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CLIMATE SMART AGRICULTURE FOR DEVELOPMENT

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AFLATOXINS AND THE FIRST 1000 DAYS OF LIFE

KEY MESSAGES

Current Scientific evidence suggests:

1. Dietary exposure to aflatoxins is widespread in sub-Saharan Africa. Prof Gong's research demonstrated aflatoxin exposure biomarkers can be detected in over 90% of the children studied in many Sub-Saharan countries.
2. Aflatoxins can cross the maternal placental barrier and be found in breast milk. They are also found at high levels in weaning foods made with staples such as maize and groundnuts.
3. Consumption of heavily aflatoxin-contaminated foods has negative consequences for fetal and child development and growth.
4. Low-cost, post-harvest storage improvement and public education intervention strategies **at household and subsistence farm level** have been demonstrated to be effective at reducing dietary aflatoxin exposure by **60%**.

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INTRODUCTION AND BACKGROUND

Aflatoxins are harmful substances produced by certain types of fungi that exist naturally in the environment. The fungi grow and produce aflatoxins on staple foods such as maize and peanuts, particularly in hot and humid conditions.

Children are the most vulnerable group of the population when exposed to aflatoxins within 1000 days of life, i.e., from conception to the child's second birthday. Children are highly affected because their systems have not yet fully developed to allow for detoxification, and their diets are primarily cereal based. Children can be exposed to aflatoxins through breast feeding, and the introduction of weaning and family foods. Furthermore, aflatoxins have been demonstrated to cross the maternal placental barrier (**1**). Our research showed that exposure can be detected in >90% of the children in sub-Sahara African countries (**2**). The exposure to aflatoxin during the first 1000 days of a child's life leads to stunting (**3, 4**). In an 8-month long follow-up study with 200 young children in Benin, children of the highest quartile of exposure had 0.8 cm less height gain than those in the lowest quartile (**5**). Our recent work funded by the Bill and Melinda Gates Foundation further proved this link in a Gambian child cohort (**6**).

The mechanism of how aflatoxin exposure slowed child growth is not clear. Aflatoxins inhibit protein synthesis, and this can be detrimental to the fast growth and development in early life. Aflatoxins modulate immune defense systems and thus increase the risk of gut infection, diarrhea and nutrient loss (**7, 8**). Acute outbreak of aflatoxicosis has resulted in damaged liver function and in severe cases death, this has happened in several countries such as Kenya and Tanzania (**9**). Consumption of safe and high-quality food is therefore of essential importance to maternal and child health, and to prevent aflatoxin poisoning.

Aflatoxin contamination of foods revolves around poor agricultural practices (poor quality seeds, untimely harvest, poor drying and storage facilities) that favor abundant growth of fungi. When combined with limited awareness of aflatoxin risks and insufficient knowledge of options to reduce contamination of food crops, it creates a challenge that needs to be addressed.

DESCRIPTION OF INTERVENTION

Low-cost culturally acceptable Intervention strategies by Prof Gong's group have been demonstrated to be effective in reducing mycotoxins exposure risk in West Africa **(10,11).** Other interventions have demonstrated similar effects in South Africa **(12).** A community cluster randomized trial conducted across Guinea evaluated the effectiveness of post-harvest storage interventions. The interventions, when compared with control villages who had been using their usual postharvest practices, reduced aflatoxin exposure by 60% after 5 months intervention **(10).** The package of interventions covered:

- Hand sorting - Farmers were shown how to identify groundnuts that were visibly moldy or had damaged shells.
- Drying on mats - Groundnuts are commonly spread on the ground for sun drying, making them susceptible to humidity and difficult to protect in the event of unexpected rain. Therefore, locally produced natural-fibre mats for the sun-drying process were provided.
- Sun drying - Incomplete sun-drying leaves residual humidity in the groundnuts during storage. Farmers were shown how to judge the completeness of sun drying.
- Storage in natural-fibre bags - Farmers most frequently use plastic or other synthetic bags for storage, which promote humidity. Therefore natural-fibre jute bags were provided.
- Wooden pallets - In the storage facilities, bags of groundnuts are stored on the floor or on stones leading to the risk of humidity from the earthen floors. Locally made wooden pallets were provided.
- Insecticide use - One of the main factors affecting aflatoxin formation is the damage of grains by insects in field and storage.
- Other post-harvest approaches have been reviewed recently **(13).**

POLICY IMPLICATIONS

- Incorporate aflatoxin prevention and control in national and regional policies, guidelines and strategies. This includes both agricultural and health system.
- Promote diet diversification in weaning foods and family foods to reduce reliance on aflatoxin susceptible crops such as maize and groundnuts, for example promoting other starch and protein sources.
- Promote education and capacity building on knowledge of aflatoxins, the health risks associated with consumption of contaminated foods, and low-cost culturally acceptable approaches for reducing aflatoxins in grains.
- Fund research into the long term effects of aflatoxin exposure in children and the combined effects with malnutrition and exposure to other toxicants.

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About the Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy (AFRICAP) Programme

The Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy (AFRICAP) programme is a four-year research programme focused on improving evidence-based policy making to develop sustainable, productive, agricultural systems, resilient to climate change. The programme is being implemented in Malawi, South Africa, Tanzania, Zambia, and the UK led by the University of Leeds, in partnership with the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), a pan-African multi-stakeholder policy network. The programme is funded by the UK Government from the Global Challenges Research Fund (GCRF), which aims to support research that addresses critical problems in developing countries across the world. It is administered by the UK's Biotechnology and Biological Sciences Research Council (BBSRC) - UK Research and Innovation (UKRI).

Implementing Partners

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