Is there a health risk concerning the children's consumption of cereal-based products?

A cumulative mycotoxin risk assessment approach.

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Background & Aims

- People, animals and the environment can be exposed to single and multiple chemicals at once from a variety of sources
- Risk assessment is usually carried out based on one chemical substance at a time
- Cereals are among the first solid foods eaten by child
- Mycotoxins (fungal secondary metabolites)
  - are known to potentially cause toxicity and carcinogenic outcomes
  - are commonly found in a variety of foods including cereal-based foods intended for consumption by infants and young children
  - many species of mycotoxin-producing fungi are known to be capable of producing more than one mycotoxin

Aims:
- Perform the cumulative risk assessment of mycotoxins present in a set of cereal-based foods including breakfast cereals (BC), processed cereal-based foods (PCBF, flours) and biscuits (BT), consumed by children (1 to 3 years old, n=75) from Lisbon region, Portugal:
  - Food consumption data
  - Contamination data
  - Exposure assessment

Results

Cereal based foods consumption

![Figure 1: Percentage of consumers of cereal-based foods (n=75)](image)

Contamination of cereal based foods

![Figure 2: Percentage of contaminated samples, considering each mycotoxin (BC, n=75; PCBF, n=40; BT, n=40)](image)

- 75% of PCBF, 50% of BT and 96% of BC analyzed samples were contaminated with, at least, one mycotoxin.
- OTA, ZEA, AFB1, DON and FB1 were the most frequent mycotoxins in cereal based samples (>50%).

Exposure assessment & Risk characterization

![Figure 3: Exposure assessment and risk characterization](image)

- Main results revealed a significant health concern related to aflatoxins and especially aflatoxin M1 exposure according to the combined margin of exposure (MoET) and margin of exposure (MoE) values (below 10000)4, respectively.
- The aflatoxin children intake is mainly due to ingestion of processed cereal-based products (flours) contamination.
- For higher percentiles of intake (≥ P97.5%), DON intake revealed a significant health concern5, showing a hazard quotient (HQ) above 1.
- For the remaining mycotoxins, hazard quotients (HQs) were below 1 for all percentiles, suggesting no potential health concern6.

These are the first results on cumulative risk assessment of multiple mycotoxins present in cereal-based foods consumed by children. Considering the present results, more research studies are needed to provide the governmental regulatory bodies with data to develop an approach that contemplate the human exposure and, particularly, children, to multiple mycotoxins in food. The last issue is particularly important regarding the potential synergistic effects that could occur between mycotoxins and its potential impact on human and, mainly, children health.

References:
- Alvito et al. (2010).
- Ricardo Assunção at Universidade de Évora, Évora, PT; University of Aveiro, Aveiro, PT, and NOVA University of Lisbon, Lisbon, PT.