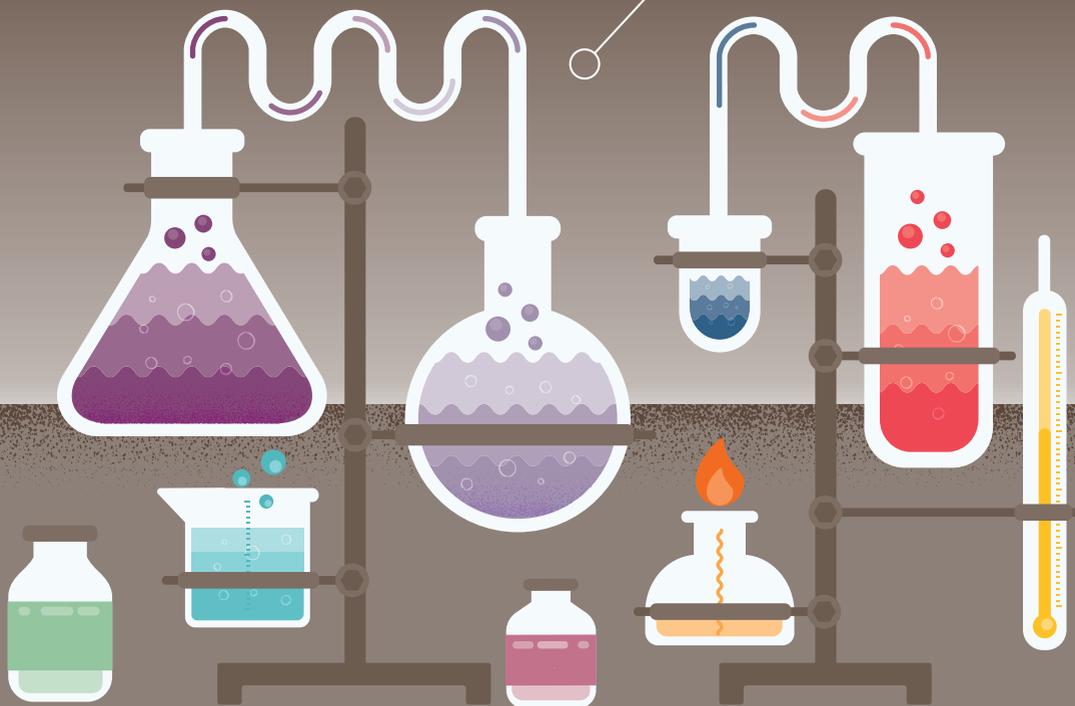


MYCOTOXINS

WHAT YOU
NEED TO KNOW



HBM4EU

science and policy
for a healthy future

What are mycotoxins?

Mycotoxins are toxic chemical substances naturally produced by certain types of moulds, or fungi, that grow on crops and foodstuffs, particularly under warm and/or humid conditions. Mycotoxins may pose a threat to the health of both humans and livestock.

There are hundreds of different mycotoxins. The group of mycotoxins studied under the Human Biomonitoring Initiative for Europe (HBM4EU) are part of the Fusarium toxins, with a focus on deoxynivalenol (DON) and fumonisin B1 (FB1).

With the aim of protecting public health, policies are in place to assess and manage the risks posed by mycotoxins.

Where are mycotoxins found?

Mycotoxin-producing mould infect crops worldwide, both before and after harvesting. The general population is primarily exposed to mycotoxins via food.

Food products, which may be contaminated with mycotoxins, include:

- Cereals, such as maize, wheat, rice, quinoa, cereal-based foods, such as flour, muesli, and cereal-based beverages, such as beer
- Nuts and their products, such as groundnuts, peanuts and peanut butter, almonds, almond powder, hazelnuts and hazelnut spread, pistachios, Brazil nuts
- Seeds, such as sesame, melon seeds
- Cocoa and coffee beans
- Spices, such as chili, nutmeg, spice mixes, curry powder
- Fruits, dried fruits, such as dried figs, sultanas, raisins, dried mulberries, preserved plums, dried vegetables, such as dried chillies, and fruit-based beverages, such as apple juice and wine
- Dairy milk and milk products
- Meat and products derived from meat

DON is frequently found in wheat, corn and barley in temperate regions.

FB1 occurs mainly in maize, wheat and other cereals.

Workers' exposure may also happen in farms, warehouses, and factories when workers handle contaminated crops, food or feed.

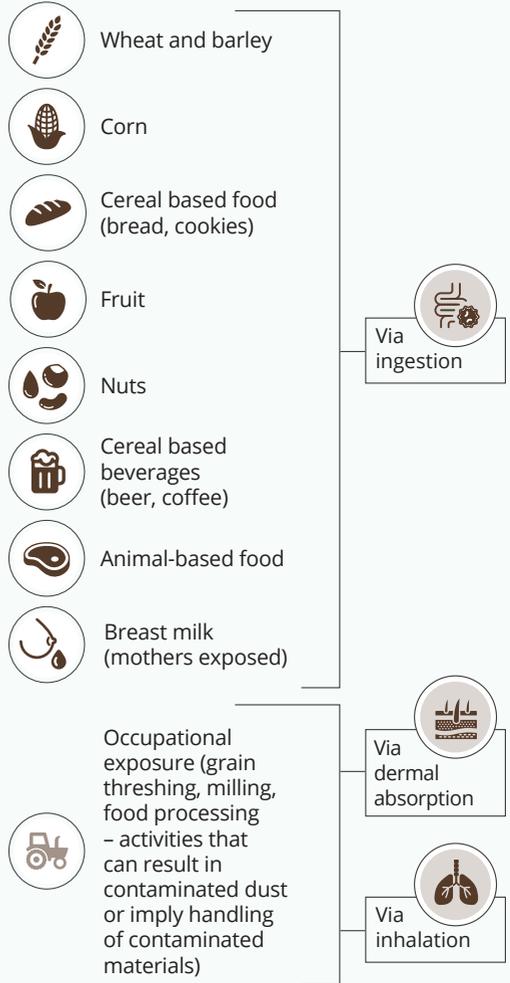
How can mycotoxins enter your body?

Mycotoxins can enter our bodies through three routes.

Ingestion: This is the most significant route for the general population. You may swallow mycotoxins directly by eating contaminated plant-based foods, such as cereals, or by eating products, such as meat or dairy products (milk), from animals that themselves were fed with contaminated feed. A baby may be exposed to mycotoxins through breast feeding, if the mother has been exposed. This has been documented for the mycotoxin FB₁.

Inhalation: In factories processing relevant foodstuffs, the air may be contaminated by mould spores or dust containing mycotoxins. Workers may then breathe in the contaminated air. Examples include activities such as grain threshing or milling, and food processing.

Dermal absorption: Some mycotoxins may pass through the skin into the blood, known as dermal absorption. This route is not well understood and is only considered relevant for workers. For DON and FB₁, this is not a significant route of exposure.



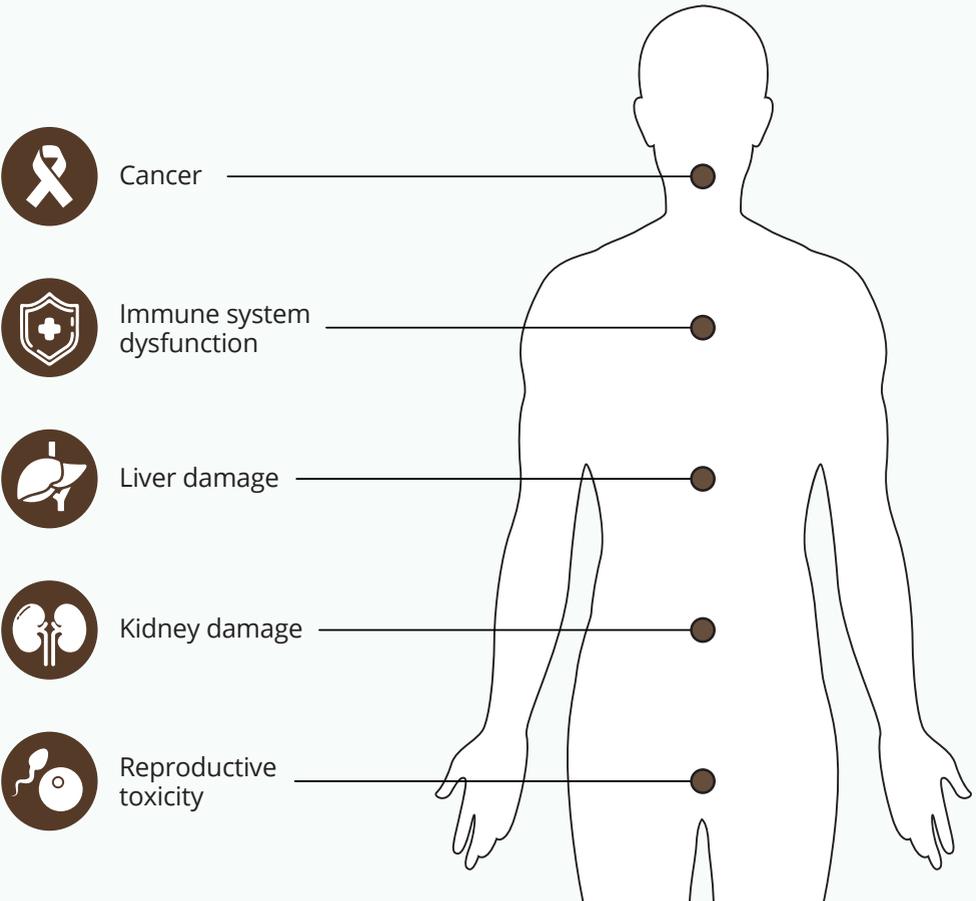
How might mycotoxins affect health?

Over time, exposure to low levels of mycotoxins through the consumption of contaminated food (so called “chronic” exposure) can lead to impacts on health. Mycotoxins can cause serious damage to the liver and kidneys and can affect the functioning of the immune system. Some mycotoxins can contribute to the development of cancer or may affect the reproductive system.

Although further research is needed to fully understand the toxic properties of both DON and FB₁, some effects are already known:

- DON is poisonous and can contribute to intestinal diseases and cause nausea, vomiting, diarrhoea, as well as affecting the reproductive system.
- FB₁ can cause harm to the immune system, the liver and kidneys and can affect the development of young children. It may also cause cancer.

Children are most at risk of exposure to mycotoxins. Their smaller bodies, higher metabolic rate, and underdeveloped organ functions make them more vulnerable and less able to detoxify their bodies when exposed to mycotoxins.



UNDERSTANDING CHEMICAL RISK

The risk of harm from any chemical results from the hazard associated with the chemical, combined with exposure to the chemical. Hazard refers to the properties of the chemical that make it toxic, meaning it can cause harm to human health. Exposure describes the amount of a chemical that an individual comes into contact with, as well as the frequency of exposure. The term threshold is used to indicate the concentration, or level, of a chemical to which people can according to current knowledge be exposed without suffering negative health effects. Exposure up to this level is considered safe. Some chemicals can cause health effects at any concentration and are considered as having no threshold. For such chemicals, no level of exposure is safe.

How can you reduce your exposure to mycotoxins?

Ensuring that feed and food commodities are efficiently dried and properly stored are the most effective precautions. Keep in mind that the moulds that produce mycotoxins thrive in warm and/or humid conditions. Mould may also grow on food kept in the refrigerator, as it does not require warm conditions. Most mycotoxins are heat-stable, implying that cooking contaminated food will not reduce the level of contamination. Mould does not just grow on the surface of foods but can penetrate deep into the food.

You can take the following precautions to minimize your exposure to mycotoxins:



✗ **Avoid** food stored for long periods



✓ **Keep** food dry and not too warm, stored properly and free of insects



✓ **Inspect** food (whole grains, nuts and dried fruits) for evidence of mould; discard rotten mouldy, discoloured or shrivelled food items



✓ **Buy** grains and nuts as fresh as possible and preferably locally grown, to avoid long transportation and storage periods



✓ **Ventilate** your home regularly



✓ **Use** protection gloves when handling products that might be contaminated (e.g. grains, nuts, dried fruit).



✓ If working in settings processing and/or handling relevant food and feed commodities, **avoid** inhaling the dust that can be emitted during tasks such as storage, loading, or milling contaminated materials and others, such as caring for animals in animal husbandry settings. **Use** the ventilation systems available and/or the respiratory protection equipment.

Human exposure to mycotoxins in Europe

It is possible to measure the mycotoxins themselves and their metabolites in samples such as urine, blood serum and breast milk using human biomonitoring techniques. Metabolites are breakdown products produced inside the body.

Human biomonitoring studies have evidenced mycotoxins exposure, including DON and FB₁, of the general population in several European countries including Austria, Belgium, Croatia, France, Germany, Italy, Portugal, Sweden and the United Kingdom. The consumption of contaminated food is the most significant source of exposure.

Workers in relevant food processing industries have been found to have higher levels of mycotoxins in their bodies when compared with the general population. Climate change is expected to affect the occurrence of mycotoxins in the food chain, due to increase in temperature and precipitation creating favourable conditions for mould growth. It is therefore important to continue to monitor these contaminants, both in food and feed and in humans using human biomonitoring. More research is needed to have a more complete understanding of people's exposure in Europe to mycotoxins and how this may be affecting their health.

Human exposure is measured through human biomonitoring that involves taking samples of blood, urine or hair and measuring the concentration of a chemical in the sample. The measurement reflects the total amount of a chemical in the body at a certain moment, representing previous input from all possible sources. Samples are taken preferably from large numbers of people, in order to get a picture of the variability of exposure in the general population and in higher exposed sub-populations. Besides measuring the exposure, also health effects and individual susceptibility can be investigated with the help of using human biomonitoring.

What is HBM4EU doing on mycotoxins?

HBM4EU investigates the exposure of European citizens to priority chemicals, including mycotoxins, with special focus on DON and FB₁. This is particularly important due to knowledge gaps regarding the extent of human exposure in Europe, in the context of the occurrence of mycotoxins in food and known impacts on health.

HBM4EU is answering some key questions:

- Are there validated and harmonized analytical methods to assess exposure to the selected mycotoxins?
- What is the current exposure of the European population to the selected mycotoxins and are there exposure data available for other mycotoxins?

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- ☑ Does people's exposure to mycotoxins differ among countries, and/or European regions? Does exposure differ across population groups and if yes, what drives these differences (e.g., age, gender, occupation, geographic localization, season/year)?
 - ☑ Has human exposure to mycotoxins changed over the past years across Europe? If yes, what has driven this change (e.g., food safety policies, climate change)?
 - ☑ What factors influence long-term health effects due to chronic exposure to the target mycotoxins?
 - ☑ Is the risk of human exposure to these mycotoxins well understood?

How is the European Union protecting citizens?

The EU has taken action to protect you from mycotoxin exposure.

- ☑ Good agricultural, storage and processing practices are recommended.
- ☑ **EU legislation on mycotoxins** sets maximum levels for mycotoxins in food and feed to ensure they are not harmful to human or animal health and lays down the methods of sampling and analysis for the official control of the levels of mycotoxins in foodstuffs.
- ☑ A **European Union Reference Laboratory for mycotoxins** has been appointed to coordinate a network of National Reference Laboratories and to ensure that official monitoring and control programs are of the highest quality.
- ☑ EU Member States develop and apply monitoring and control programs for mycotoxins in food and feed. Products with concentrations of mycotoxins above the maximum permissible levels are withdrawn from the market and food safety authorities across the EU are notified via the **Rapid Alert System for Food and Feed**. These data are also used for the development of new EU measures.
- ☑ The **European Food Safety Authority** assesses the risk of exposure to mycotoxins from food and feed, publishes scientific opinions and provides advice to inform risk management.
- ☑ Research is undertaken to advance the scientific understanding of people's exposure to mycotoxins in Europe and possible effects on health, to inform food safety efforts. In particular, the European Union co-funds **HBM4EU** to generate missing data on human exposure and fill knowledge gaps through research on mycotoxins.



For further information on mycotoxins, please see the [infographic on the HBM4EU webpage](#).

www.hbm4eu.eu



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