolate Milk	0.936
10	Gluten Free Cookies with Deal	4.045

**(b) Frozen products (pizza)**

Due to its popularity, pizza is considered one of the most popular snack foods. It has a lot of refined sugar, flour, polyunsaturated fats, salts, and a slew of other ingredients. In the selected pizza sample SFA 14.49%, MUFA&PUFA 16.45% and TFA 0.14%, respectively. Each slice or dish of frozen pizza found to have about 0.3 gram or more trans fat (Romero, Cuesta and Muniz, 2000) <sup>[34]</sup>. Trans fats are responsible for the flaky quality of a frozen pizza crust. The convenience factor of this frozen cuisine is not worth the health risks it poses due to its high trans-fatty acid content.

**(c) Dairy Products**

Dairy food is the richest natural source of 'harmful' fats like long chain saturated and trans fatty acid in the diet (Gebauer *et al*, 2011) <sup>[8]</sup>. It has been reported that there is no evidence that the prevailing TFA in milk exerts the same unfavorable effect as exerted by the TFAs of the hydrogenated vegetable oils in the diet. However ghee is found to have TFA content of 4.398%, which might be due to presence of unsaturated fatty acid (MUFA and PUFA) that accounts for 29%, respectively. About 70% of dairy fat contains SFAs of which the majority (45%) are of 12–16 carbon chain length and 2.7% are trans fats and these have the ability to raise plasma cholesterol (Lindmark-Månsson, Fondén and Pettersson, 2003) <sup>[22]</sup>. Milk contains cholesterol as a natural component, it is relatively low in cholesterol (i.e. less than 0.5 percent of milk fat). In sample analysed the amount of cholesterol was found to be in the range 14.75 mg/100g to 37.79 mg/100g. Its concentration in dairy products is proportional to the fat content and found to be maximum for buffalo milk and products developed thereof.

**(d) Meat and Meat Products**

Meat and meat products are reported to have high fat content mostly saturated in nature that raises the bad cholesterol level. Cholesterol content of raw and cooked meat and poultry

products ranges from 40 to 90 mg/100 g Earlier studies (Mazalli, 2009; Honikel, 2009; Mourot and Hermier 2001; Piironen *et al*, 2002; Valsta *et al*, 2005) <sup>[24, 14, 27, 32, 39]</sup> have reported high cholesterol in processed meat and meat products. As a result of anaerobic bacterial fermentation in the rumen, trans-fatty acids occur naturally in animal fat. TFA content in meat and meat products ranged from 0.2% to 0.77%, respectively. The gut absorbs the trans-fatty acids, which are then dispersed throughout the animal's fat stores. Thus animal and poultry fat are reported to increase bad cholesterol level in healthy persons causing sever problems (Joseph, 2016) <sup>[18]</sup>.

**Conclusion**

Consumption of fast food vis. pizza, breakfast cereals, fat spreads, meat products, chips, savory snacks, and confectionery are reported to have associated risk factor. In the selected food samples the total TFA contents ranged from 0.002 to 0.1 g (g/100 g), respectively. Among the studied fast-foods, pizza, and burger, fries, had the highest TFA content, while cakes and chips had the lowest. Dairy product such as ghee also contains TFA in the range of 4-5% respectively. Cholesterol have been found in minor percent in all the food samples, which is highest in animal fat i.e. Cheese burrata 37.79%, respectively. Animal fats such as meat and dairy fats contribute to the diets high in TFA. Consumers should be aware of trans fat-containing products and avoid them. Alternative fats should be used in preparing food and manufacture by eateries producers, and local, state, and governmental institutions should support these attempts by enacting enacted regulations prohibits the use of trans fats.

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