Ultra-processed foods (UPFs) are characterized for being inexpensive, highly processed, rich in calories, but low in some essential micronutrients such as minerals and vitamins. Nearly 60% of the calories consumed by the average American come from UPFs (Martínez Steele et al., 2016). Processing of food plays a crucial role in the overall chemical safety of the American diet (also known as the Western diet) since different manufacturing conditions promote the formation of unintended and harmful compounds in the final product. This is the case of cholesterol oxidation products (COPs) which have been associated with the development of several chronic diseases. COPs are derived from the oxidation of cholesterol and can be triggered by different parameters such as light, heat, radiation, metal ions, and other agents. Until this study, there has been no database of these compounds in the Western diet and their level of exposure of the US population.

A total of 63 UPFs were tested. Fatty acids, cholesterol and its oxidation products, tocoferols and phytosterols were comprehensively assessed by chromatographic means. Oxidative status of the Western diet was evaluated by the quantification of secondary oxidation
products such as malondialdehyde (MDA). Twelve main COPs (7α-OH, 7β-OH, 4β-OH, 5,6α-Epoxy, 5,6β-Epoxy, 7-Keto, Triol, 6-Keto, 20α-OH, 22-OH, 24-OH, and 25-OH), and other sterols (cholesterol, phytosterols, and tocopherols) were detected. An assessment of the level of exposure of COPs was performed using the Stochastic Human Exposure and Dose Simulation (SHEDS) developed by the US Environmental Protection Agency (EPA) (EPA, 2020).

Forty-four percent of the samples showed a different fat content than those reported on the food item’s nutritional label. Moreover, 78% of the UPFs showed a higher cholesterol content than the reference value from their nutritional label. Twenty-six percent of fast food (FF) meals showed a high PUFA content which is a type of healthy fat that improves cardiovascular health (Harris, 2007; Lu et al., 2011), brain function, and overall health during pregnancy (Koletzko et al., 2008). Saturated fatty acid (SFA) content in UPFs was directly related to the food item’s price. β-Sitosterol was the most abundant phytosterol. However, differences in concentrations were observed depending on the food matrix and ingredients added to the food item throughout its preparation. Similarly, total COP content varied among food matrices and ingredients added. This means that food matrix, ingredients and cooking conditions employed in the product’s confection play an important role in the distribution of these sterols. Lastly, infants (6-12 months) could be exposed to upwards of 309.56 mg/kg/6 mo. (0.0031 mg/kg/6 mo.). Since there is no study addressing the effects of COPs on infants’ health, no assumption could be done to determine if it should be considered a health risk.

This study provides a complete overview of the oxidative lipid status of the most popular UPFs in the Western diet as well as an assessment of the exposure level of these compounds in one of the most vulnerable groups: infants. Nutritional quality and dietary patterns seem to be
jeopardized by prices and popularity of UPF meals, resulting in a public health issue that should be addressed.

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