RISKBENEFIT4EU PROJECT

PARTNERING TO STRENGTHEN THE RISK-BENEFIT ASSESSMENT WITHIN EU USING A HOLISTIC APPROACH

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OUTLINE

A brief story...

✓ Mycotoxins in baby foods

✓ Risk assessment and risk characterisation of mycotoxins mixtures in infant food (MYCOMIX)

The present challenge...

✓ Risk-Benefit Assessment in food (RB4EU)
  Case-study involving mycotoxins
A brief story...

Occurrence of Aflatoxins and Ochratoxin A in Baby Foods in Portugal

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Abstract Infants have a more restricted diet and they generally consume more food on a body weight basis than adults. Therefore, the significance and potential health risk of any contaminant in foods consumed by infants is increased and diligent attention must be paid to this particular area. The present study aims to determine the occurrence of aflatoxin M₁ (AFM₁), aflatoxin B₁ (AFB₁) and ochratoxin A (OTA) in processed cereal-based foods (flours) and infant formulae (milk powder) available in the Portuguese market, both sold as conventional and organic origin. Mycotoxin determination was carried out using a method previously applied to duplicate diet samples. This method employed chloroform extraction, liquid-liquid extraction, immunoaffinity column (IAC) cleanup and HPLC analysis with fluorescence detection after post-column derivatisation. Quantification limits were 0.014, 0.004 and 0.028 μg kg⁻¹ for AFM₁, AFB₁ and OTA, respectively. These toxins could only be quantified in 12 of 27 analysed samples (15 positive results); two samples with AFM₁, two samples with AFM₁ and OTA, one sample with AFB₁ and OTA and seven samples with OTA. Positive results concerned four for AFM₁ (26%), one for AFB₁ (7%) and ten for OTA (67%). For these samples, contents ranged between 0.017–0.041 μg AFM₁ kg⁻¹, 0.034–0.212 μg OTA kg⁻¹, and one sample had a value of 0.009 μg AFB₁ kg⁻¹. Considering the presented results, we could provisionally conclude that the presence of these mycotoxins in baby foods does not constitute a public health problem. These are the first results concerning the occurrence of mycotoxins in marketed baby foods in Portugal and this is the first study using the HPLC method, proposed for duplicate diets, in baby food sample analysis.

Keywords Aflatoxins · Ochratoxin A · Baby Foods · HPLC · Portugal · Human Health
12 of 27 samples revealed presence of mycotoxins in baby foods marketed in Lisbon market: 2 with AFM$_1$, 2 with AFM$_1$ and OTA, 1 with AFB$_1$ and OTA and 7 with OTA.

Considering the presented results, we could provisionally conclude that the presence of these mycotoxins in baby foods does not constitute a public health problem.
A Portuguese Case Study – MYCOMIX Project

“Exploring the toxic effects of MIXtures of MYCOtoxins in infant food and potential health impact”

(PTDC/DTP-FTO/0417/2012)
A Portuguese Case Study – MYCOMIX Project

Are children exposed to mycotoxins through diet?

Are there interactive effects in toxicity of mixtures of mycotoxins?

Children are exposed to mycotoxin mixtures through their diet and this constitutes a health threat.

Could this exposure be a health threat to children?
Single-compound and cumulative risk assessment of mycotoxins present in breakfast cereals consumed by children from Lisbon region, Portugal

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**Daily exposure of children to ochratoxin A, fumonisins and trichothecenes showed no health risks to the children population considering individual mycotoxins. The combined exposure to fumonisins and trichothecenes are not expected to be of health concern.**

Exposure to aflatoxin B₁ (AFB₁) suggested a potential health concern for the high percentiles of intake (P90, P95 and P99) considering individual toxins.

The combined margin of exposure (MoET) for the aflatoxins group could constitute a potential health concern and AFB₁ was the main contributor for MoET.
96% of the analysed breakfast cereal samples were contaminated with several mycotoxins. Twenty-two combinations were identified including two to seven different mycotoxins.

Mycotoxin contents were all below the maximum levels established in the European legislation for breakfast cereals, when available.

Conclusions pointed out an urgent need to review legislative limits in food matrices consumed by children and to perform a more accurate risk assessment of children’s exposure to mycotoxins mixtures in food.
Portuguese children dietary exposure to multiple mycotoxins - an overview of risk assessment under MYCOMIX project

Food and Chemical Toxicology (in press)


**Portuguese children (1-3 years old)**

**Consumption data:**
Pilot study through 3-days food diary

**Multiple mycotoxins occurrence data in cereals-based products:**
Breakfast cereals, infant cereals & biscuits

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**MYCOMIX**

“Exploring the toxic effects of mixtures of mycotoxins in infant food and potential health impact”

National funded project

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**Risk assessment:**
- 94% of analyzed products were contaminated with at least one mycotoxin and 75% with two or more mycotoxins
- Aflatoxins exposure suggested potential adverse health effect for P50 or higher
- Mycotoxins present in food usually consumed by young children could constitute a risk for children’s health
Climate change and the health impact of aflatoxins exposure in Portugal – an overview

Ricardo Assunção, Carla Martins, Susana Viegas, Carla Viegas, Lea S Jakobsen, Sara Pires and Paula Alvito

Considering the $+2^\circ$C scenario of temperature increase in next 100 years in Europe, and the estimated increase of aflatoxin contamination of maize, in the southern European countries, it is expected that in the future the number of DALYs and the associated cases of hepatocellular carcinoma due to aflatoxins exposure will increase due to climate change.

The potential impact on health of the Portuguese population through the dietary exposure to aflatoxins, should represent an alert for the potential consequences of an incompletely explored perspective of climate change.

Mycotoxins and climate change – EFSA video
https://www.youtube.com/watch?v=yi46ZQLjMYw
Food could be a vehicle of health adverse but also beneficial effects.

**ASSESSMENT OF RISKS + BENEFITS**

Consumption of foods presenting various types of chemical (e.g. acute toxic or endocrine-disrupting substances), microbial (e.g. pathogens), and/or nutritional (e.g. saturated fatty acids) hazards, together with beneficial nutritional components (e.g. unsaturated fatty acids).
Risk-benefit assessment performed in Portugal

- Only approached issues related with fish and seafood consumption
- Mainly dedicated to the nutritional and chemical components
- Just few included probabilistic approaches
- Studies including common health metrics (as DALYs) are not available

Portugal remains as a country that needs technical and scientific support to develop and implement RBA.

RiskBenefit4EU – Partnering to strengthen the risk-benefit assessment within EU using a holistic approach

AIM: to strengthen the EU capacity to assess and integrate food risks and benefits in the areas of microbiological, nutritional and chemical components through the development of a harmonized framework that will be available to EU member states organizations.
RiskBenefit4EU will contribute for the development and the establishment of RBA as a tool to provide *scientific evidence to inform risk management decisions* in the area of food safety and nutrition.
Can we ever have a quantitative tool that enable food and health authorities to estimate the balance between risks and benefits of foods?

Until now Portugal has not a multidisciplinary team that could execute food risk-benefit assessment in a holistic perspective.

DTU and INRA, as experts in the RBA area, will support and collaborate with Portuguese team in order to organize and develop, for the first time, an approach for cereal-based products consumed by children through the application of a case study.
RiskBenefit4EU: partners

Portugal

Denmark

France

Funding:

EFSA Partnering Grant
RiskBenefit4EU
Grant Agreement Number GP/EFSA/AFSCO/2017/01 - GA02
RiskBenefit4EU: objectives

1) To **capacitate** recipient partners on food RBA

2) To develop **RBA tools** that can estimate the overall health effects of foods, food ingredients and diets

3) To develop a **harmonized framework for RBA** that can be applied to data from different countries

4) To validate the generated framework through the application to a **case study**

5) To **disseminate and promote** the harmonized framework to potential **EU users**
RiskBenefit4EU: main activities

Training
(where project partners will transfer and exchange knowledge)

Workshop on Risk-Benefit Assessment of Foods
21st & 23rd May 2018, Lisbon

Research
(framework development and its application to a case study)

RBA case study

Dissemination and promotion activities
(through web-site dissemination, publications and international conference organization)

Website
https://riskbenefit4eu.wordpress.com/
RiskBenefit4EU: tasks

**RiskBenefit4EU | Partnering to strengthen the risk-benefit assessment within EU using a holistic approach**

| Task 1: Project management and coordination |
| Task 2: Capacity building & Framework development |
| Task 3: Framework application |
| Task 4: Sustainability and dissemination activities |
| Task 5: Quality assurance and impact evaluation |
Task 1: Project management and coordination

- Management and coordination activities associated to the project organization.
- Led by INSA, Portugal
- Includes:
  - organization of project meetings, and training activities;
  - elaboration of reports;
  - financial management
Task 2: Capacity building and framework development

- Capacity building activities and framework development
- Led by INRA, France
- Includes:
  - knowledge transfer through the capacity building of all partners for the methodologies needed for RBA (nutrition, toxicology and microbiology), using common health metrics;
  - development of the harmonized framework for RBA
Task 3: Framework application

- Application of the generated framework (task 2) to a case study
- Led by DTU, Denmark
- Includes:
  - Portuguese case study on cereal-based foods gathering already obtained data.
RiskBenefit4EU: case study

- To validate all the developed tools, a Portuguese case study on cereal-based foods will be developed

Needed data?

- Chemical contaminants (Mycotoxins)
- Microbiological contaminants
- Consumption data: information on food consumption
The RiskBenefit4EU case study will concern the **health risks** associated with consumption of **cereal-based foods**, an important source of nutrients with **beneficial health effects**.
Task 4: Sustainability and dissemination activities

- Sustainability of the generated capacity building and dissemination activities
- Led by INSA, Portugal
- Includes:
  - Micro-site under PortFir
  - Open-access publications
  - Future training activities

https://riskbenefit4eu.wordpress.com/
Task 5: Quality assurance and impact evaluation

- Quality assurance and the impact evaluation of the main activities developed under RiskBenefit4EU
- Led by Uporto, Portugal
- Includes:
  - Application of questionnaires to measure the impact of training activities
  - Quality control
Thank you!

Project management:
Sergio Potier Rodeia-EFSA
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