REPORT OF NIGERIA MYCOTOXIN AWARENESS AND STUDY NETWORK (NMASN) 3rd ANNUAL CONFERENCE AND WORKSHOP. April 28-30, 2008

HOSTED BY:STANDARDS ORGANISATION OF NIGERIA, LAGOS, NIGERIA,

DAY 1

OPENING CEREMONY

The 3rd Annual Conference of Nigeria Mycotoxin Awareness and Study Network was hosted by Standards Organisation of Nigeria (SON), Lagos, Nigeria.

Opening prayer was said by Mrs. M. E. Eshiett,Local Organising Committee Chairperson

Welcome address was delivered by the Director General, Standards Organisation of Nigeria, Dr. John N. Akanya. He welcomed participants to the third annual conference and noted that the issues of mycotoxins contamination poses great threat to our economy and this must be addressed.

Speech by the President of NMASN Dr. S. O. Fapohunda,Babcock University,Ilisan-Remo,Nigeria also welcomed participants to the third annual conference tagged SON 2008. He informed the gathering that NMASN was made up of experts in diverse but related fields having as a common interest on the issue of managing mycotioxin in food and feeds. He said that in order to guarantee public health and fair trades at the global level, there is the need for harmony in detection methods and setting limits for mycotoxins.

Speech by Senior Regional Food & Nutrition Officer, FAO Regional Office for Africa, Accra, Ghana. Dr Cheikh Ndiaye expressed pleasure in being at the workshop which he considered very important within the context of improving the Health and Nutrition well being of the populace. He also stressed the importance of reference laboratories within the African Region to support food safety activities through building of expertise and information exchange.

Speech by the chairman, The secretary general of COPAL,Amb. Sona Ebai spoke extensively on the emerging issues on mycotoxins and how it affects our economy through export rejects. He called on all experts in the field of Mycotoxin to work together and proffer solutions to mycotoxin contamination of our export produce.

Speech by the Honourable Minister of Commerce and Industry, Chief Charles Ugwu. Who was ably represented by Dr. Peter Attah congratulated NMASN on hosting its third Annual Conference. He applauded the Network on its noble objectives and implored the participants especially the researchers to device means of controlling mycotoxin contaminations in other to prevent rejection of our exports and eliminate the resultant diseases.

2ND SESSION

PAPER 1

The paper 1 titled '**Mycotoxins traceability and risk assessment, prevention or reduction of their biosynthesis.**

The paper was presented by Dr. Olusegun Atanda for the guest lecturer Prof. M. Elisabetta Guerzoni .

The presenter highlighted the importance of mycotoxins traceability and risk assessment, prevention or reduction of their biosynthesis as follows:

- The problem of food and feed contamination with mycotoxins is of current concern and has received a great deal of attention in developed and developing countries. The frequent incidence of these toxins in agricultural commodities has a potential negative impact on the economies of the specific regions, where harvest and post-harvest techniques are not adequate for the prevention.
- Although currently more than 300 mycotoxins are known, scientific attention is focused mainly on those that have proven to be carcinogenic and/or toxic. These include a metabolite of Aspergillus flavus and Aspergillus parasiticus, aflatoxin B1, the most potent hepatocarcinogenic substance known, which has been recently proved to be genotoxic;
- Ochratoxin A, produced by Penicillium verrucosum and Aspergillus ochraceus, which is known to be carcinogenic in rodents and nephrotoxic in humans, although its genotoxic power has so far not been definitively established;
- It has been calculated that 25% of foodstuffs currently produced in the world are contaminated by mycotoxins, with serious repercussions on human health and significant financial loss for the various producing sectors.
- The National maximum tolerated levels for aflatoxins in Human food was highlighted as follows

Nation	**Total aflatoxin standards in human food (µg/kg)**
Australia	5
China	20
European Union (EU), Harmonized	4
Germany	4
Guatemala	20
India	30
Ireland	30
Kenya	20
Taiwan	50

- The 2003 Council for Agricultural Science and Technology Mycotoxin report states that one 21st century goal is the development of uniform regulations worldwide for foodborne mycotoxin contamination

- This study informs that endeavor by a risk assessment and economic analysis of two important mycotoxins: Fumonisins and Aflatoxins.

- If a Fumonisin standard of 0.5 mg/kg were adopted worldwide, total export losses from Fumonisins in corn may exceed $300 million annually: 3-fold higher than if the less stringent U.S. standard of 2 mg/kg were adopted. Likewise, export losses from Aflatoxins in peanuts may exceed $450 million under the current EU regulatory standard of 4μg/kg: almost 5-fold higher than if the U.S. standard of 20 μg/kg was adopted.

- Risk assessment is now a well-recognized and accepted approach within food safety risk management

- Risk assessment must be an iterative process, since the problem formulation and the risk assessment may need to be revised to reflect new data and theories (see Renwick, 2003).

- Risk assessment involves the following four components:

1. Hazard identification—identifies via in vitro and in vivo methods the potential target(s) and the potential end point(s) of toxicity.
2. Hazard characterization—include dose-response considerations and evaluation of the relevance of certain end points in experimental systems for humans (from such data in the pivotal study, no observed adverse effect levels (NOAEL/NOEL), or lowest observed adverse effect levels (LOAEL/ LOEL) can be identified).
3. Risk characterization—integrates information from hazard characterization and exposure assessment into advice suitable for risk management decisions. This advice can be a quantitative estimate of health risk at certain exposure levels, or it can be in form of a level of exposure without significant adverse health effects, such as the acceptable daily intake (ADI) or the tolerable daily intake (TDI) (including provisional (P) and temporary (t) qualifying designations).
4. It is a structured, systematic approach to integrate and evaluate information from many diverse sources along the food chain. In this way, it can lead to:
    a. An enhanced understanding of the factors that influence risk
    b. A major insight of risk management

c. An identification of critical knowledge gaps that hinder effective action in mitigating the risk of food borne illnesses.

- **Mycotoxin control strategies**
  - ✓ Good agricultural practices (GAPs)/Good manufacturing practices (GMPs)
  - ✓ HACCP Hazard analysis critical control points
  - ✓ Biological control measures
  - ✓ Transgenic approach
  - ✓ Use of resistant varieties (eg. corn varieties producing volatile aldehydes such as hexanal inhibiting Aspergillus spp. (Wright et al. 2000)

- **BIOLOGICAL CONTROL MEASURES**
  - ➢ Use of specific antifungal agents during storage
  - ➢ Use of antagonistic microbial species
  - ➢ Toxin degradation by naturally occurring enzymes
  - ➢ Detoxification with microflora of cow intestine
  - ➢ Inoculum with lactic acid bacteria producing antifungal agents such as hydroxy acids

Biological control: use of volatile molecules

Use of specific antifungal agents during storage

STRATEGIES FOR PREVENTION OF MYCOTOXINS IN MAIZE

Pre-harvest strategies known to be effective

- Reduction in plant stress through irrigation, mineral nutrition, protection from insect damage.
- Avoidance of environmental conditions that favour infection in the field.
- Minimization of crop residues and other point sources of inoculum. Potentially effective
- Breeding for maize cultivars resistant to fungal infection.
- Use of crop protection chemicals that are antifungal agents. Developmental
- Development of transgenic maize plants resistant to fungal infection.
- Development of transgenic maize cultivars capable of catabolism/interference with toxin production.
- Development of maize genetically engineered to resist insect damage.
- Development of maize seeds containing endophytic bacteria that exclude toxigenic fungi.
- Exclusion of toxigenic fungi by pre-infection of plants with biocompetitive non-toxigenic fungal strains.

Post-harvest strategies known to be effective

• Harvesting when water content is optimal to prevent saprophytic development of toxigenic fungi.

• Removal of damaged maize and drying of kernels to the optimal moisture content before storage.

• Control of insect and rodent activity and maintenance of appropriate moisture levels and temperature.

• Frequent cleaning of feed delivery systems and short-term storage areas.

Potentially effective

• Use of antifungal agents such as propionic and acetic acids.

- **Physical methods**

Irradiation

Cleaning: screening out fine materials reduces Fumonisins and other mycotoxins – simple but incomplete.

Segregation and sorting: "black light" test for Aflatoxins – simple but misleading; colour sorting technology – unproven with maize, but promising.

Density segregation and washing: of Fumonisins, Deoxynivalenol, Zearalenone – non-specific and incomplete, but suitable for wet milling and alkaline processing of maize.

Thermal degradation: incomplete for most mycotoxins.

Microwave treatment: high levels destroy Trichothecenes.

Solar degradation: of Aflatoxins – results in maize oil encouraging.

Extrusion cooking: of Fumonisins – temperature- and screw speed-dependent destruction – very promising (Katta et al., 1998).

Wet milling: produces starch free, or almost free, of Zearalenone, Fumonisins and Aflatoxins, but T-2 toxin is increased in maizegerm.

- **Chemical methods**

Thermal treatment plus reducing sugars: of Fumonisins – promising but toxicology and stability uncertain.

Nixtamalization/alkaline hydrolysis: reversible degradation of Aflatoxins and partial degradation of Fumonisins, but toxicity remains – not an effective method for detoxification of Fumonisins or Aflatoxin; reduced Zearalenone and Deoxynivalenol.

Bisulphite: destroys aflatoxin B1, reduces Deoxynivalenol in maize

– Bisulphite is a common food additive (the DON sulphonate is unstable in alkali).

Ammoniation: approved method for Aflatoxin in maize in Mexico, South Africa and several states in the United States – may not be effective in detoxifying Fumonisins in maize.

Hydrogen peroxide/sodium bicarbonate: destroys Fumonisin in maize.

Ozonation: degrades and detoxifies Aflatoxins in naturally contaminated maize – promising.

Hydrated sodium calcium aluminosilicates: bind aflatoxins with high affinity and capacity – demonstrated efficacy in vivo when added to diets; non-selective Aluminosilicates may pose significant risks and should be avoided (Mayura et al., 1998).

Activated charcoal: reduces dietary conversion of Aflatoxin B1 to Aflatoxin M1 in cows.

- **Microbiological methods**

Ethanol fermentation: does not break down aflatoxin B1,

zearalenone or fumonisin B1; toxins may actually be increased in spent grain used in animal feeds.

Probiotic mixtures: Lactobacillus and Propionibacterium may reduce bio-availability of dietary aflatoxin (Ahokas et al., 1998).

Dietary interventions: Choline, methionine, vitamins, protein, dietary fat, antioxidants and inducers of metabolizing enzymes: addition to animal feeds can lower toxicity caused by mycotoxins in maize.

PAPER 2

The second paper **titled 'Effects of mycotoxigenic fungi and ota on quality deterioration of cocoa beans and cocoa butter'**was presented by Adegoke G. O.,University of Ibadan, Nigeria. His presentation was based on the following:

Most biochemical activities carried out in cocoa beans after harvest are water-based.

Qualities that determine the international reputation of nigerian cocoa beans and cocoa butter are :

- Absence of mouldiness
- Absence of slatiness
- Absence of acidity
- Absence of germination
- Absence of black beans
- Low moisture
- High cocoa butter fat etc.

Conclusion

Mycotoxigenic fungi caused deterioration of cocoa bean qualities.

Ochratoxin A caused an increase in ffa, pv and acid value in cocoa butter.

Recommnedation

Observation of quality control using tools like GAP, GHP and GMP

Paper 3 titled 'Managing mycotoxin risks: from farm to fork ' Presnted by Kohwo S. Ohwofa The Chairman/CEO of O.M. SIMONS NIG. LTD. Representing Biomin GmbH was highted as follows

- Overview
  - What are mycotoxins?
  - General mycotoxin-related problems
  - Agriculturally relevant mycotoxins
  - Mycotoxicoses

- Definition. Mycos (Greek) = fungus, Toxicum (Latin) = toxic "Mycotoxins are toxins produced by fungi" secondary metabolites produced under favourable environmental conditions… on almost all agricultural commodities worldwide! > 300 mycotoxins identified.

  Mycotoxins are chemically stable, resistant against temperature, resist storage and resist processing conditions

  Mycotoxins are invisible, odorless and tasteless!
- Introduction
  - 25% of world's crop contaminated with mycotoxins
  - 95% of the mycotoxins in feed are already produced on the field

Many factors influence mycotoxin formation!

- Production: weather conditions, insect manifestation, variety of grain, crop density, fertilization, etc.
- Harvest: crop maturity, moisture content, agricultural practice
- Storage: moisture, insect control, preservation, etc.
- Distribution: shipping conditions, processing, etc.
- Moisture
- Damage of the
- plants/kernels/yield

High incidence of aflatoxin

- Southern United States (U.S. corn belt)
- Southern China
- Southeast Asia
- Africa
- South America

Affected feeds/foods

- cereals (corn, barley, millet, oats, rice, sorghum, wheat)
- peanut, pistachio, almond
- other tree nuts
- soybeans
- milk, milk products (cheese)
- Eggs

- Conclusion

Only the combination of different strategies will bring success!

There is no single approach to counter all mycotoxins …

PRACTICAL SESSION

A practical session chaired by Dr. Mrs. M. Edema was conducted by facilitators from VICAM South Africa, Standards Organisation of Nigeria and National Agency for Food & Drug Administration & Control, using :

- Vicam Mycotoxin Testing Kits by Grant:ulation
- Neogen veratox test kit approved by GIPSA/FGIS/AOAC as a test method for the analysis of mycotoxin in some food products details can be found in the GIPSA hand book on mycotoxin

DAY 2

The second day conference was chaired by Mrs. Stella Denloye

Paper 4 titled: 'Biocontrol of Aspergillus Flavus and its metabolites on Sorghum Bicolor [L. moench] seeds using Lippia multiflora leaf extracts was presented by Makun H. A.**.** His presentation was highlighted as follows

- Introduction
  - Sorghum (Sorghum bicolor L. Moench) Family Gramineae is the world's 5th most important cereal grain after wheat, maize, rice and barley (FAO, 2000).
  - livestock feeds, human food; more protein and fat than maize but lower in vitamin A (Coetzee, 1995)
  - seed-borne fungi often controlled with various antifungal synthetic chemicals

- L. multiflora (L) Modenke Family Verbanaceae leaf is aromatic, thyme-scented & most valued part of the plant.
- This study identified seed-borne fungi of sorghum from Minna markets,
- And investigated the effects of Lippia leaf extracts on the germination of sorghum seeds applied with A. flavus mycelia and its metabolites

- Problems and justification
  - Aspergillus spp. - pathogenic fungi of Sorghum
  - Produces aflatoxin - adversely affect seeds, human and animal health. (Christensen and Kaufnaiann, 1988)
  - Most farmers find it difficult to obtain a certified fungi-free or resistant seeds.
  - Effective synthetic seeds dressing fungicides are unaffordable by most resource-poor farmers (Salako, 2004)
  - Produce toxic residue on the environment (Anastasiah, 2001)
  - Development of resistance strains (Mehrota and Aggrawal, 2005)
  - Unlike animal and human mycotoxicoses, limited reports on the effects of botanicals on seed mould and mycotoxin

Discussion

- Aspergillus, Fusarium, and Penicillium spp. are considered to be significant pathogenic moulds of cereal crops (Makun, 2006).

- Aspergillus spp. and their metabolites implicated in root rottening and seedling wilting (Mehrotra and Aggarwal, 2003).

- Probably due to aflatoxin present in the metabolites (Marassas, 1995).

- Relatively high germination % by Lippia leaf treatments might be due to fungitoxicity of its extract, their stimulatory effects or its antidotal action to Aspergillus metabolites thus reducing its toxicity.

- Mwangi, et al., (1991) reported the extract to be phenolic-rich & contains a. i. like carvacrol, linalool, flavonoids, pulegone 1, 2 epoxide, and saponins glycosides which have antifungal property.

- Conclusion

  - Most sorghum seeds sold in Minna markets were borne with mould.
  - A. flavus singly or in combination with its metabolites reduce G % and seedling V.I. of maize seeds.
  - Seeds/grains sold in the markets be inspected periodically and certified to be mould-free by an appropriate agency.
  - The adverse effect of mycelia was less severe on germination than its metabolites.
  - Lippia leaf ethanolic extract applied to maize seeds infected with the fungus or its metabolites had improved G% and seedling V. I.
  - a. i. in the crude Lippia extracts could be isolated, so that commercial fungicide for resource-poor farmers is formulated from it.
  - Confirmation of the efficacy of the extract on the field is imperative. If found effective, it is more affordable and environment-safe

Paper 5 titled 'The application of HACCP to mycotoxin control'. The presenter Mr. Akogun O.I highlighted the application of Hazard Analysis Critical Control Point (HACCP) which is a systematic approach to the identification, evaluation, and control of food safety hazards.

HACCP is a structured systematic approach for the control of food safety throughout the commodity system (from farm to table)

- HACCP functions effectively if the following well established ::

  a. Good Manufacturing Practice (GMP)

  b. Good Hygienic Practice (GHP)

  c. Good Agricultural Practice (GAP) and

  d. Good Storage Practice (GSP)

The above pre-requisite programme must be effective before HAACP could be applied.

- Information such as time of harvest, drying procedures, storage conditions, the marketing chain etc should be verified and any modifications made should be documented.

WAYFORWARD

1. HACCP is a powerful tool with application to the control of mycotoxin in the commodity system
2. HACCP study promotes a greater awareness of safety issues.
3. HACCP system is not an end in itself. The ongoing maintenance of the HAACP plan is where the benefit really lies.

Paper 6: '**REPRODUCTIVE POTENTIALS OF RABBITS FED MAIZE-BASED DIETS CONTAINING FB1 STRAIN OF FUSARIUM VERTICILLIOIDES (SACC.).** by K.O. IDAHOR

- Introduction

Fusarium verticillioides (sacc.) is one of the most common fungi associated with crops worldwide particularly maize. According to Visconti and Doko (1994), Fumonisin B1 (FB1) is the most prevalent of the at least fifteen identified members of fumonisins. They are mycotoxins produced by F. verticillioides and a significant accumulation of them in maize occurs when the weather conditions favour fusarium kernel rot (De Leon and Pandey, 1989).

They are known to be heat stable, light stable, water soluble, poorly absorbed, metabolized and rapidly excreted by animals. Thus, most of them would eventually end up being recycled into the environment in a manner that will concentrate its spatial distribution. Hence, the amount that enters the environment may be quite large (WHO, 2000). Although there are some evidences that fumonisins can be metabolized by some micro-organisms yet, little is known about the environmental fate of them after they are either excreted or processed.

- RESULTS AND DISCUSSION

The mean values of the paired testes weight, relative paired tests weights and the testicular elements (spermatogonia, primary & secondary spermatocytes, round and elongated spermatids and spermatozoa) obtained for bucks in the three treatment diets were not significantly different ($p>0.05$) from one another

WAYFORWARD

The findings in this present study indicated that fumonisin B1 at approximately 2.0mg/kg diet seems apparently not to have spermaticidal and embryotoxic effects on rabbits. There was no evidence of FB1 crossing the placenta to cause developmental abnormalities in the fetuses examined. However, there might have been some damages on the physiological status and possibly, gradual accumulation of FB1 in the carcasses which will in turns, pose residual health hazard to humans when consumed.

Paper 7 titled 'DETERMINATION OF OCHRATOXINS AND TOTAL AFLATOXIN IN WHEAT' presented by Denloye S.A (NAFDAC)

- INTRODUCTION

  Mycotoxins are secondary metabolites of moulds exert toxic effects on animals and humans.

  - The chemical structures of mycotoxins vary considerably, but they are all relatively low molecular mass organic compounds.

- Studies in Nigeria have shown that exposure to Aflatoxins begin in the uterus as a consequence of maternal consumption of toxin infected foods.
- Findings in Sierra Leone showed that 20% of children studied had ochratoxin A in their bloods while 58% of them had aflatoxins.
- The recent incidence of the death of several people in Kenya after consuming moldy grains is a confirmation of the level of exposure to mycotoxin contamination in developing countries

OBJECTIVE OF THE STUDY

- To analyze samples of wheat imported into the country in order to determine the occurrence and levels of ochratoxins, and aflatoxins.

- Procedure 'AGRAQUANT ELISA TEST KIT'

- RESULTS AND DISCUSSION

102 different brands of Wheat imported into the Country in 2006 were sampled and assessed for Ochratoxins and Total Aflatoxin.

48 Samples were tested for Ochratoxins while 54 were tested for Total Aflatoxins

The results obtained are shown in the tables below:

Table 4.1: Amount of Ochratoxin detected in samples of Wheat:

SAMPLES	*DETECTED SAMPLES*
(Not detected)	*(0.1-5.9µ/kg)*
43	*5*

RECOVERY DATA

HPLC METHOD

- Cereals
- Spike level 5µg/kg
- Mean 82%
- Recovery, n = 4
- RSD(%) 7.8%

- Recovery Data continued with HPLC Method of analyzing Ochratoxin A in cereal
- ELISA method (using Agraquarant Standard) for total Aflatoxin in Wheat
- ELISA method (using Biopure Standards) for total Aflatoxin in Wheat
- RESULTS

- The results obtained in this study showed that out of 48 different brands of wheat tested for Ochratoxins, 10.4% were found to contain Ochratoxins.
- The content of Ochratoxins ranged from non-detected to 4.4ug/kg,
- None of the samples was found to be above permitted level of 5ug/kg.
- There could be an onset of Ochratoxins contamination if samples are not properly stored since Ochratoxin is a storage toxin.
- 54 different brands of wheat were also tested for Total Aflatoxins 25.92% were found to contain total aflatoxins.
- The content of total aflatoxins ranged from non-detected to 5.9ug/kg,
- None of the samples was found to be above permitted level of 10ug/kg.

- Conclusion and Recommendation
  - The low level of contamination evident from this study suggests that the wheat imported into the country is safe.
  - Although this should not be regarded as final conclusion as new batches of wheat products are being imported to the country from time to time.
  - Based on the facts above, it would be highly recommended that regulatory bodies are mandated to test every batch of wheat entering the country before they are released into the markets.
  - It is also recommended that GMP inspection be made to exporting countries.
  - Careful sorting and processing may further reduce the level of contamination.

Paper 8 titled; Aflatoxin contamination in Cassava flour, Wheat, flour and Animal feeds flour and feed mills Within Lagos and Ibadan, metropolis was presented by Mr. Ikhenebome D.R.(SON)

Aims and Objectives were highlighted as follows:

- To provide a sound scientific basis for a number of subsequent studies, estimations and decisions.
- A tool to determine the exposure of humans and animals to Aflatoxins in these products.
- To protect consumers by drawing attention to contamination problems.
- To examine the level of Aflatoxin contamination in Cassava flour, Wheat, flour and Animal feeds flour and feed mills Within Lagos and Ibadan metropolis.

CONCLUSION

The results of the survey showed that 2 out of the 6(33.3%) wheat grains sampled had levels of total aflatoxins greater than the EU limit of 4ppb for foods meant for human consumption. None (0%) of the cassava samples had total aflatoxins levels

RECOMMENDATIONS - up to 4ppb. 2 out of the 6(33.3%) milled flour sampled had total aflatoxins levels greater than 4ppb. The feeds samples had significant amount of aflatoxins but none (0%) of them had total aflatoxins levels up to the EU/US-FDA action level for feeds for all species. One of the Bran samples (used for animal feeds) had total aflatoxin level as high as 8.7ppb.

Though total aflatoxins levels in all the feeds were greater than 4ppb but the EU/US – FDA action level of 20ppb was not exceeded by any of the feeds samples in this survey. However meeting the EU limit for total aflatoxins in these food products remains a challenge.

RECOMMENDATIONS

In line with the vision of the Federal Government to increase export of non-oil products and also with the new regulation on the use of cassava flour in the milling process by the Federal government, it is imperative that the level of mycotoxins in cassava flour and other allied products be adequately monitored.

More so, special attention should be giving to issues of:

a. presence of rodents and insects in the raw materials and finished products stores.

b. Cleanliness of the production floor, equipment stores and personnel directly involved in production.

c. Temperature monitoring and humidity control in both the raw materials and finished products stores.

It is our hope that this survey will trigger the setting up of a national programme on Mycotoxin monitoring in Nigeria

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Paper 9 titled 'Biological Control of Aflatoxin in Maize' by Dr. Ranajit Bandyopadhyay (IITA, Ibadan)

Outline

- Food systems (as associated with climatic change)
- Aspergillus diversity
- Biocontrol
- Other management tactics
- Conclusions

Field Testing of Atoxigenics

- 24 atoxigenic from 6 locations plus 4 toxigenic strains field-tested in Ibadan
- Inoculation of atoxigenics alone and in combination with a toxigenic strain
- Toxin production in cobs and competition between toxigenic and atoxigenics evaluated.

Field Release of Atoxigenic Strains

- One toxigenic and four atoxigenic strains released together in field; with controls

Objective: Reduce aflatoxin contamination in maize

Activities

- Conduct farmers' participatory trials in 10-15 locations in each of three agroecozones
- Identify the opportunities and constraints for aflatoxin management technology with emphasis on biocontrol
- Develop a convenient model for sustainable production and supply of biocontrol agents in consultation with various stakeholders

- Outputs
  - Efficacy of biocontrol validated
  - Model for production and supply of biocontrol established

Summary

- Aflatoxins in food and feed pervasive in Africa
- Biological control in conjunction with other management practices has potential to dramatically reduce aflatoxin contamination
- Atoxigenic strains are indigenous to Nigeria
- Several safety tests performed
- Inoculum production method developed
- Linkage needed with other organizations for safety, registration, mass production, marketing & other downstream dissemination activities
- Scope for impact – improving health and income

Collaboration:

- USDA-ARS
- Univ. of Bonn
- Univ. of Ibadan

  - The factors including climatic change, stressing the plants, grains development, moist condition
  - He also explained *Aspergilus flavus* as opportunistic microscopic organism that can be affected by external factors such as: low starch content in the grains, temperature and $_{P}$H e.g. extracted toxin with high $_{P}$H can cause lost of toxin
  - Recommendation of advanced infrastructures that enables air to blow through and dry the grains in small scales and regulated

- Interest from the producer and consumer end
- Bringing the stake holders together and strategise to remove the toxin

- **Paper 10** titled '**DOSE RESPONSE OF OCHRATOXIN-A IN 21-DAY OLD CHICKS IN LAGOS NIGERIA'**
  M. A. BADRU College of Health Sciences Olabisi Onabanjo University, Sagamu Ogun State

- **Introduction**

  OTA is a secondary metabolite of some toxigenic species of aspergillus and penicillium

- **Effects of OTA on animals**
  - Hepatotoxic
  - Nephrotoxic
  - Teratogenic
  - Carcinogenic

- **General objective of the study**
  To determine the dose response of OTA in 21-day old chicks.

- **Specific objective**
- 1) To determine the nephrotoxicity of OTA in 21-day old chicks.

  2) To determine the effect of OTA on leucocytes count.

  3) To determine the effects of OTA on basic blood parameters
  (PCV and Hb).

- **Conclusion**
  This study has shown that at certain concentrations, OTA is nephrotoxic as demonstrated by significant changes in blood urea, creatinine and electrolytes levels. The study has also shown that OTA could induce anaemia because significant lower Hb and PCV values were observed in chicks intraperitoneally dosed with varying concentrations of OTA solution.

- **Recommendation**
- The result of this study, therefore, called for strategic control of OTA contamination of feeds and foodstuffs**.**

COMMUNIQUE

3RD ANNUAL CONFERENCE OF THE NIGERIA MYCOTOXIN AWARENESS AND STUDY NETWORK (NMASN) HELD AT STANDARDS ORGANISATION OF NIGERIA AND LAGOS SHERATON HOTEL

FROM 28 – 30 APRIL 2008

Communique issued at the end of the 3rd Annual Conference of the Nigeria Mycotoxin Awareness and Study Network.

1. PREAMBLE/ATTENDANCE

The 3rd annual conference of the NMASN was held on the 28-30 April 2008 at Standards Organisation of Nigeria, Lekki, Lagos.

The events also featured for the first time, hands-on training workshop for participants which included the high ranking policy makers and technical experts from Government Ministries/agencies, academia, the food and feed industry, and other stakeholders from within and outside Nigeria.

RESOURCE PERSONS FOR THE TRAINING COMPRISED:

- NMASN team led by Mrs. Bose Ogunbanwo
- IITA team led by Dr. Ranajit Bandyopadhyay
- South African company – VICAM, represented by

Mr. Grant Kilian

Other international companies that carried out demonstrations and illustrations include;

- BIOMIN (Austria) represented by O. M. Simons
- NEOGEN (USA) represented by Brooderhouse
- Katchey Nigeria Limited

2. RESOLUTIONS

The meeting resolved as follows:

- The Mycotoxin menace should be a source for concern because of our climate and the poverty level of Nigerians
- More workshops should feature in future conferences
- The Federal Government should be actively involved in the formulation of a National Mycotoxin Policy
- The extension and enlightenment unit of the Network be made more functional so that farmers and the industry can have direct access to regular information on intervention strategies

ATTENDANCE

S/N	NAMES	ORGANISATION REPRESENTED
1	Dr. P.K Attah	(representing Hon. Minister of Commerce and Industry) Federal Ministry of Commerce & Industry Abuja
2	Dr. J. N. Akanya	Director General (Standards Organisation of Nigeria)
3	Prof. D. N. Akunyili	Director General (NAFDAC)
4	Amb. Sona Ebai	Secretary General, Cocoa Producers Alliance (COPAL)
5	Mr. Grant Kilian	VICAM South Africa
6	Dr. Cheikh Ndiaye	FAO Regional office for Africa, Ghana
7	Dr. K. Dada	NEOGEN, USA
8	Mr .Aburime H .O	Bendel Feed & Flour Mills
9	Dr. H.A Makun	Federal University of Technology, Minna
10	Dr. Ranajit Bandyopadhyay	IITA, Ibadan
11	Dr. S.T Anjorin	Federal University of Technology, Minna
12	Laniya Olatunji	Sudit Oil &Chemical, Ibadan
13	Ewulluh Onjinye	Envou Oil Ind.Ltd Onitsha
14	Osomatah Anthony	Envoy Oil Ind. Ltd Onitsha
15	Junaid M. Aderonke	Vitamalt Plc Agbara, Ogun State
16	Mr Olusegun Moyosade	Standard Flour Mills Ltd , Lagos
17	Mr. Andre Kunadt	Standard Flour Mills Ltd , Lagos
18	Mr. M.O Olaleye	Cadbury Nig. Plc, Lagos
19	Mr. Samuel A. Sambo	Dangote Flour Mills Plc, Lagos
20	Haruna Mohammad	Dangote Flour Mills Nig Plc, Lagos
21	Mr. Ohunleye B.	Cadbury Nig Plc, Lagos
22	Mr .Ogunronbi J.	Cadbury Nig Plc, Lagos
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25	Dr. Afolabi Ogunledun	Olabisi .Onabanjo University Ogun State
26	Adedigba Ramota Aderinola	National for Biotechnology Development Agency Abuja
27	Christopher U. Orji	National for Biotechnology Development Agency Abuja
28	Adsola Segun-Salami	Doyin Group of Coys Limited, Lagos
29	Olubukola Irurhe	NAFDAC, Lagos
30	Robert Adebayo	Zartech Nig Ltd Ibadan.
31	Mary Ojejinmi	IFMPL Ogba Ikeja, Lagos.
32	Balogun Adesina A.	Dangote Flour Mills Plc, Lagos
33	Edo Isimemen Christian	Okiel Industries Ltd
34	Oganah B.C (Ms)	Home Econs Dept , LACOED, Ijanikin
35	Nden Emmanuel	

36	Emmanuel Nwaotule	Bioingredients Ltd ,Oregun Lagos
37	Joseph Udoh	Bioingredients Ltd Oregun Lagos
38	Erant Kilian	Microsep
39	Talatu K. Ethan	SON, Lagos
40	Aina J.A	NSPRI, Ibadan
41	Dr. K.A. Arowora	NSPRI,Ilorin
42	Idahor O.K	NSUK , Shab-Lafia
43	Alice .S. Ofttong	Niger Mill Co.Ltd Calabar
44	Olubunmi Olugbile	U A C Foods, Lagos
45	Idowu Wilson	U A C Foods, Lagos
46	Opeyemi Fadipe	Nestle, Foods Nig. Plc.Lagos
47	Oluwaseun Ayeni	Nestle Foods Nig. Plc. Lagos
48	Badru Muyis .A.	Olabisi Onabanjo University
49	Olusola Sowumi O.	Crown Flour Mills, Lagos
50	Patricia Ikharo . O.	Crown Flour Mills, Lagos
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52	Somorin Yinka .M.	University Of Agric, Abeokuta (Unaab)
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54	Akinola O.E	Nig. Plant Quarantine Service
55	Dongo, L.N.	Cocoa Research Inst. of Nig.
56	Arannilewa C.O	SON, Lagos
57	Akogun O.I	SON, Lagos
58	Mrs. C.A Okonkwo	Topfeed/SEEPC
59	Paul Deaye	Topfeed/SEEPC
60	Gbelee O. Stanley	Nig. Eagle flour mills, Lagos
61	Dr. A.O Oyebanji	NSPRI, Ilorin.
62	Mrs. O.I Osiyade	Honeywell, flour mills Apapa Lagos
63	Mr. B.O Fabusuyi	Honeywell flour mills Apapa Lagos
64	Mr. T.T Dosumu	SON, Lagos
65	Mr. Monday Ekpo	Solive vegetable oil Ind. Nsukka.
66	Ikhenebome David	SON, Lagos
67	Alade Olumide	SON, Lagos
68	Etoh Esther	SON, Lagos
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73	Dr. Moji Edema	University of Agriculture Abeokuta.

74	Dr. Taiwo A. Banjo	Olabisi Onabanjo University Ago –Iwoye
75	Lawani .S.Gilbert	Dangote flour mills , Lagos
76	Akosile I.O	Amo BYNG Nig.
77	Otarkpo M.O.E	Olabisi Onabanjo University Sagamu
78	Fadulu Ngoze	Bio-Organics nutrients Systems Ltd
79	Dr. Dotun Oladele	Animal care service consult
80	Ojutalayo Abimbola	Dangote flour mills Ltd, Lagos
81	Peter F. Ogunleye	Dangote flour mills Ltd, Lagos
82	Bolarinwa O.Ajibola	Wemy Ind.Ltd, Lagos
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87	Yakubu J.Amasa	Grand Cereals & Oil mills Ltd, Lagos
88	Ambros Ejuh	Grand cereals &Oil mills Ltd, Lagos
89	Arua Julliet Ifenyinwa	Olabisi Onabanjo University, Sagamu
90	Oyadoke Olusoji A.	Deunited Foods Ind. Ltd, Lagos
91	Ibitokun Omolara A.	SON, Lagos
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94	John N. Ikeorah	Linkjon Agrobased Ind. ,Umunze Anambra
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104	Mr. L. O. Njoku	SON, Lagos
105	Mr. J. Sulle	SON, Lagos
106	Engr, S. J. Fowowe	SON,Lagos
107	Mr. S.A. Adegun	SON,Lagos
108	Mr. B. Fashina	SON, Lagos
109	Mr. Robbert Edward	SON,Lagos