Glycidyl Fatty Acid Esters (GEs) Fact Sheet

What are GEs?

- GEs are process contaminants which are found in refined fats and oils, as well as in foods that are produced using these as ingredients[1]
- Common examples include margarine, fat spreads, fried potato products, infant formulae and dietary supplements[1,2]

How are GEs formed?

- The refining process of edible oils including vegetable and fish oils at temperatures of ~200°C or higher can lead to the production of GEs[2]
- This usually occurs during the deodorization step in the refining process, where some of the precursors naturally present in the oils can react with other oil compounds[1]

Are there any safety concerns for GEs?

- GEs are broken down during digestion and release a compound called glycidol, which has been identified as a genotoxic carcinogen in rodents and classified as "probably carcinogenic to humans" (Group 2A)[1,3]
- According to a review paper published in 2017, direct harmful effects of GEs on humans and animals have not been demonstrated thus far[3]

Are there any international authority risk assessments in relation to GEs?

Currently, the Codex Alimentarius Committee (Codex) has not set any maximum levels for GEs in food[1]. Starting in 2018, the European Union has set maximum levels for GEs in different foodstuffs, including foods intended for infants and young children to exclude possible health risks[1,4].

	Foodstuffs	Maximum level of GEs, expressed as glycidol (µg/kg)
1	Vegetable oils and fats placed on the market for the final consumer or for use as an ingredient in food, with the exception of food referred in (2)	1,000
2	Vegetable oils and fats destined for the production of baby food and processed cereal-based food for infants and young children	500
3	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children	50 (Powder)
		6.0 (Liquid)

Any advice on how to reduce GEs from dietary exposure or in manufacturing process?

According to advice from the Hong Kong Department of Health in relation to GEs intake[1]:

⇒ We should maintain a balanced diet and consume a wide variety of food in order to minimize the risk of contaminant exposure from limited food sources

⇒ Cook at home with fresh ingredients to reduce the chance of consuming GEs from processed foods

In 2019, the Food and Agriculture Organization of the United Nations (FAO) released a Code of Practice to reduce GEs in refined oils and associated food products[2]. For example, as GE formation begins at ~200°C and becomes more significant at temperatures > 230°C, significant formation can be avoided when oils can be deodorized at temperatures < 230°C[2]. The Code of Practice has highlighted that while mitigation measures are important, there should also be considerations on the overall impacts on product quality including smell, taste and stability attributes[2].

References: *1. Hong Kong Centre for Food Safety. Glycidyl esters, a harmful substance, in refined fats and oils. Available at: https://www.cfs.gov.hk/english/multimedia/multimedia_pub/multimedia_pub_fsf_142_01.html. Accessed on 18Aug2020. 2. Food and Agriculture Organization of the United Nations. Code of Practice for the Reduction of 3-Monochloropropane-1,2-diol Esters (3-MCPDES) and Glycidyl Esters (GEs) in Refined Oils and Food Products Made with Refined Oils. 2019. 3. Cheng WW et al. Compr Rev Food Sci Food Saf. 2017;doi:10.1111/1541-4337.12251. 4. European Commission. Commission Regulation (EU) 2018/290. 2018.*

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