THE MYCOTOXIN SITUATION IN NIGERIA AND ROLE OF THE MYCOTOXICOLOGY SOCIETY OF NIGERIA

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Secretary, African Society of Mycotoxicology

PRECIOUS CORNERSTONE UNIVERSITY

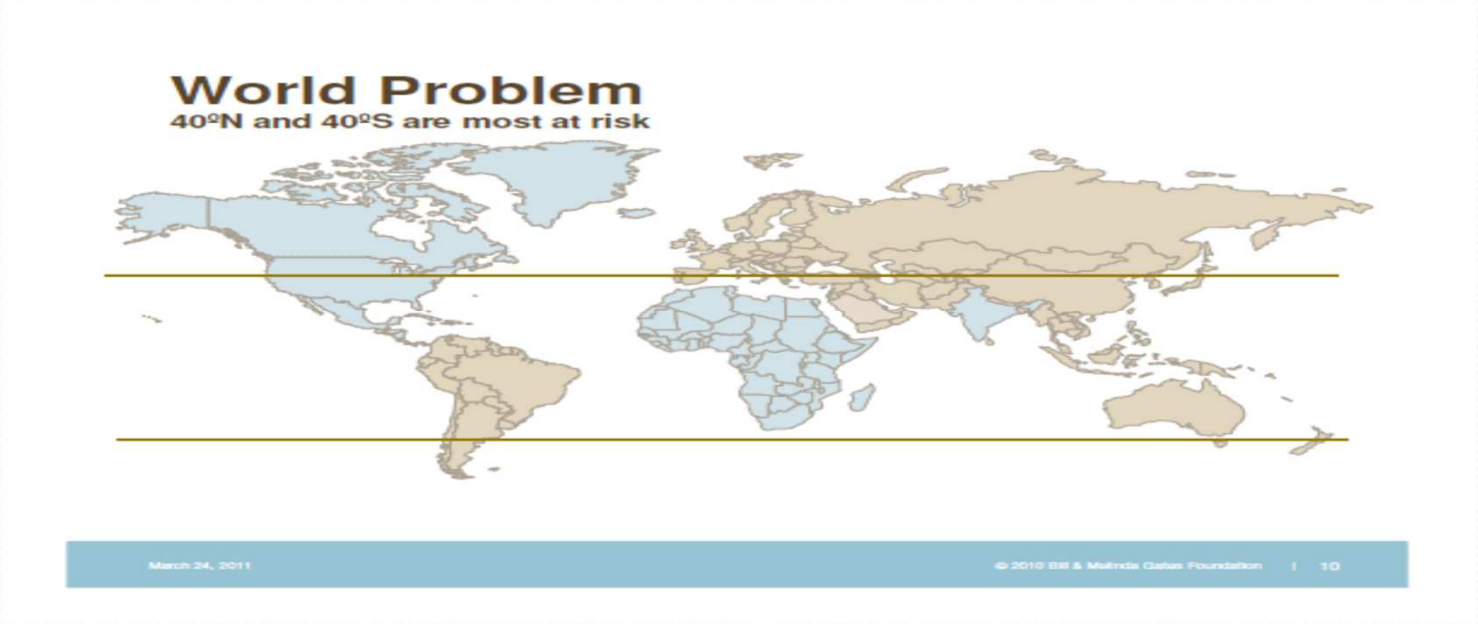
- **HISTORICAL BACKGROUND**

The Precious Cornerstone University (PCU), Old Ife-Road, Ibadan was established in 2017.

It is sponsored by the SWORD OF THE SPIRIT MINISTRIES (SOTSM) INCORPORATED.

INTRODUCTION

•Countries such as Nigeria located between 40º N and 40º S of the equator including the entire African continent offer suitable growing conditions for growth of mycotoxins: the secondary metabolites of fungi



Source: Warrior (2011)

- Thus mycotoxigenic fungi belonging to not less than forty- five fungal genera and about twenty different mycotoxins were detected in Nigerian foods and feeds and many regions of Nigeria (Atanda *et al*., 2013)

- The predominant species being

  Aspergillus, Fusarium and *Penicillium*

AT WHAT STAGES ALONG THE FOOD CHAIN DOES AFLATOXIN CONTAMINATION OCCUR?

- The risk of aflatoxin contamination begins during pre-harvest and can be worsened by inappropriate harvesting, handling, storage, processing, and transport practices.

- Droughts, high temperatures, low soil fertility, pest infestation and other stresses that affect plant growth and vigor increase the likelihood of fungal infection as well as the levels of aflatoxins produced by the *Aspergillus* fungi.

- Aflatoxin contamination can thus be prevented by application of good agricultural practices in crop cultivation and good management practices in post-harvest food handling.

Premium should also be paid for aflatoxin-free commodities

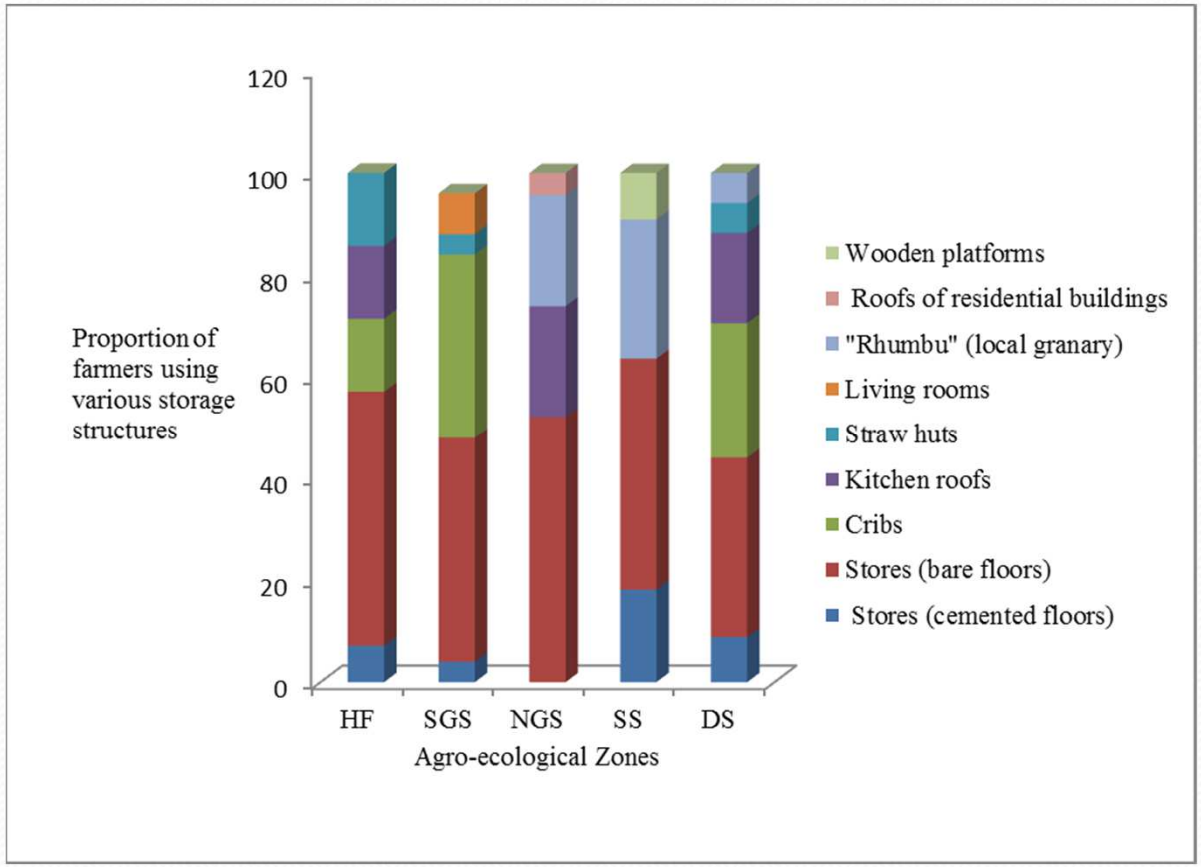
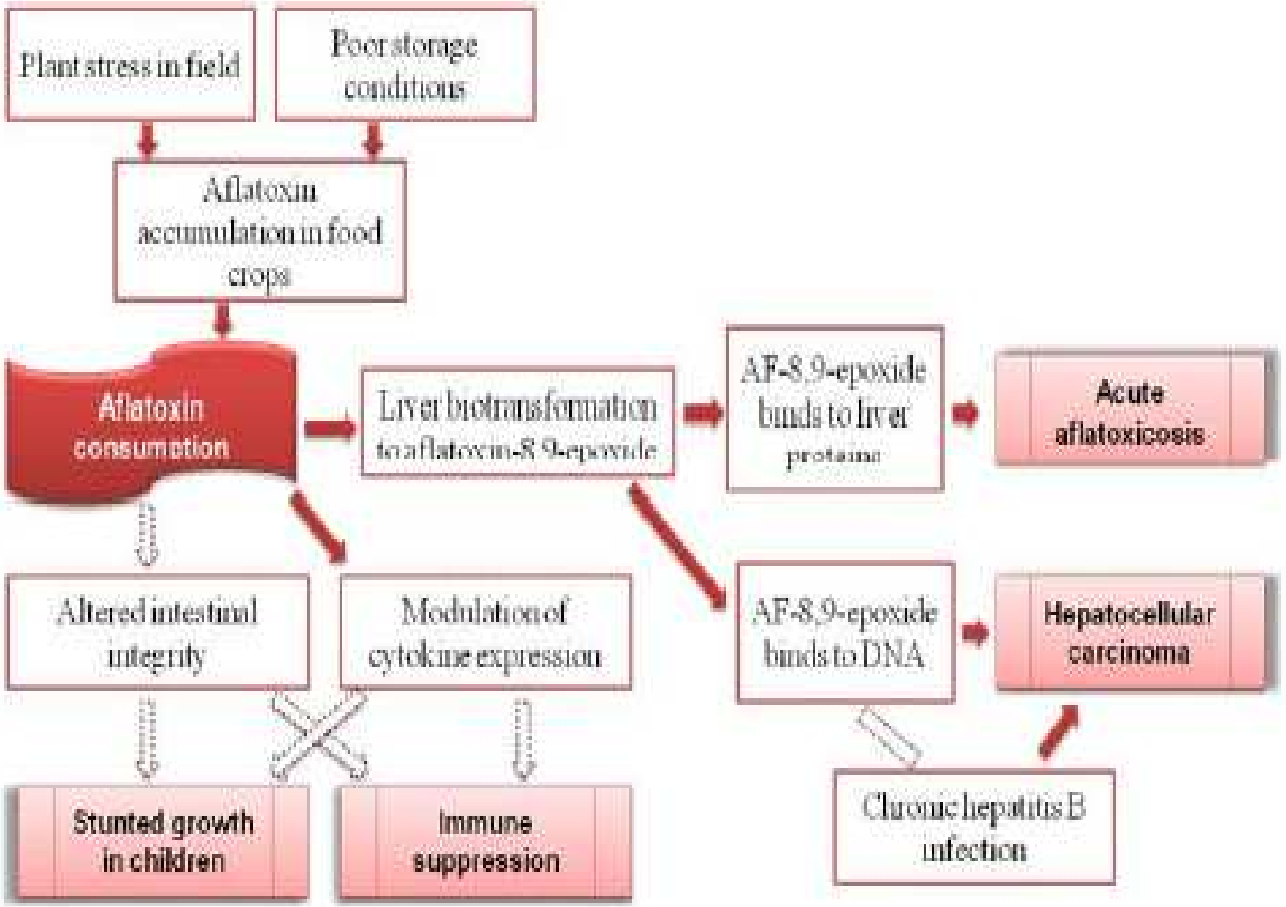


Fig. 1: Storage structures of maize in Nigeria
Source: Adetunji et al., 2014

Plate 1: Mouldy maize showing mixed infection with fungi
Source: Bankole *et al*., (2013)

Plate 2: *Aspergillus flavus* contaminated dried meat displayed for sale in an open market in Nigeria

Source: Atanda *et al*., (2012)

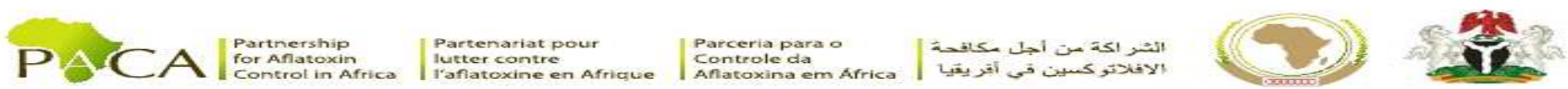


The darker arrows identify linkages that have been well-established in agricultural and toxicological research; the white arrows denote linkages that have been relatively less well-established (Wu 2010)

Fig 2: Health Impact of Aflatoxin
Source: Warrior (2011)

STRENGTHENING AFLATOXIN CONTROL IN NIGERIA:
POLICY RECOMMENDATIONS

BASED ON FINDINGS OF THE COUNTRY-LED SITUATION ANALYSIS AND ACTION PLANNING (C-SAAP) CONDUCTED FROM 2016 TO 2018 FOR PARTNERSHIP FOR AFLATOXIN CONTROL IN AFRICA (PACA)



- The country assessment was organised around the three pillars of PACA-Agriculture and Food Security, Trade, and Health that are adversely affected by aflatoxins

- The identified three crops of concern were Maize, Sorghum and Sesame

- The total aflatoxin (TA) content of the composite samples (formed from those taken at various locations of the food chain) in Nigeria were quantified by direct fluorescence measurements of the purified extracts using VICAM technology

TO WHAT EXTENT ARE NIGERIAN FOODS CONTAMINATED WITH AFLATOXINS

- Samples of maize (taken in 2016) contained detectable aflatoxin levels ranging (Fig 2) from **1 –260 ppb**, with a mean concentration of **26.9 ppb.**
- Aflatoxin levels in about 31% of the samples exceeded the European limit of 4ppb and the US limit of 20 ppb in 16% of samples.
- Aflatoxin levels in groundnut (Fig 3) ranged from **1 – 260 ppb**, with a mean of 16.4 ppb.
- Aflatoxin levels in 51% of the samples were above the EU limit of 4 ppb and exceeded the US limit of 20 ppb in 14% of the samples
- For sesame, all the samples contained detectable aflatoxin levels ranging from 1 – 150 ppb (mean, 16.8 ppb).
- Levels in **31% of the sesame samples** exceeded the European limit of 4 ppb and 9% had aflatoxin above the US

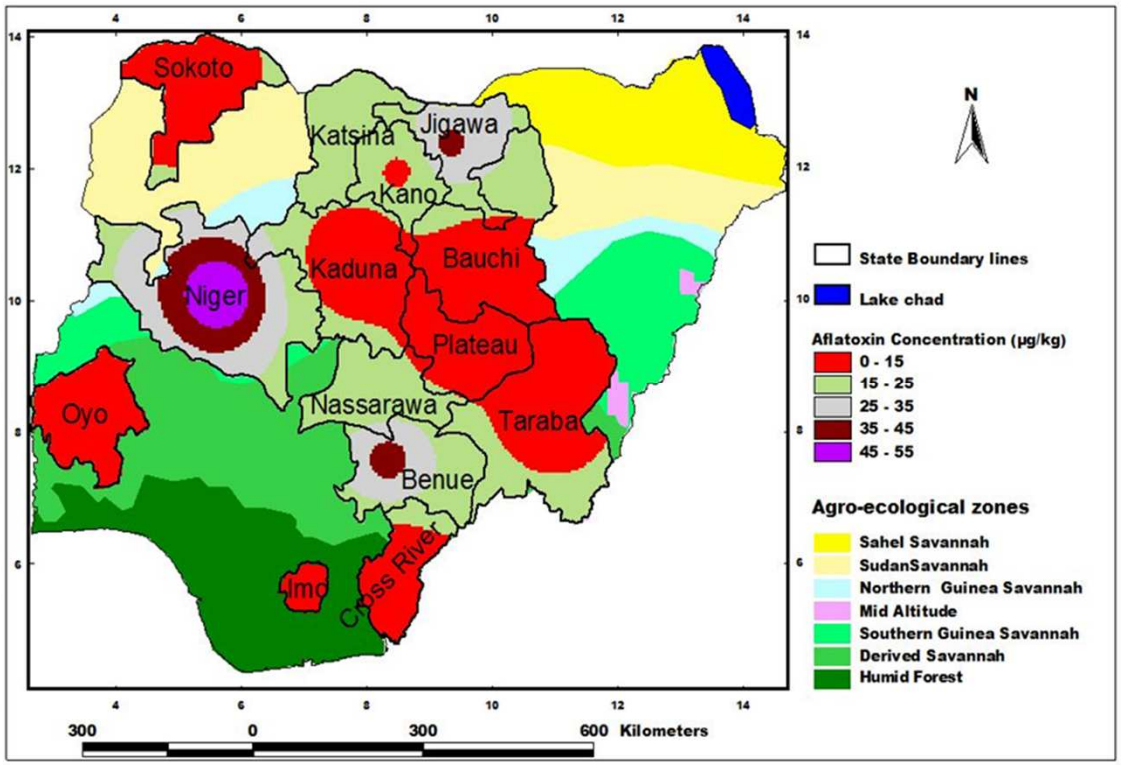


Fig 3: Aflatoxin Contamination of Nigerian Maize/State
Source: PACA, 2018

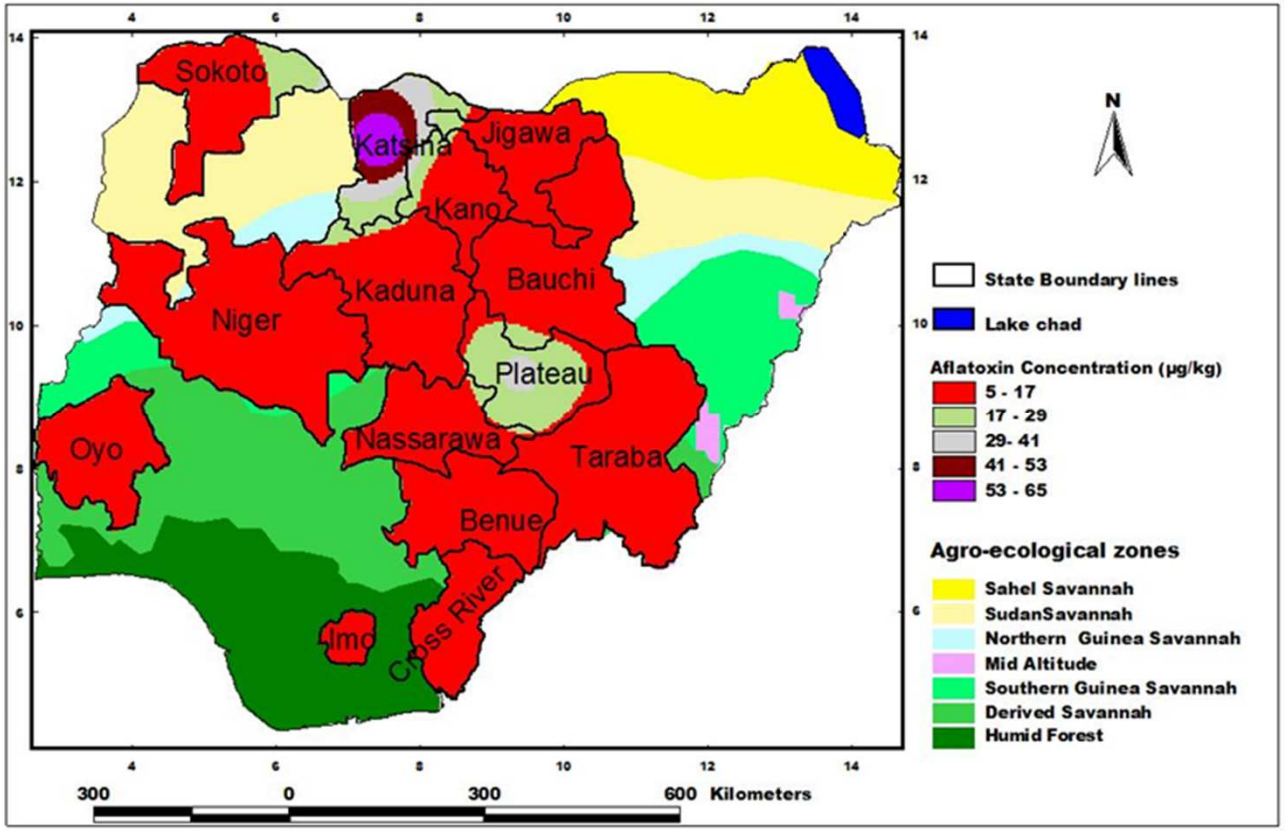


Fig. 4: Aflatoxin Contamination of Nigerian Groundnuts/ State
Source: PACA, 2018

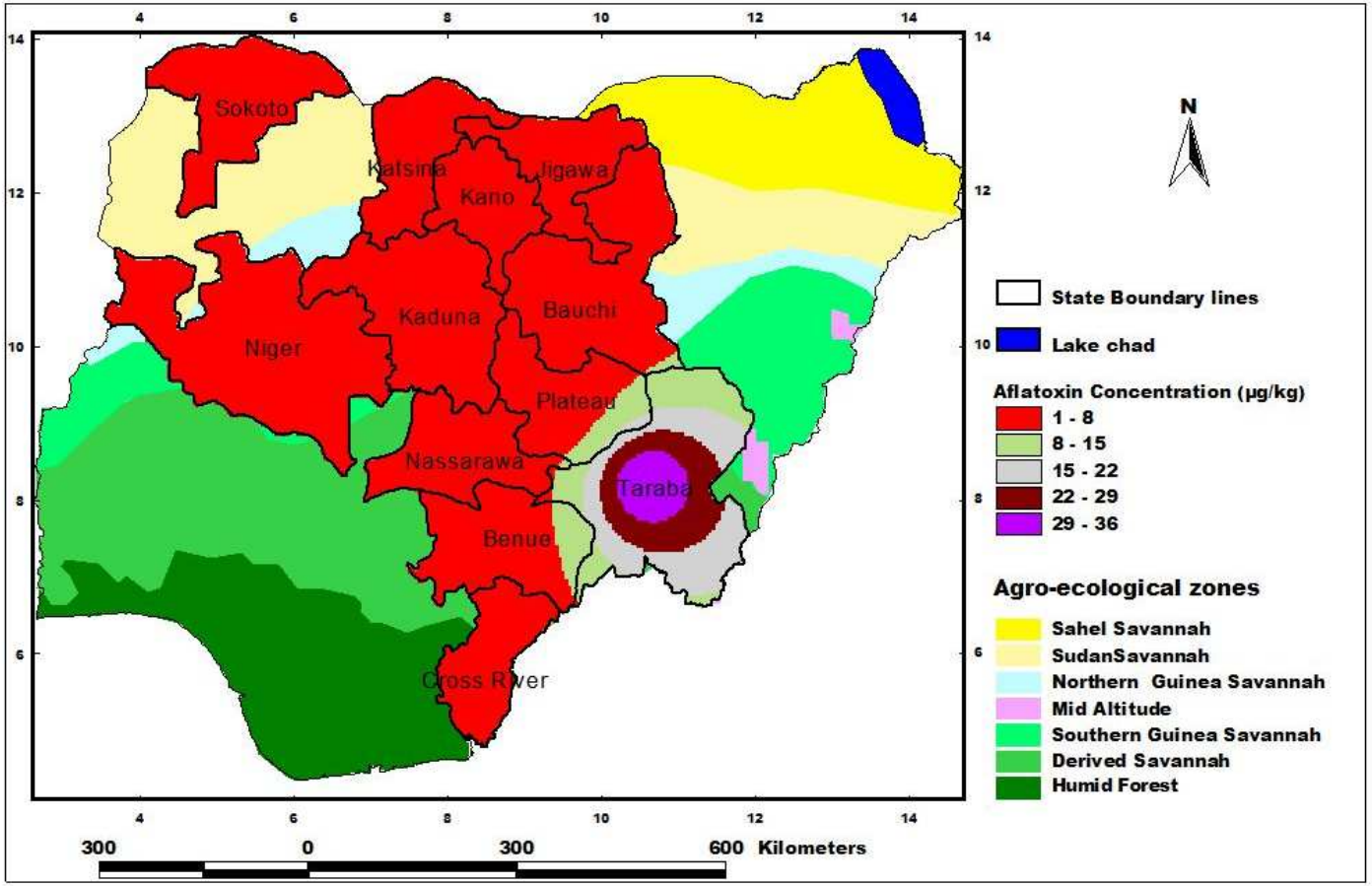


Fig 5: Aflatoxin Contamination of Nigerian Sesame Seeds/State
Source: PACA, 2018

WHAT IS THE EXTENT OF AFLATOXIN EXPOSURE AMONG NIGERIANS

- Dietary aflatoxin exposure in Nigeria ranges from 27.36 - 77.38 ng/kg bodyweight (bw)/day, with a mean national exposure of 34.81 ng/kg bw/day.
- The national aflatoxin exposure exceeded the health concern level of 0.017 ng/kgbw/day by more than 2,000 fold.
- Agro-ecological zones with mean exposures above the average(34.81ng/kg bw/day) are Mid-Altitude (35.35ng/kgbw/day), Southern Guinea Savannah (37.46ng/kg bw/day),Sudan (42.18ng/kg bw/day) and Sahel Savannah(46.21ng/kg bw/day

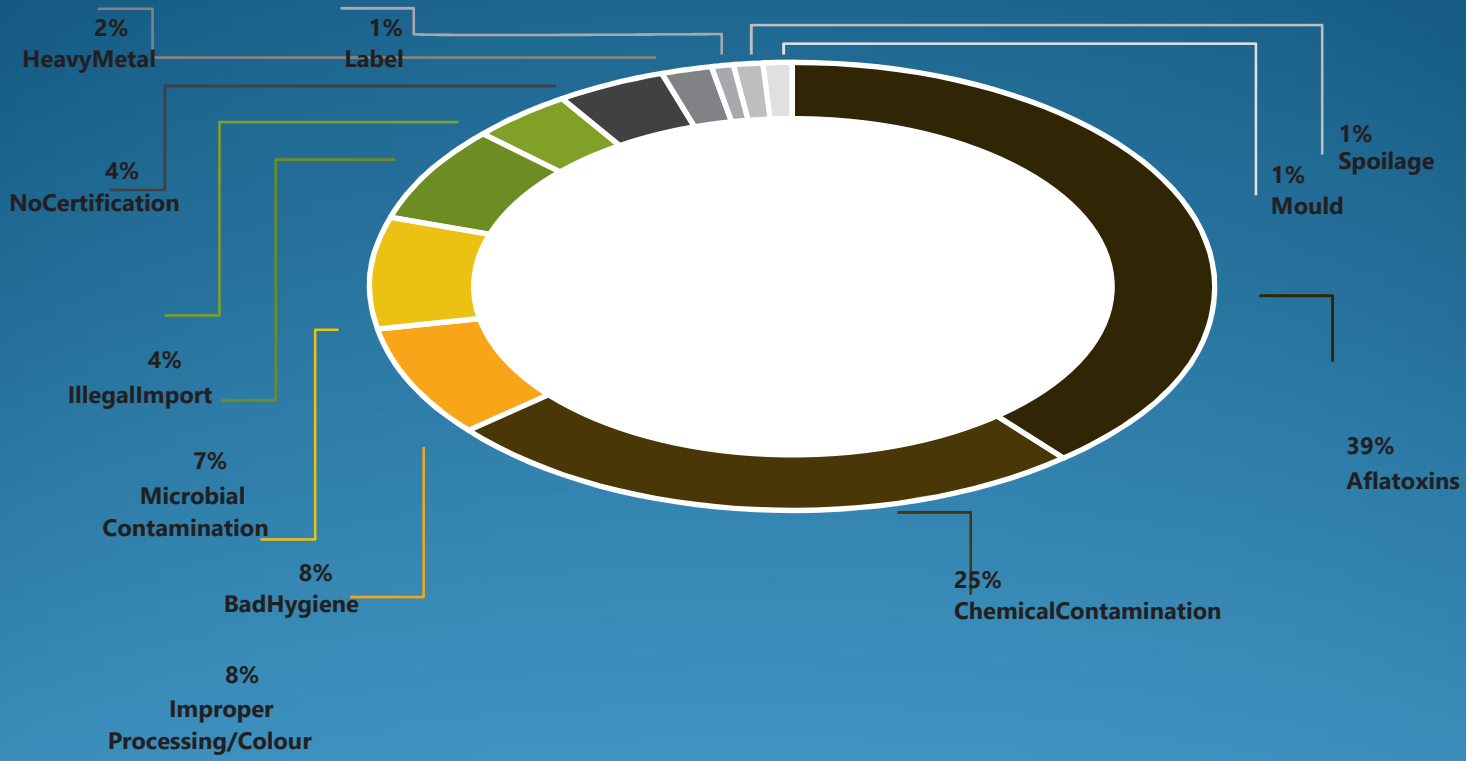
WHAT IS THE RISK OF DEVELOPING AFLATOXIN INDUCED LIVER CANCER IN NIGERIA

- Population risk (cancer cases per year per 100,000 people)for aflatoxin-induced liver cancer ranged from 1.28 in the Humid Forest to 2.28 in the Sahel Savannah.
- The trend of liver cancer population risk followed the aflatoxin exposure pattern
- The national estimate of liver cancer population risk was estimated to be 1.72 cancer cases per year per 100,000 people.
- With this population risk, it was estimated that Nigeria has **3,262** new cases of aflatoxin-induced liver cancer, annually.
- The total cases were estimated based on the population figure of 189.56 Million as estimated by the Nigeria National Population Commission in 2016 and HBsAg-positive prevalence rate in Nigeria(13.6%).

Plate 1: Liver cirrhosis with cancer in a Nigerian Child due to aflatoxins

Source: Jibrin, (2012)

FIG.4: PROPORTION OF CAUSES FOR REJECTION OF NIGERIAN AGRICULTURAL PRODUCE BY THE EUROPEAN UNION (COMPILED FROM EURASFF)



Data extracted from EURASFF porta lrevealed that aflatoxin contaminated produce contribute the largest percentage of agricultural commodities rejected by the EU.

Between 1980 and 2016, a total of 389 Nigerian agricultural export shipments were rejected or seized by the EU, with 39% of these being due to aflatoxin contamination

WHAT IS THE NUMBER OF HEALTHY LIFE YEARS LOST DUE TO AFLATOXIN-INDUCED LIVER CANCER IN NIGERIA?

- With assumption that each liver cancer case results to death within a year, it was estimated that the **3,262** aflatoxin-induced liver cancer cases, would lead to a loss of **42,574** healthy life years, annually.
- The healthy life years lost were estimated using the disability adjusted life years (DALYs) approach whereby DALYs per liver cancer case of 13.05 was used.
- The DALYs per liver cancer case was based on the sex

Specific DALYs per caseof 12.30 for males and 13.8 for females estimated by Abt Associates Inc. for Nigeria in 2013.

- It was estimated that the liver cancer cases (3,262) would lead to annual financial loss of up to **US$ 1,599 million.**
- This health economic impact of aflatoxin-induced liver cancer was estimated by multiplying the liver cancer cases (3,262) by $490,205, which is the Value of Statistical Life (VSL) estimated by Narayan et al (using income elasticity of 1)per liver cancer death.
- This loss represents the amount of money that could be saved annually by adopting measures to curb aflatoxin contamination in Nigeria.

MYCOTOXICOLOGY SOCIETY OF NIGERIA

- A not for Profit Organisation (formerly Nigeria Mycotoxin Awareness and Study Network) was founded in 2006 (www.ngmycotoxin.org) and is registered with the CAC.

- It is the first formalized Mycotoxicology Society in Africa

- It is a body of scientists in the academia, industries, regulatory agencies and other stakeholders in the food and feed sectors united by the need to create awareness on mycotoxins

•With the primary aim of promoting awareness the Society carries out research, collaborates with colleagues within and outside Nigeria (PACA, Bill and Melinda Gates, RMRDC, ISM, Ghents University, Mytox-South**)** and publishes information (http://dx.doi.org/10.5772/55664)- Mycotoxins and Food Safety in Developing Countries)

This book chapter has achieved a download of 7,000 users to date.

-Compendium of Abstracts of Mycotoxicology in West Africa: 1980-2015

•The Society organises Annual Conferences in different parts of the country and publishes an Annual Journal- “Mycotoxicology”.

- It also reports extension activities related to mycotoxins in Nigeria so that such findings can be applied for the resolution of mycotoxin problems and the preservation of food resources.

- The dangers inherent in the consumption of mycotoxin- contaminated meals which may include kidney/liver disorders and immuno-suppressions are made available to the general populace and farmers in local languages

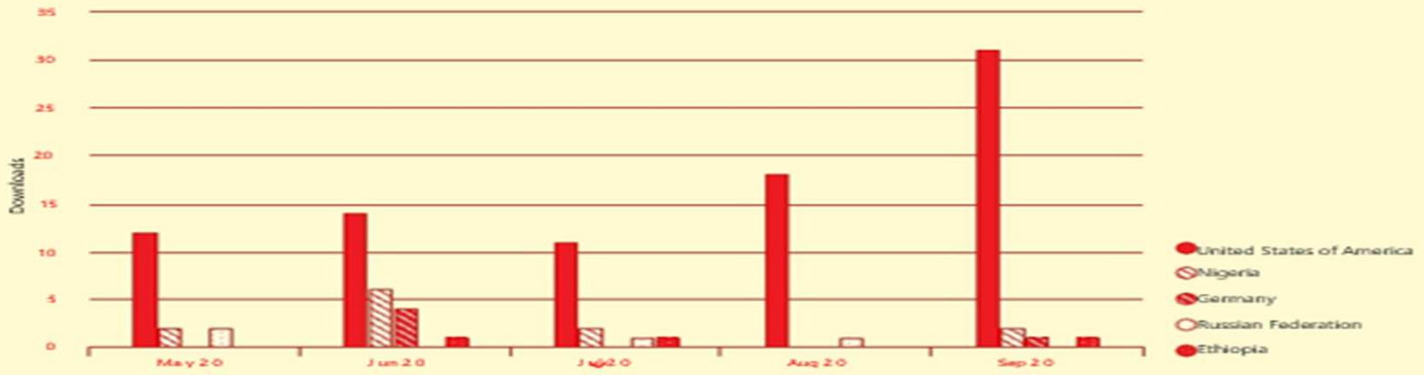
The Society

IntechOpen

Chapter:
Fungal and Mycotoxin Contamination of Nigerian Foods and Feeds

Cumulative Downloads
By Countries/Time Frame

TOTAL
7000



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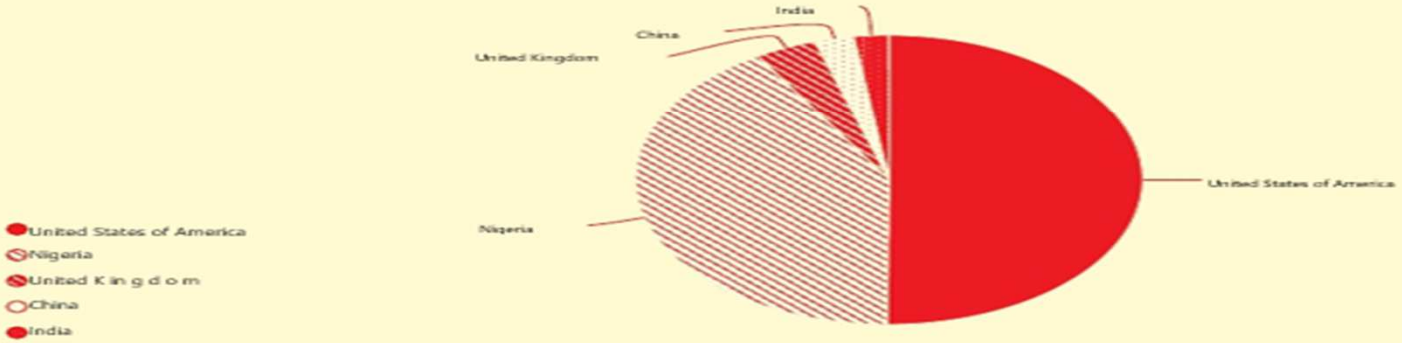

Fig 5. Compendium of Abstracts of Mycotoxicology in West Africa: 1980-2015

140 Paged Book consisting of 295 Abstracts of Mycotoxicology

occasion/former Minister of Education, Mrs. Oby Ezekwesili; President, Women Arise for Okei-Odumakin; and founder, Women Empowerment and Legal Aid, Mrs. Funmi Falana, mit on child marriage in Lagos ... on Thursday. Photo: Goke Famadewa.

urges Saudi to address pilgrims' plight

"Noting that Nigerians are a very religious people who take their religious obligations seriously, President Jonathan told the new Ambassador that the Federal Government will greatly appreciate his cooperation and support in making the participation of Nigerian Muslims in the Hajj easier and free of hindrances."

The President was also quoted as saying that Nigeria would welcome greater economic relations with Saudi Arabia.

At an earlier audience with the new Ugandan High Commissioner to Nigeria, Mr. Peter Kiwanuka, the President said African nations must make a greater effort to boost economic and trade relations amongst them.

Scientists blame cancer, kidney problem on contaminated food

Femi Makinde, Ado Ekiti

SCIENTISTS under the aegis of Mycotoxicology Society of Nigeria have blamed increasing cases of cancer and kidney problems on consumption of fungal-contaminated food.

The President of the association, Dr. Olusegun Atanda, and a Senior Research Fellow at the Nigerian Institute for Oceanography and Marine Research, Mrs. Olaitan Olajuyigbe, said this at the eight annual conference of MSN in Ado Ekiti, Ekiti State, on Thursday.

According to Atanda, mycotoxins are secondary metabolite of fungi found in agricultural produce during storage and

He said, "The danger inherent in the consumption of mycotoxin-contaminated meals include kidney/ liver disorders and immune suppression. We have been working hard to create awareness on mycotoxins and their effects on food security and human health since this society was founded in 2006."

Atanda urged the United Nations to declare a day known as "World Mycotoxins Day, because of the danger posed to humans and animals by mycotoxins. He said that this would allow more people to know its danger and how to prevent it.

"Olajuyigbe said, Mycotoxins cause kidney

heart problem and even cancer. The problem is that mycotoxins do not cause the havoc immediately, these problems may come after consuming fungal contaminated food for a period of time and that is why we should avoid consuming contaminated food.

"Our advice to Nigerians is that when you buy corn, beans or other cereals, they should remove the bad ones before processing the remaining ones. Hot water cannot reduce or kill the potency of mycotoxins. Don't just buy dried fish or meat and start eating it. Remove the bad part of it before cooking it. Also, our food should be well preserved to avoid mould growing

Plate 11: Press Coverage of the 8th Annual Conference and Workshop at Federal Polytechnic, Ado-Ekiti.

Source: Punch Newspaper, 29th Sept, 2013

- With active participation of members, livestock farmers and the food and feed industries, the Society has made it a policy to reach out to farmers in nooks and corners of the country and this has been our practice as farmers are always invited to our conferences and workshops

- International Solution providers like Biomin, Katchey, Neogen and Vicam are always on hand to display the efficacy of their various products in support of mycotoxin research during our conferences

Plate 12: Members of the Steering Committee of Partnership for Aflatoxin Control in Africa (PACA) at the Technical Session of the 7th Annual Conference & Workshop of MSN at NIOMR, Lagos Nigeria, 28th June, 2012

29/4/2013

UN urged to declare World Mycotoxin Day

•The President of Mycotoxicology Society of Nigeria (MSN), Dr. Olusegun Atanda, has called on the UN to set aside a day to be known as ‘ Mycotoxin Day’ due to the dangers posed by mycotoxins to food safety and public health.

•He said there was a particular urgency to create more awareness on aflatoxins, which are naturally occurring mycotoxins and are considered toxic and carcinogenic.

- There is the need for the UN to declare a world mycotoxin day. If they (UN) can declare one for HIV/AIDS, if they can declare one for malaria etc then there must be a world mycotoxin date, where people will get to know the implications of mycotoxins".
- The view of the Society is continually being sought by Stakeholders involved in the management of aflatoxins and by the Government (***Discussion paper on fungi and mycotoxins in Sorghum.*** Joint FAO/WHO CCCF document CX/CF 12/6/14 performed by the electronic Working Group. Chaired by Nigeria under the Lead under the Lead Authorship of Dr. H. Makun & Dr. O. O. Atanda ftp://ftp.fao.org/codex/meetings/cccf/cccf6/cf06_14e.pdf. Rome : Published by FAO/WHO
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