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Researchers track the effects of insidious crop molds on children

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Nearly 162 million children under the age of 5 suffer from stunted growth, a condition that leads to smaller stature later in life, according to a 2014 United Nations study. Shorter height may not sound like such a big deal, but Patrick Webb, the McFarlane Professor at the Friedman School, says even minor stunting can lead to serious health problems.

"It's not just a matter of height. It's a marker of long-term nutrient deprivation," says Webb. "Stunting slows the development of internal organs. It can impair cognitive function and cause a greater risk of dying from diseases like malaria or chronic diarrhea."

Poor sanitation and lack of access to clean drinking water and diverse nutrition might contribute to the problem, he notes, but only about 20 million cases of stunting can be attributed directly to those issues. The cause of the remaining cases is somewhat of a mystery, but Webb thinks the culprit could be a substance in the food supply itself, a naturally occurring poison called "aflatoxin" that is produced by common types of mold.

These molds, called Aspergillus, are found worldwide. They grow readily on corn, grains, ground nuts and other staple crops and can easily infest large stores of harvested foods. If ingested regularly, Webb says, the toxins they contain can wreak havoc on the body.

"Some would argue that these are the most dangerous naturally occurring toxins in our environment," he says. "They are incredibly carcinogenic.

They can impair your immune system and systems that promote the body's growth. They can also impair gut function, which means you could be absorbing fewer nutrients."

Going to the Source

In the United States and Europe, foods are tested regularly for aflatoxins, and government agencies set strict limits on acceptable levels of exposure. In developing countries, that sort of oversight is often not feasible. Many families, Webb notes, are too poor to throw out foods contaminated with Aspergillus. "They might pick out the worst kernels of infested corn, but some of the mold is invisible to the eye, so they're still exposed," he says.

Although Webb says there's a growing body of research that points to a connection between aflatoxins and childhood stunting, the full extent of the toxins' impact is still unclear. To learn more, he and his colleagues at the Friedman School are leading a new multiyear study in Nepal and Uganda that aims to track aflatoxins in the food supply and examine their effects on the health of pregnant mothers and newborns.

The researchers will follow a group of pregnant women in those nations over several years, conducting surveys on their diet and sanitation and assessing the health of both mother and child until each baby is 18 months old. Throughout pregnancy and early childhood, the researchers will also take samples of blood, breast milk and other food sources to test for levels of aflatoxins.

"We want to know how aflatoxin first gets into a child's blood," says Webb. "Is it transmitted from mother to child in the womb? Through breast milk? Through food eaten during weaning? It's likely a combination of all three."

In the past, he notes, researchers have focused on recording levels of aflatoxin at a single point in time. But in the upcoming study, he and his colleagues will be able to see how levels of the toxin vary from season to season and trace how exposure over the early years of childhood affects growth over time.

Innovation Lab

Conducting such a long-term study is expensive. According to Webb, few labs in the world are equipped to measure aflatoxins in blood, and the tests can cost hundreds of dollars per sample.

"In Nepal alone, we're looking at 600 mothers-to-be, and their 600 children. We're planning to take four blood samples each, plus all the breast milk and food samples, so that really adds up," he says.

For this study, the costs will be covered by major grants from the U.S. Agency for International Development (USAID), which is providing funding for research in Nepal and Uganda. Similar funding from USAID in 2010 allowed the Friedman School to create its Feed the Future Nutrition Innovation Lab, a collaborative research group based at Tufts that is spearheading the study.

The group, which partners with universities and research institutions in the United States and abroad, seeks to improve nutrition in developing nations by focusing on agricultural programs and policies.

Webb says that means not only finding better ways of growing crops, but ways of expanding the diversity of those crops, the diversity of foods available to consumers and the quality of those products on the whole—including a focus on such food-safety issues as aflatoxin contamination.

The idea of looking at nutrition through the lens of food safety is a relatively new concept, Webb notes. "Improving the productivity and diversity of crops and of diet is essential for improving nutrition, but it's only going to get us part of the way there if there's widespread contamination in the food supply," he says. With that in mind, he hopes the study will act as a gateway—a sort of entry point for discussing larger agricultural and nutritional issues in developing nations.

"Ultimately, we're looking at places where biology interfaces with human choices and policy," he says. "Those are the sorts of situations where the Nutrition Innovation Lab really shines."

Provided by Tufts University