METABOLIC EFFECTS OF ULTRAPROCESSED FOOD CONSUMPTION

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1. OBJECTIVES

- To study the effects on the metabolism from the consumption of ultraprocessed foods.
- To differentiate between food categories.
- To study what are the health effects due to the consumption of ultra-processed foods.
- To observe the consumption trends of ultra-processed foods in recent years.

4. SUGARS

- Fructose and glucose follow different metabolic pathways when they are absorbed in the organism, as fructokinase enzyme does not phosphorylate the same Carbon for fructose and glucose.

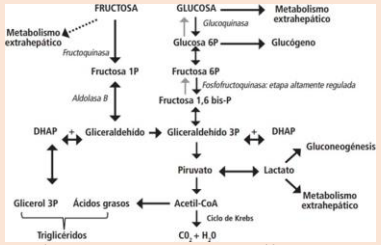

Figure 6. Comparison of metabolic pathways in the absorption of fructose and glucose (Zago et al. 2017)

- This difference causes that these two metabolic pathways can't be connected between them, so the excess of the substances produced from fructose won't be able to be transformed in glycogen, and instead will follow lipogenesis ways to be converted in fat.

5. CONSUMPTION TRENDS

- From 1909 to 1999, the consumption of refined soybean oil has more than a thousand times increased, and now composes the 7% of the total calories in the diet of a United States inhabitant.
- Sugar consumption in 1990 accounted for the 8% of the total calories of the Spanish population, and in 2010, it already exceeded the 13%.
- These studies, which referes to the consumption of refined vegetable oils and sugar, are only one part of an amount of studies that have proved the consumption of this ultraprocessed food is increasing by the years without control.

2. NEW FOOD CATEGORIES

Figure 1. Modified from Monteiro et al. 2019

6. CONCLUSIONS

- ✓ The most important conclusion is that the consumption of ultraprocessed food causes harmful effects for the consumer health.
- ✓ An excess of refined vegetable oil consumption can cause inflammation. Likewise, from an excess of consumption of trans fatty acids there have been described diseases as obesity or cancer.
- ✓ An excess of sugar consumption can lead to an accumulation of fat over the time.
- ✓ The consumption of ultraprocessed food has ridiculously increased in just a few decades.

3. REFINED VEGETABLE OILS

Relation between an unbalanced ω-6/ω-3 rate and inflammation

- ω-3 and ω-6 are essential fatty acids, so they need to be ingested in our diet. From each of them, our organism can build new ω-3 and ω-6 fatty acids.

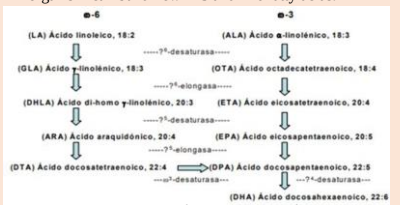

Figure 2. Biosynthesis process of AA, EPA and DHLA fatty acids (Martha Coronado Herrera 2006).

- The metabolic pathway of ω-3 and ω-6 fatty acids synthesis is connected to the synthesis of eicosanoid precursors (pro or anti inflaming).

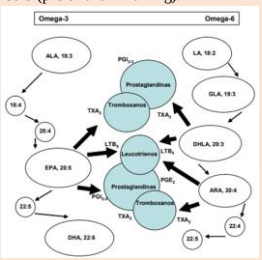

Figure 3. Metabolism of polyunsaturated fatty acids and health-associated end products (Martha Coronado Herrera 2006).

- The higher ω-6/ω-3 rate, the higher production of proinflammatory eicosanoid precursors. This rate should be from 1/1 to 4/1, but nowadays it can be from 16/1 to 25/1.

Trans fatty acids consumption in relation with harmful effects for health

- Cis fatty acids configuration: the Hydrogens are located on the same side of the chain. Trans fatty acids configuration: the Hydrogens are located on the opposite side of the chain.

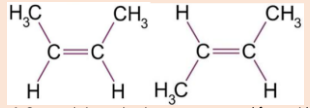

Figure 4. Geometric isomerism in monounsaturated fatty acids. On left, a cis fatty acid, and on right, a trans fatty acid (Barrera-Arellano and Block 1993).

- In nature, vegetable oils have the majority of isomers in cis position, but they are not useful for food industry.
- With hydrogenation process, vegetable oils change its configuration from cis to trans, and it allows they can be solid at room temperature.

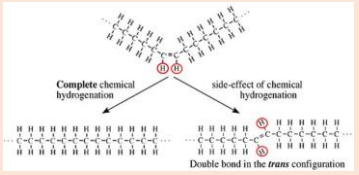

Figure 5. Hydrogenation process of unsaturated fatty acids, modified from the reference of (Barrera-Arellano and Block 1993).

- However, this kind of fatty acids can contribute harmful effects for the health of the consumer, like the coronary disease, obesity or cancer.

REFERENCES:
Barrera-Arellano, D., and J. M. Block. 1993. "Technical and Nutritional Implications of Trans Fatty Acids in Hydrogenated Oils." Grasas y Aceites 44(4–5): 286–93.
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Monteiro, Carlos A. et al. 2019. "Ultra-Processed Foods: What They Are and How to Identify Them." Public Health Nutrition 22(5): 936–41.
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