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The Trans Fat Dilemma: Taste and Health

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Fats and oils are essential in our diet and play a crucial role in human health, but their chemical structure determines the impact on human body. The effects of fats/oils on the health and their contribution to taste are two separate matters. Fats are made up of different types of fatty acids. In the era of largescale food processing, trans fatty acids (TFAs) are the compounds produced by slight atomic rearrangement contributing to desirable culinary properties but significant health risks. Hence, it is important to explore the science behind trans fats, from their structure to the impact on our health.

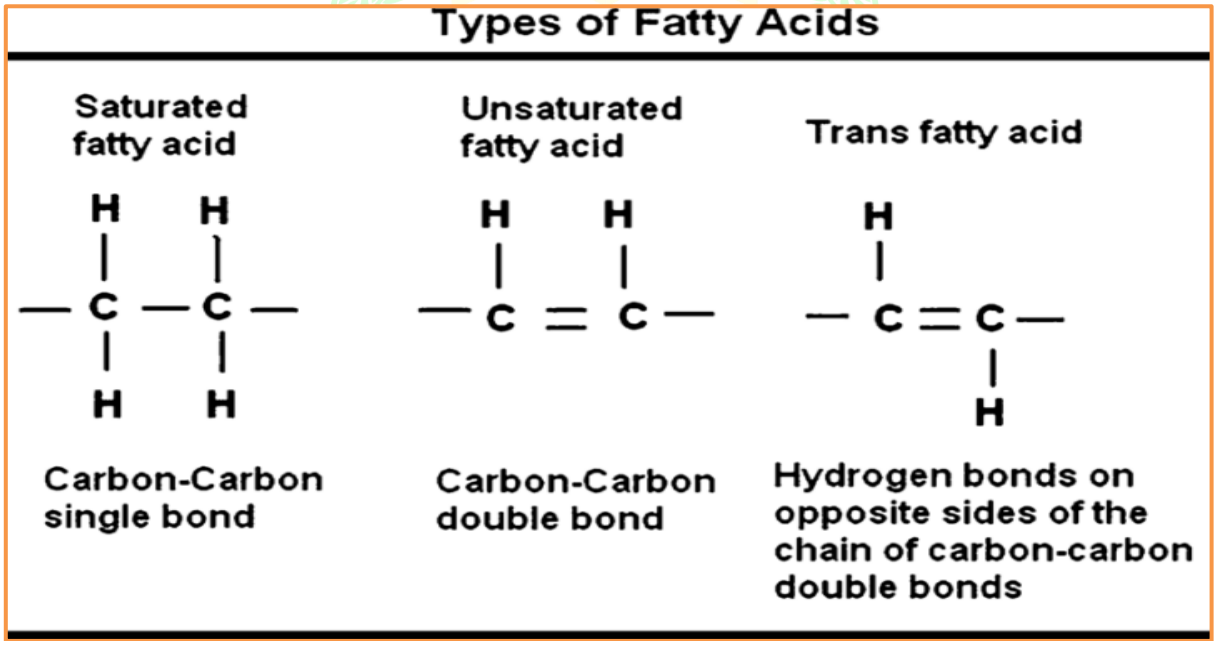
The molecular structure of fats: *cis* vs *trans*

Natural fats and oils are primarily triacylglycerols (TAGs), which are esters formed from glycerol and three fatty acid chains. Fatty acids are classified by their saturation:

- **Saturated Fatty Acids:** No double bonds, straight, flexible chains and solid at the room temperature (e.g., butter).
- **Unsaturated Fatty Acids:** One or more double bonds, commonly found in the *cis* configuration.

The *cis* configuration is key where two hydrogen atoms adjacent to the double bond are on the same side. This forces the carbon chain to bend, preventing the molecules from packing efficiently. Hence, *cis*-unsaturated fats are liquids, e.g., sunflower oil, olive oil etc.

Trans fatty acids are geometric isomers of their *cis* counterparts. The hydrogen atoms are on opposite sides of the double bond. The carbon chain is straighter, more rigid molecule that behaves more like a saturated fat.



Sources of trans fats

The two primary sources of trans fats are:

- Natural (Ruminant): These are produced in the stomach of ruminant animals (like cows and sheep) through bacterial biohydrogenation of unsaturated fats from their feed. The primary TFAs are vaccenic acid and rumenic acid. They constitute a minor part (≈20%) in the diet.
- Artificial (Industrial): The majority (≈80%) comes from an industrial process called partial catalytic hydrogenation (PCH). This involves bubbling hydrogen through vegetable oil in the presence of a metal catalyst (like nickel).

The Industrial 'Miracle'

PCH was a breakthrough for the food industries because it allowed the manufacturers to inexpensively convert liquid vegetable oils into semi-solid fats (vs saturated fats like butter, ghee which are relatively expensive). These partially hydrogenated oils offered:

- Enhanced oxidative stability, leading to a longer shelf life and flavour stability.
- Superior textural properties, providing ideal hardness, plasticity, and crispness for baked goods, fried foods, and spreads.
- High-temperature stability for repeated frying.

Health aspects of trans fatty acids

Scientific studies establish a link between significant intake of partially hydrogenated vegetable oils, which is the primary source of trans fatty acids to the increased risk of cardiovascular disease (CVD), breast cancer, preeclampsia, colon cancer, diabetes, obesity and allergy. Some of the documented studies on the adverse health effects are:

1. **Heart disease** - TFAs increase levels of low-density lipoprotein (LDL), the "bad" cholesterol that deposits plaque in arteries. Simultaneously, they decrease levels of high-density lipoprotein (HDL), the "good" cholesterol that helps remove plaque. This combined effect markedly increases the risk of atherosclerosis and coronary heart disease.
2. **Diabetes** – consumption of TFAs may increase insulin resistance resulting in the increased risk of Type 2 Diabetes.
3. **Cancer** - Dietary TFAs may contribute to changes in the functioning of cell membranes, which as a result may lead to the development of some cancer tissue**.**
4. **Newborn health** - Dietary trans fats are transformed by the placenta to the foetus and incorporate into foetal tissues. TFAs may adversely affect infantile birth weight and reduce the duration of pregnancy.
5. **Allergy** - Positive association was observed between TFA intake and incidence of asthma, allergy and cold. Such association was not observed with intake of MUFA and PUFA.

These evidences proves that trans fats (TFAs) are detrimental to human health. Eliminating them from the diet is crucial for improving public health.

The way forward

- In response to the scientific evidence on the health risks of trans fats, the World Health Organization (WHO) has launched an initiative to eliminate industrial trans fats from the global food supply by urging countries to implement ban on partially hydrogenated oils.
- The recommendation limit for the consumption of trans fat (industrially produced and ruminant) is less than 1 % of total energy intake, which is less than 2.2 g/day for a 2000-calorie diet.
- For consumers, awareness is the key. The most reliable way to avoid industrial TFAs is to read ingredient lists and avoid products that list 'partially hydrogenated oils' and to check the calorie from trans fats on the nutrition information.

Conclusion

The evidence is clear that reducing the intake of trans fats is a vital for better health. The promising reality is that through global cooperation, smart policies and consumer awareness, we can have a path to eliminate trans fats from our diet. This proactive approach safeguards public health ensuring people to continue enjoying a wide variety of safe, tasty, and affordable foods while building a healthier future for all.

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