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# Hidden poisons on our plates: the mycotoxin threat in meat

Food safety is often discussed in terms of hygiene, refrigeration, and cooking temperatures. Yet, lurking behind the scenes of our meat value chain is a less visible but equally dangerous threat: mycotoxins. These toxic compounds, produced by certain moulds, are increasingly recognised as a public health concern in Kenya and across East Africa.

To unpack this complex issue, we spoke with Prof. Maina Wagacha, Associate Professor of Plant Pathology at the University of Nairobi and Director of Innovation and Intellectual Property Management at the Division of Research, Innovation and Enterprise. A crop health expert and mycotoxicologist, Prof. Wagacha has dedicated his career to tackling mycotoxins in agricultural products, ensuring safer food systems for consumers.

**What are mycotoxins and why are they a concern in the meat value chain?**

Mycotoxins are toxic secondary metabolites produced by moulds such as Aspergillus, Fusarium, and Penicillium. They thrive under conditions of high humidity and temperature, both in the field and during storage.

These toxins are not just a crop problem. They infiltrate the meat value chain in two main ways. Indirectly, when animals consume contaminated feed made from mouldy grains or forages, the toxins accumulate in tissues like the liver, kidneys, and muscles, persisting even after slaughter. Direct contamination can also occur during meat processing, particularly in cured or dry products such as sausages, where toxigenic moulds thrive under humid ripening conditions. Spices and environmental exposure in

processing facilities can also introduce contamination. From farm to fork, every stage of the chain presents opportunities for mycotoxins to slip into our food.

**What are the common mycotoxins, and what are some of the harmful effects of contamination?**

In Kenya and East Africa, aflatoxins are the most notorious culprits. They often enter meat products when poultry and livestock consume contaminated maize or compound feeds. Common toxins include fumonisins, deoxynivalenol, ochratoxin A, and zearalenone. The health implications are sobering: aflatoxins cause acute liver damage and hepatocellular carcinoma, while chronic exposure leads to immune suppression and higher cancer risks. Fumonisins are linked to esophageal cancer and neural tube defects. Ochratoxin A damages kidneys, and zearalenone disrupts hormonal balance, posing risks especially to children.

Mycotoxins don't just harm animals by impairing growth; they transfer residues into meat, amplifying human exposure.

**How do mycotoxins find their way in our meat?**

Animal feed is the primary gateway for mycotoxins into meat. Poultry, particularly broilers, are most vulnerable. Their rapid growth, high feed intake, and limited detoxification capacity make them prone to significant residue accumulation. Broiler feeds in Kenya often show multi-mycotoxin contamination, which transfers directly into meat. Pigs and cattle are somewhat more resilient thanks to rumen microbial detoxification, but under high exposure, even they accumulate residues in organs.

**How can mycotoxins in meat products be detected?**

Detecting mycotoxins requires sophisticated tools. Current methods include rapid immunoassays such as ELISA, lateral flow devices, and fluorescence polarisation, alongside chromatographic techniques like LC-MS/MS for precise multi-mycotoxin analysis and TLC for cost-effective screening.

In Kenya, facilities such as KALRO's regional mycotoxin lab at Katumani, the Kenya Bureau of Standards (KEBS), and commercial services like SGS Kenya provide reliable testing. Yet accessibility remains a challenge, with costs often upwards of Kshs6,000 per test. Affordable mobile kits and smartphone-readable strips are emerging, but they are not yet widespread. Efforts such as border-point mini-laboratories are promising, but scaling them across rural areas remains a hurdle.

Kenya has regulatory thresholds primarily for aflatoxins in animal feeds and milk, but specific limits for mycotoxins directly in meat products are not explicitly defined in available standards. Kenya has set a maximum of 5 µg/kg for aflatoxin B1 in complete animal feeds, with East African Community limits at 50 µg/kg for total aflatoxins and 20 µg/kg for AFB1 in adult poultry feed. These standards apply upstream to feeds rather than meat itself. The Meat Control Act regulates meat safety, including contaminants, but does not detail mycotoxin thresholds, focusing instead on general inspection and processing standards.

The scale of contamination is evident in recent studies. A retrospective analysis of 1,818 food and feed samples revealed that 64 percent of animal feeds exceeded aflatoxin limits, underscoring the systemic risk of carryover into meat products. In Nakuru, broiler feeds were found to contain aflatoxin levels ranging from 7.3 to 39.7 µg/kg, with many samples surpassing safe thresholds. A cross-sectional survey across five counties, including Kwale and Bungoma, reported aflatoxin B1 contamination in 100 percent of dairy feed samples, with 67 percent exceeding the legal limit of 5 µg/kg. The dangers are not theoretical: Kenya's 2004 aflatoxicosis outbreak, one of the worst in Africa, claimed over 100 lives and hospitalised nearly 200 people after maize consumption. These statistics highlight the urgent need for stronger surveillance, enforcement, and farmer awareness to prevent similar risks in meat and other animal products.

**What should farmers and meat processors and traders do to reduce the risks of mycotoxin contamination?**

Farmers and feed manufacturers can reduce mycotoxin risks early through targeted pre- and post-harvest actions. Crop rotation, timely planting and harvesting, and insect control limit fungal growth in fields. Harvesting at optimal moisture levels below 14–15 percent, rapid drying, and avoiding ground drying reduce contamination risks. Proper storage in cool, dry conditions using silos or hermetic bags, coupled with regular inspection, helps prevent moisture buildup. Feed formulation should prioritise quality ingredients and routine testing, with binders such as bentonite clay or enzymes incorporated to neutralise toxins.

Rising temperatures and humidity significantly heighten mycotoxin contamination risks in feed and meat by favouring fungal growth and toxin production throughout the supply chain. Higher temperatures promote thermotolerant fungi like Aspergillus flavus, expanding aflatoxin outbreaks in maize and feeds, particularly in Kenya's hotter eastern regions. Increased humidity and erratic rainfall create ideal conditions for mould growth, while droughts stress plants, making them more susceptible.

**Why is it difficult to control mycotoxin contamination?**

Stakeholders in Kenya's meat value chain—farmers, traders, processors, and retailers—are not adequately informed about mycotoxin risks and control measures. Farmers often lack knowledge of prevention strategies, with infrequent testing due to high costs

and limited laboratory access. Small-scale producers prioritise yield over consumer safety, while feed millers and processors operate under limited regulation and scarce monitoring. Retailers rarely address downstream risks, and public awareness campaigns remain limited despite chronic exposure concerns.

Direct case studies of reducing mycotoxin levels in Kenyan meat products remain scarce. However, interventions in poultry feeds upstream of meat production demonstrate proven reductions in carryover risks. A recent study tested bentonite clay and fumonisin esterase enzyme in broiler and layer feeds contaminated with aflatoxins and fumonisins. The detoxifiers suppressed toxic effects, improved productivity, and prevented aflatoxin detection in breast muscle while limiting residues in eggs and plasma.

**What innovations and regulations are needed to help control mycotoxins in the meat value chain?**

Looking ahead, innovations will be key. Deploying biological controls such as atoxigenic Aspergillus flavus strains (Aflasafe KE01®) for pre-harvest biocontrol in maize feeds has shown up to 90 percent aflatoxin reduction in trials. Scalable detoxifiers like bentonite clay and fumonisin esterase, alongside advanced detection tools for rapid on-site testing, will be vital. Integrating AI-driven climate forecasting for early warnings could preempt contamination spikes. Affordable ELISA kits and mobile laboratories for multi-mycotoxin screening would empower farmers and processors for routine monitoring. Most importantly, developing national standards for multiple mycotoxins beyond aflatoxins in feeds and meat would close regulatory gaps and strengthen consumer protection.