

Assessing Mycotoxin Exposure from Processed Cereal-Based Foods for Children

Authors : Soraia V. M. de Sá, Miguel A. Faria, José O. Fernandes, Sara C. Cunha

Abstract : Cereals play a vital role in fulfilling the nutritional needs of children, supplying essential nutrients crucial for their growth and development. However, concerns arise due to children's heightened vulnerability due to their unique physiology, specific dietary requirements, and relatively higher intake in relation to their body weight. This vulnerability exposes them to harmful food contaminants, particularly mycotoxins, prevalent in cereals. Because of the thermal stability of mycotoxins, conventional industrial food processing often falls short of eliminating them. Children, especially those aged 4 months to 12 years, frequently encounter mycotoxins through the consumption of specialized food products, such as instant foods, breakfast cereals, bars, cookie snacks, fruit puree, and various dairy items. A close monitoring of this demographic group's exposure to mycotoxins is essential, as toxins ingestion may weaken children's immune systems, reduce their resistance to infectious diseases, and potentially lead to cognitive impairments. The severe toxicity of mycotoxins, some of which are classified as carcinogenic, has spurred the establishment and ongoing revision of legislative limits on mycotoxin levels in food and feed globally. While EU Commission Regulation 1881/2006 addresses well-known mycotoxins in processed cereal-based foods and infant foods, the absence of regulations specifically addressing emerging mycotoxins underscores a glaring gap in the regulatory framework, necessitating immediate attention. Emerging mycotoxins have gained mounting scrutiny in recent years due to their pervasive presence in various foodstuffs, notably cereals and cereal-based products. Alarming, exposure to multiple mycotoxins is hypothesized to exhibit higher toxicity than isolated effects, raising particular concerns for products primarily aimed at children. This study scrutinizes the presence of 22 mycotoxins of the diverse range of chemical classes in 148 processed cereal-based foods, including 39 breakfast cereals, 25 infant formulas, 27 snacks, 25 cereal bars, and 32 cookies commercially available in Portugal. The analytical approach employed a modified QuEChERS procedure followed by ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) analysis. Given the paucity of information on the risk assessment of children to multiple mycotoxins in cereal and cereal-based products consumed by children of Portugal pioneers the evaluation of this critical aspect. Overall, aflatoxin B1 (AFB1) and aflatoxin G2 (AFG2) emerged as the most prevalent regulated mycotoxins, while enniatin B (ENNB) and sterigmatocystin (STG) were the most frequently detected emerging mycotoxins.

Keywords : cereal-based products, children's nutrition, food safety, UPLC-MS/MS analysis

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