Cheaper and more efficient method of testing grains for multiple fungal toxins simultaneously

**What is this research about?**

Mycotoxins are a group of chemical compounds produced by several fungal species, which pose a risk of causing disease in animals and humans. Mycotoxins can be divided into several distinct classes: aflatoxins, ochratoxin A (OTA), trichothecenes, fumonisins, zearalenone (ZEA), and ergot alkaloids. Together, these mycotoxins are found in a wide number of grain products, including wheat, barley, oats, rye, and maize. Contaminated grains can cause health problems in humans and animals, including cancer, kidney damage, pulmonary edema, poisoning (mycotoxicosis), and even death. Checking grain commodities for mycotoxins is thus very important from a food safety perspective. Since the chemical structures of mycotoxins differ a great deal, mycotoxin analysis has traditionally involved looking for a single mycotoxin or a small group of related mycotoxins. A new cheaper and more efficient method has been developed by scientists, which uses two chemical analysis techniques called liquid chromatography (LC) and mass spectrometry (MS) to allow testing for multiple mycotoxins in a single sample and at the same time.

**What did the researchers do?**

The accuracy and reliability of the combined LC-MS method were used as performance measures for this new technique. Five grain samples were analyzed (wheat, barley, oats, rye, and maize) which had predetermined levels of 22 different individual mycotoxins. First, the mycotoxins were extracted using an 80:20 mixture of acetonitrile and water. Next, each sample was mixed for 2 minutes in a Stomacher machine, before being centrifuged, filtered, and analyzed using LC-MS. The researchers also used LC-MS to test wheat, oat, and maize samples known to be contaminated by various mycotoxins, as well as one hundred grain samples (25 winter wheat, 15 spring wheat, 15 maize, 10 oats, 20 barley, and 15 rye) from Ontario. The detection limits and optimal conditions for LC-MS were also determined.

**What you need to know:**

A new method of simultaneously testing grains for multiple mycotoxins (fungal toxins) accurately and reliably detected 22 mycotoxins at levels below maximum allowed limits in food. This method, which combined liquid chromatography and mass spectrometry, was found to be cheaper and more efficient than traditional methods.

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What did the researchers find?
The combined LC-MS method consistently and successfully passed the proficiency tests and successfully measured the concentration of mycotoxin in contaminated samples. In some cases, the amount of mycotoxin found was affected by which grain was used. The detection limits for each mycotoxin were all below the maximum allowed limits in food. Differences between identical samples were below 15%, indicating that the LC-MS method produced repeatable results.

How can you use this research?
Food safety regulators and researchers can use the combined liquid chromatography-mass spectrometry method to more efficiently and cost-effectively test grains for multiple mycotoxins.

Chemical analysts can continue this research by using this the LC-MS method for multymycotoxin testing of a wider range of samples. More testing will lead to a greater confidence in the food supply.

Keywords:
Mycotoxins, aflatoxins, fumonisins, wheat, barley, oats, rye, maize, food safety, chemical analysis, Liquid chromatography, Mass spectrometry

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