



# Control of mycotoxigenic fungal infection using maize seed systems

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## DESCRIPTION

Mycotoxins are secondary metabolites produced by certain fungi such as *Alternaria*, *Aspergillus*, *Fusarium* and *Penicillium* in agriculture for maize production. Mycotoxins enter the food chain as a result of pre and post-harvest fungal infections. These mycotoxins are a major health concern in developing countries like Africa and receive little, if not more, attention. The most dangerous mycotoxins in human food or animal feed in Africa include aflatoxin, ochratoxin, fumonisins, deoxynivalenol and zearalenone. These mycotoxins are so stable that they may continue to be present during crop production and harvesting, transportation and storage, as well as processing and post-processing operations. They also accumulate in contaminated feed or animal products from fed animals. Chronic exposure to mycotoxin contaminated corn can cause cancer, and acute exposure can lead to sudden death. Exposure to mycotoxins is a development of poor food handling, inadequate food storage, malnutrition, and weak regulation to prevent mycotoxin-containing food and feed products from reaching acceptable levels for consumption was most common in developing countries. Given the negative effects of these fungal toxins, mycotoxins have a significant impact on food security and livelihoods, and affect the competitiveness of agricultural production in Africa. If so, exposure to mycotoxins still exceeds maximum permissible limits and continues to endanger public health. Potential solutions to this health risk are capacity building and value chain management. However, consumption of animal foods that accumulate mycotoxins can pose similar dangers. These differences were largely related to climate and weather related factors,

especially precipitation and temperature during the sensitive stages of forage and forage production. These call for tighter control of mycotoxins, but also suggest that keeping mycotoxins under control in a changing global context may not be easy. High income countries use a combination of regulation and certification to control the mycotoxin threat. The Food and Drug Administration (FDA) and the European Commission have established food contamination limits for certain mycotoxins to protect consumers from exposure to mycotoxins. Certifications such as HACCP (Hazard Assessment and Critical Control Point) help companies in the food value chain prevent mycotoxin contamination and keep it at acceptable levels. However, certification and enforcement of food regulations are at odds with smallholder agriculture and local or regional value chains in low income countries such as Africa. Farmers consume a portion of their produce without market intervention, making it difficult to enforce food safety controls, but locally sold and purchased grains are also exempt from such controls.

Mycotoxins are defined as low molecular weight natural products produced as secondary metabolites by filamentous fungi. They are toxic to vertebrates at low concentrations and vary widely in biosynthetic origin, chemical structure, and toxicity. Symptoms of mycotoxin poisoning vary depending on the type and amount of mycotoxin, duration of exposure, age, sex, health and nutritional status of the victim. The most common mycotoxin producing fungi belong to the genera *Alternaria*, *Aspergillus*, *Fusarium* and *Penicillium*. Control measures vary in effectiveness

depending on the genus. Avoiding grain damage at harvest, rapid drying to low moisture levels, and good storage practices are effective against *Alternaria* and *Aspergillus* species. These storage fungi mainly produce mycotoxins during storage in contrast to *Fusarium* and *Penicillium* species, which produce mycotoxins mainly under field conditions. An important control strategy to avoid mycotoxin contamination is to prevent enterotoxigenic fungal infections including genetic and agronomic approaches. Awareness of the hazards, knowledge of control measures, and sufficient

incentives to take appropriate action can mitigate the problem. However, an often overlooked part of the supply chain, and an often overlooked part of the contamination chain, is seed production, which precedes the production of marketable food and feed. Mycotoxin contamination has been reported to begin as seed to seedling transmission of infected seeds, resulting in infected plants and affected products should be considered part. Seed health can be controlled to avoid or reduce mycotoxin fungal infections in developing countries.