

# Mycotoxins



## What are mycotoxins?

Mycotoxins are compounds produced by molds under specific environmental conditions. These toxins are harmful to human and animal health.

Some of the most important mycotoxins are shown in the following table:

Mycotoxins	Mold Species
Aflatoxin	<i>Aspergillus spp.</i>
Cyclopiazonic acid	<i>Aspergillus and Penicillium spp.</i>
Deoxynivalenol (DON)	<i>Fusarium spp.</i>
Fumonisin	<i>Fusarium spp.</i>
Ochratoxin	<i>Aspergillus and Penicillium spp.</i>
Patulin	<i>Penicillium spp.</i>
Sterigmatocystin	<i>Aspergillus and Penicillium spp.</i>
T-2 toxin	<i>Fusarium spp.</i>
Zearalenone	<i>Fusarium spp.</i>

Most mycotoxins are very stable. They can resist high temperatures, up to 180°C and several manufacturing processes such as milling and cooking. It is not surprising to detect small amounts of mycotoxins in processed foods. This is why it is important to prevent the formation of toxins in raw material.

## Health Implications

High doses of mycotoxins can cause acute illness or death; low doses cause chronic toxicity. The toxicity of mycotoxins may affect the body's nervous system, heart, lungs and digestive tract. Mycotoxins are also associated with acute hepatitis and liver cancer.

## When are mycotoxins produced?

Mold contamination usually occurs in the field. Mycotoxins can develop at various stages:

- pre-harvest
- harvest
- storage

## Food affected by mycotoxins

Mycotoxins occur in many varieties of food and feed. The food crops most often affected are corn, peanuts, cottonseed, sorghum, wheat, barley, coffee, cocoa and tree nuts (pecan, almond, pistachio, hazelnut, walnut and Brazil nut). They have also been found in rice, beer and wine. In Canada, mycotoxins occur mainly in cereal grains and corn, but have been reported in other crops such as alfalfa and oilseed.

## Factors affecting mycotoxins production

The following factors enhance mold growth and toxin production:

- high moisture content (20 to 25%)

- high relative humidity (70 to 90%)
- warm temperatures (22 to 30°C)

Insects and mites can also cause physical damage to the kernel predisposing it to mold invasion which can then lead to toxin production.

Most molds are naturally found in soil and air. It is difficult to prevent mold from contaminating agricultural commodities, but factors affecting growth and toxin production can be controlled.

## Prevention and Control

Mycotoxins are difficult, and sometimes impossible to eliminate. The best control is prevention. Mycotoxins can be prevented by reducing the moisture content of food products and controlling storage conditions such as temperature and/or relative humidity.

In general, reducing moisture content to the equivalent of less than 0.70 water activity (<14.5% moisture by weight) prevents mold growth and mycotoxin formation.

The Canadian Food Inspection Agency (CFIA) recommends the following management practices to minimize mycotoxin contamination:

- Limit bird and insect damage. Damaged kernels are easily contaminated with mold.
- Harvest grain as soon as possible to reduce high moisture conditions. Mold grows better in a high-moisture environment.
- Dry grain. Low moisture conditions prevent mold growth and mycotoxin production post-harvest.
- Ensure silo conditions remain oxygen free (Anaerobic conditions) to limit mold growth

and mycotoxin contamination. Mold cannot grow under truly anaerobic conditions.

- Use crop rotation to minimize the carry-over of molds from one year to the next.
- Avoid planting crops that may be susceptible to mold infestation next to fields where the disease may spread from one crop to the other.

## Detection

Food products need to be tested for mycotoxins:

- to meet regulatory guidelines
- to reduce the risk of mycotoxin consumption
- to maintain product quality

Mycotoxins cannot be detected visually and have no specific taste or smell. This makes it difficult to identify an infected food product or crop.

Analytical tests are the main tool for toxin detection. Available tests include: ELISA, thinlayer chromatography, high-performance liquid chromatography, gas chromatography, liquid chromatography, and mass spectrometry.

## Regulation and Guidelines

More than 100 countries, including Canada and the United States have mycotoxin regulations for food and/or feed.

Recommended tolerances for several mycotoxins can be found at: [inspection.gc.ca](http://inspection.gc.ca)

For more information on worldwide regulations, see the Worldwide Regulations for Mycotoxins in Food and Feed in 2003 at: [fao.org](http://fao.org)

For more information on food safety please contact the Food Safety and Inspection Branch at [foodsafety@gov.mb.ca](mailto:foodsafety@gov.mb.ca).