**ADVERSE HEALTH EFFECTS ASSOCIATED WITH AFLATOXIN HAZARD**

INTRODUCTION

The impact that climate change has on agriculture is wide and of varying effects. Research shows that climate change is a huge contributor to the growth, spread and toxin production of mycotoxigenic fungi on economically important crops[[1]](#_ftn1). One of the major toxins affecting crops is the aflatoxin. Aflatoxin production has become such a major safety issue over the years that it is now a threat world over.

Aflatoxins (AFS)are a group of naturally occurring carcinogens that are known to contaminate different human and animal foodstuffs. They are poisonous by-products from soil-borne fungus which are responsible for the decomposition of plant materials[[2]](#_ftn2). They represent one of the main mycotoxins produced by Aspergillus flavus and Aspergillus parasiticus, with the most prevalent and lethal subtypes being AFB1, AFB2, AFG1, and AFG2.

According to the Food and agricultural Organizations of the United Nations study of 2004, Myotoxins have affected at least 25% of the global food crop. This makes it a global food safety health concern. This issue is seen to mostly affect Africa and Asia since the conditions responsible for aflatoxin production such as, grain and environmental humidity, temperature, damage by insects, rodents and genetic inheritance are prevalent in these two continents.

Absorption, distribution and mechanism action of aflatoxins

Human beings and animals are exposed to aflatoxins through either Inhalation of aflatoxin affected dust particles mostly AFB1 or through direct ingestion of aflatoxin infected foods or those carried over by feeds from milk or milk products. The aflatoxins are then absorbed across the cell membranes where they reach the blood stream. The blood then carries them through different tissues into the liver. Aflatoxins are mainly metabolized by the liver to a reactive epoxide intermediate or hydroxylated to become the less harmful aflatoxin [[3]](#_ftn3).They are the metabolized by cytochrome then converted to a very reactive form that bind with the DNA and to albumin in the blood serum forming adducts and consequently causing damage to the DNA.

Health effects of aflatoxins on the human body

a) Impaired child growth

The WHO have defined stunting as a height-for-age Z-score (HAZ), of <-2, being underweight as a weight-for-age Z-score (WAZ), of <-2, and wasting as a weight-for-height Z-score (WHZ), of <-2.[[4]](#_ftn4)

Studies show that aflatoxin exposure can occur in utero through a transplacental pathway. A direct correlation has been found between the utero exposure and birth weights, meaning, the higher the exposure the lower the body weight. A recent study by Hernandez -Vargas et al shows that differential methylation of genes, including some growth and immune function related genes, was observed to be associated with AF-alb exposure although it is not clear whether such changes are associated with impaired growth.

Similarly, exposure to aflatoxin during weening has been named as one other cause of growth impairment as study from a cross section of 480 children from Benin and Togo shows. In this areas36% to 42% of children are reported to have stunted growth.

b) Hepatocellular carcinoma (H.C.C)

H.C.C is a form of cancer that is mainly identified with less developed regions. It is reported to be the sixth most prevalent cancer worldwide. Aflatoxins have mutagenic and carcinogenic properties which make it a major risk factor alongside the hepatitis B virus (HBV) and the hepatitis C virus (HCV). It has been shown that aflatoxin and hepatitis B, which is also highly prevalent in Africa and South Asia, can synergistically interact, resulting in an increased risk of HCC[[5]](#_ftn5)

c)HIV/TB

Aflatoxin exposure increases the spread of HIV in that it causes rapid progression of HIV since aflatoxin increases risk of infection. Recent investigations of the interaction of aflatoxin exposure and HIV infection in Ghana show that viral load is higher in HIV-infected adults exposed to higher levels of aflatoxin[[6]](#_ftn6)

d)Enteropathy

It is also known as Tropical enteropathy. This is an intestinal inflammation brought about by frequent fecal-oral contamination as a result of poor living conditions. It may be characterized by diarrhea. It can also cause malnutrition which then leads to stunted growth I children. Research shows that there may be connection between Enteropathy and Aflatoxin in that the intestine may be capable of metabolizing aflatoxin into toxic metabolites, which damage large molecules such as the intestinal junction proteins or epithelial nutrient transporters[[7]](#_ftn7)

e) Renal damage

This is a result of long-term administration of aflatoxins. This is characterized by toxicosis, cell necrosis and inflammation which may increase the weight of the kidneys and induce congestion in renal siunosoids.

Strategies for prevention and control of aflatoxins

a) Inhibition of fungal growth

This can be achieved through chemical, physical or biological means like;

i)Due to the fact that factors such as humid climate, high moisture levels and extremely warm temperatures contribute to aflatoxin production, drying seeds and commodities to the safe moisture levels (<9% for peanut kernel, and < 13.5% for corn) (17).and proper storage and use of natural herbs such as allicin and related substances from garlic and onion extracts, cinnamon extract: trans-cinnamic acid, trans-cinnamaldehyde, and ferulic acid or chemical acids such as gamma irradiation of large scale commodity [[1]](#footnote-1)and suitable transportation of harvested crops is of paramounce in the prevention of fungal infection.

ii)Statutory control of aflatoxins such as devolution through creation of boards and ministries and control programs to deal with matters food contamination where farmers, factory men and middle men may be educated about Myotoxins ad encouraged to prevent the spread. So far organizations such as the United Nations have played a major role in spreading awareness on maters aflatoxins.

b) Economic interventions

This may be difficult to implement because it requires the government and non-governmental sectors to join forces despite the fact that aflatoxins have not been generally prioritized especially in low-income countries. Governments ought to consider investing in things like an opportune and nonexpensive analytic detection, unifying worldwide government regulations, deviation of

aflatoxin-contaminated commodities from the food supply, improving research on the

biosynthesis and molecular biology of aflatoxins, and designing new control strategies for

the abolition of aflatoxin contamination of food crops,

Conclusion

It is important to note that the effects of aflatoxins re not uniform, instead, they vary according to various factors such as rate of exposure, duration and state of the body prior to infection. They may vary from a minor infection to death. It is therefore necessary for all stakeholders to come together to inhibit the spread of aflatoxins so as to protect lives.

**REFERENCES**

  [[1]](#_ftnref1) Magan N., Medina A., Aldred D. (2011). Possible climate change effects on mycotoxin contamination of food crops pre- and postharvest. Plant Pathol. 60 150–163.

[[2]](#_ftnref2) Review of the Biological and Health Effects of Aflatoxins on Body Organs and Body Systems (2013) Godfrey.S. Bbosa

[[3]](#_ftnref3) Wild.C.P.Montesano.R.2009.A Model of interaction: Aflatoxins and hepatitis viruses in liver cancer aetiology and prevention. Cancer letter 286Legislative control of aflatoxins

[[4]](#_ftnref4) WHO (2006) WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. Geneva: World Health Organization

[[5]](#_ftnref5) . Qian GS, Ross RK, Yu MC, et al. A follow-up study of urinary markers of aflatoxin exposure and liver cancer risk in Shanghai, People’s Republic of China. Cancer Epi Biom Prev. 1994; 3: 3–10.

[[6]](#_ftnref6) Jolly et.al. 2013

[[7]](#_ftnref7) Yun Yun Gong, Institute for Global Food Security, Queen’s University Belfast, United Kingdom

Michael Routledge, School of Medicine, University of Leeds, Leeds, United Kingdom, Alex Bombana, Ministry of Agriculture, Animal Industry and Fisheries, Uganda; Building an Aflatoxin Safe

East African Community

[[8]](#_ftnref8) , [Bryden, 2012](https://www.frontiersin.org/articles/10.3389/fmicb.2019.02861/full#B32); [Pierron et al. , as it is usually the case, chronic, insidious disorders that impairs animal productivity (Bryden, 2012; Pierron et al., 2016)., 2016](https://www.frontiersin.org/articles/10.3389/fmicb.2019.02861/full#B205)).

1. Prevention and control of mycotoxins by Maitree Suttajit [↑](#footnote-ref-1)