

Ancient cooking technique offers modern defense against dangerous food toxin

Findings from new ASU study suggest culturally familiar cooking practices could play important role in improving food safety

By Rithwik Kalale, ASU News
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Aflatoxin is one of the world's most dangerous food toxins, having been linked to [liver cancer](#), [impaired immune function](#) and [chronic inflammation](#).

As climate change creates warmer and more humid growing conditions in many agricultural regions, researchers expect aflatoxin contamination to become an increasing concern in many parts of the world, making practical, culturally accepted ways to reduce exposure even more important.

For centuries, people across Latin America have prepared maize using a cooking technique known as nixtamalization, which has been shown to decrease aflatoxin concentrations. The process involves steeping corn in an alkaline solution, washing it and grinding it into dough.

However, past studies tested aflatoxin concentrations differently, making it unclear which steps in the cooking process had the most impact on aflatoxin removal. Now, researchers at the [Biodesign Institute Center for Health Through Microbiomes](#) at Arizona State University have grounded that question in the actual way families cook, systematically recreating household methods to narrow down what drives this toxin concentration decrease.

The research team, consisting of [Hannah Glesener](#), [Lee Voth-Gaeddert](#) and [Rosa Krajmalnik-Brown](#), recreated these methods used in rural Guatemala and showed that the process decreased concentrations of aflatoxin B1, a known human carcinogen, by 81%. The [study's findings](#) suggest that culturally familiar cooking practices could play an important role in improving food safety.

"Aflatoxin exposure is a major health issue because of its global prevalence and toxicity," said Voth-Gaeddert, a research assistant professor in the center. "More than 50% of the world's population are exposed to this Group 1 carcinogen."

While countries with centralized agricultural systems, such as the U.S., invest heavily in monitoring and testing contaminated grain, those safeguards are often more difficult to implement in decentralized agricultural systems and local markets.

"The problem is hard to solve because contamination often happens before food reaches the kitchen," said Glesener, lead author of the study and a PhD student at ASU. "Within food systems where monitoring and control are limited, specific cooking techniques can actually help mitigate the toxin."

To investigate whether traditional cooking practices could reduce aflatoxin exposure, the research team first surveyed households in Guatemala's Western Highlands to document how families prepare maize. They found considerable variation in cooking times, steeping durations, calcium hydroxide concentrations (or culinary lime, the essential agent used in this process) and washing practices.

The researchers then recreated those household methods under controlled laboratory conditions using ASU's [Core Research Facilities](#), systematically testing how differences in individual steps influenced aflatoxin removal.

The results showed that every nixtamalization method tested decreased aflatoxin concentrations in the finished tortillas, but some cooking practices performed better than others.

One of the most important factors was steeping time. Allowing maize to soak longer in the alkaline cooking liquid significantly improved toxin reduction. Maintaining sufficient calcium hydroxide concentrations also proved essential.

"Those steps give the alkaline solution time to penetrate the corn kernels, loosen the outer layers, move a portion of the toxin into the processing liquid and break down the toxin," Glesener said. "Multiple actions are happening simultaneously, leading to less aflatoxin in the final food product."

Many people might assume that cooking tortillas at higher temperatures would destroy more of the toxin. Instead, the researchers found that extremely high cooking temperatures actually reduced the effectiveness of the process.

"Simply cooking hotter appears to be slightly counterproductive," Voth-Gaeddert said. "Extreme heat causes rapid moisture loss, cutting short the time the alkaline liquid has to draw out and break down the toxin, so more of it remains in the final product."

Although nixtamalization substantially lowered aflatoxin concentrations, it did not eliminate them completely. The researchers emphasize that traditional cooking should be viewed as one layer of protection rather than a replacement for preventing contamination earlier in the food supply chain.

"Nixtamalization is a good traditional cooking method that has the added benefit of helping decrease aflatoxin concentrations," said Krajmalnik-Brown, director of the center and professor at the School of Sustainable Engineering and the Built Environment. "However, it will not completely remove the aflatoxin if it is present."

For households purchasing food through larger commercial supply chains, the team noted that monitoring programs and food safety regulations already reduce much of the risk. But in communities where maize is grown, stored and sold locally, nixtamalization can provide an

additional safeguard when combined with careful grain selection and proper storage.

Beyond food safety, the researchers also examined how nixtamalization affected the nutritional composition of maize. They found that the process significantly increased calcium content while largely preserving other important nutrients, including iron, magnesium and protein.

The team also looked at thousands of naturally occurring compounds in the maize, identifying chemical changes that may contribute to antioxidant and other health-promoting properties of the final food products.

The researchers chose to focus on Guatemala because the country faces well-documented challenges with aflatoxin contamination while maintaining strong traditions of nixtamalization.

"Guatemala presents a scenario that, if solved, can apply to much of the decentralized agricultural system problems faced in the U.S.," Voth-Gaeddert said. "Across the communities we worked with, they represented a wide range of nixtamalization practices that capture much of the variability seen in the U.S. and globally."

Looking ahead, the team hopes the findings can support practical community education rather than major changes to traditional food preparation. By building on cooking traditions that families have practiced for generations, these approaches could improve food safety without requiring expensive new technologies.

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Main image



Cornfield in Guatemala. Photo by Hannah Glesener/ASU

Text image(s)



A home in rural Guatemala preparing the corn for cooking. Photo by Hannah Glesener/ASU