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Editorial

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The Basic of Trans-Fatty Acids in Foods: An Update to Prevent Diseases

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Most of naturally occurring Fatty Acids (FAs) in humans are found in *cis* (Z) configuration. The change of *cis*-FAs (e.g. monounsaturated and polyunsaturated FAs) in *trans* (E)-Fas is made by isomerization, which could be geometric and/or positional according to a given carbon chain.[1-3] In the *cis* configuration, the two hydrogen atoms are on the same side of the carbon chain with respect to the double bond, a situation that produces a bend in the FAs, whereas in the *trans* configuration, the two hydrogen atoms are diagonally opposed to each other, straightening the carbon chain.[1,2] (Figure 1).

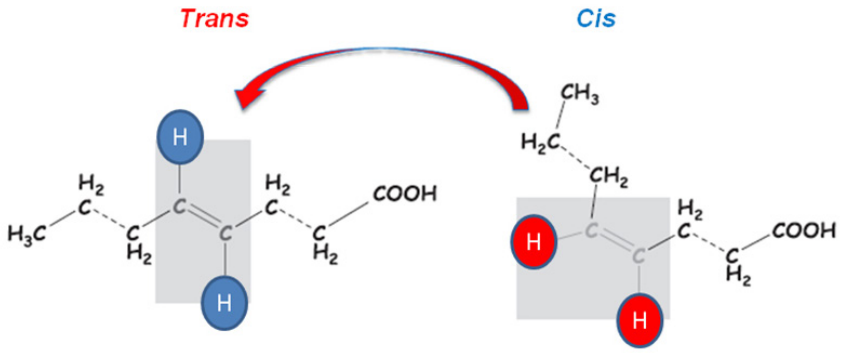

Figure 1: *Cis*- and *trans-configurations* of fatty acids.[1]

TFAs mainly arise from hydrogenation either through: (i) naturally occurring enzymatic process involving desaturases (i.e. enzymatic transformation) in the rumen of animals (e.g., bacterian flora in cows, sheeps, goats) in mammalian breasts;[4,5] (ii) partial (or total) industrial catalysis of vegetables or fish oils requiring hydrogen gas or a metal catalyst (e.g. nickel) to replace saturated FAs, solidify vegetal fat products (e.g. pizzas, cakes, chocolates, shortenings such margarines), decrease their oxidation sensitivity, and enhance their taste;[2,6] or (iii) extreme thermal treatments (e.g., deep-fat frying, barbecue, deodorization during oil refining), although these are considered as a minor source.[1,2]

While too little information is available about the effects of natural TFAs on human health,[1,7,8] most experimental and experimental studies, *albeit* sometimes controversial, report that industrial TFAs are neither essential nor salubrious, and could even predispose to important pathologies, including fetal malformations, Cardiovascular diseases (CVDs), and other inflammatory-state diseases (e.g., cancers, diabetes, metabolic syndrome, obesity), especially when consumed chronically or at high doses.[1,7,9] Interestingly, certain TFA isomers (e.g. Conjugated Linolenic Acids (CLAs), which are polyunsaturated FAs in mixed configuration *cis/trans*) would be beneficial for health,[1,10] and so, should not be banned.

Prevention modalities should be based on finding alternative industrial approaches and preventive actions. Thereby, two relevant industrial approaches can be used to reduce or

eliminate TFAs in food[1,2,11,12]: (i) food reformulation (e.g. replacement of TFAs with edible base stock FAs, such palm oil, although some of the fat replacers might run the risk of increasing SFA levels); and (ii) modification of FA composition through valuable innovative processes (e.g. chemical or enzymatic fat interesterifications, which usually display interesting physicochemical features that minimize SFA levels). Furthermore, the production of healthier shortenings by these industrial processes, along with reforms for greater transparency in labeling (i.e. specifications of TFA composition and amount on prepackaged foods) and/or active consumer educational campaigns to substantially reduce TFA production and consumption, have been successfully applied in some countries but remain a challenge in many others, despite the growing evidence of their impact on health.[1,2,13-15]

Therefore, it becomes clear that both individual- and policy-level initiatives to decrease TFA consumption should continue, particularly in population subgroups (e.g. young individuals), and recent findings provide further evidence to support the concerted effort to minimize or even ban TFAs in the diet.[16]

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