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Fortified by Global Warming, Deadly Fungus Poisons Corn Crops, Causes Cancer

A carcinogenic mold, its growth exacerbated by the warming climate, reached record highs in 2012

By Mollie Bloudoff-Indelicato | Tuesday, January 15, 2013 | 3 comments

Last year's drought increased the spread of a carcinogenic mold called aspergillus (*Aspergillus flavus*), a fungal pathogen that poisons cattle, kills pets and has infected the 2012 corn crop, rendering significant portions of the harvest unfit for consumption.

Whereas the deadly organism mainly affects countries like China and developing African nations, many U.S. states have experienced an increase in corn contamination since 2011. Farmers are likely to see more of the carcinogen as temperatures continue to rise and droughts become more frequent.

"It's really a climate variable issue," says Barbara Stinson, founding and senior partner of Meridian Institute, a public policy organization. "We're probably looking at an increase in aflatoxin as a result of that."

A. flavus releases toxic spores that can be fatal when ingested, prompting symptoms that include jaundice, liver cancer and internal bleeding. The poison is so deadly that in 1995 Iraqi dictator Saddam Hussein confessed to weaponizing the mold spores for use in biological warfare. The high toxicity of the mold means crops with more than 20 parts per billion—the equivalent of about 100 kernels in a truckload of corn—can't cross state lines, says Ronnie Heiniger, professor of cropping systems at North Carolina State University.

That's bad news for the agricultural industry, which suffers annual losses of more than \$190 million due to aspergillus. Last year the green-black mold contaminated more than half the corn harvested in Missouri by October. In contrast, only 8 percent of the 2011 crop suffered, according to the Missouri Grain Inspection Service.

"We have a big aflatoxin problem," says Charles Woloshuk, a botanist and plant pathologist at Purdue University. "There are loads of corn coming to the [grain] elevators that have been rejected."

Grains like corn and cereals are well documented hosts of aspergillus, although the fungus is also found in oilseed, spices, tree nuts, groundnuts, milk, meat and dried fruit—all staples on which a significant portion of the world's population rely for sustenance. Drought conditions don't cause the mold, but they do help speed its expansion. Unlike the fuzzy stuff that grows on bathroom tiles or in the back of the garage, *A. flavus* prefers hot, dry climes—precisely like the drought afflicting more than half the U.S.

Although the international community has adopted strict legislation to regulate the acceptable amount of aflatoxin for individual countries, cases of poisoning, called aflatoxicosis, still surface regularly. Because the level of aflatoxins found in any given load of corn can be higher than the legal maximum, farmers are allowed to mix contaminated corn with safe corn to dilute the amount—but

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sometimes contaminants slip through the cracks.

“That’s always the problem with a contaminant at these low levels—the distribution of that contaminant in that load,” Heiniger says. “The detection of these contaminants is almost more of an art than a science because you’re searching for this one little kernel.” He adds, “If you selected one bite from that whole area and happened to hit that one kernel you’d get the contaminant.”

Aflatoxin contamination is a global food security issue, but it’s especially a problem in developing countries, which are often largely populated by subsistence farmers who don’t have the resources, technology or infrastructure needed for adequate grain testing. Lack of education about the effects of the mold also contributes to aflatoxicosis poisoning.

“The average person can’t tell whether the mold contains aflatoxin. You can’t tell if it’s highly toxic or an innocuous fungus,” Stinson says. “So people are used to eating it and don’t know that they’re poisoning themselves or their children.”

To make matters worse, aflatoxins react strongly to the hepatitis B virus (HBV), the most common cause of liver cancer in the world. In countries where HBV is endemic, such as in China and some African nations, ingesting the mold intensifies and speeds liver failure by acting as an immunosuppressant. Consequently, there are over 750,000 new reported cases of primary liver cancer reported yearly worldwide, making it the sixth most common cancer for humankind, according to 2008 statistics from the World Cancer Research Fund International.

The cost in human life is likely due, in part, to international trade issues. Because aspergillus standards in developed countries are so high, African nations export much of their pure commodities overseas, leaving the tainted crops at home for consumption by locals. Natural disasters that increase foreign demand for African products—like floods and droughts in industrialized countries—only compound the issue.

Researchers at the University of Pittsburgh (Pitt) estimate more than five billion people worldwide are at risk for chronic exposure through contaminated foods, according to a March 2012 study published in *PLoS One*.

“Strict aflatoxin standards mean that many nations will export their best-quality foods and keep contaminated foods domestically, resulting in higher aflatoxin exposure in low- or middle-income nations where hepatitis prevalence is high,” wrote co-authors Felicia Wu and Hasan Guclu, both Pitt faculty members.

Whereas the U.S. is most often spared the cost in human health, the repercussions aren’t nil. Dairy cows and cattle, already stressed from living in close proximity to large numbers of animals, are at particularly high risk for succumbing to aflatoxicosis, though they can handle higher doses of toxin. Pets, too, are susceptible to the poison. In 2007 aflatoxins forced a nationwide pet food recall—but not before dozens of man’s best friends fell ill and died.

Researchers have not yet found an animal species immune to the aspergillus’s effects. The spores are so poisonous that even destroying the contaminated crops is an ordeal. Scientists worldwide keep careful tabs on aflatoxins in a large-scale effort to avoid outbreaks of aflatoxicosis, according to Stinson.

“Our understanding is that in some cases you can’t even incinerate (contaminated food) safely because the aflatoxin can get airborne and be inhaled,” she says. “If there is a high level of aflatoxin...they’re going to be in the position of having to store and destroy crops.”

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