Presentation title: Community-based Management of Acute Malnutrition, RUTF Production and Aflatoxin

Author: Tim Williams, University of Georgia

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Community-based Management of Acute Malnutrition, RUTF Production and Aflatoxin.

J H ‘Tim’ Williams
Peanut Collaborative Research Support Program
University of Georgia

Ready to Use Therapeutic Foods

- Food Industry Perspective – RUTF is not a single product – RUTF is a class of foods
- Peanut is already a RUTF for coronary heart disease.
- RUTF as discussed in this meeting are correctly malnourished child RUTFs (MCRUTFs).

Relevance of AF to CMAM

- AF contributes to malnutrition
- Risk of AF exposure greatest in famines and food insecure situations
- AF contributes to morbidity and mortality in malnourished children through ….
  - respiratory diseases
  - increases in diarrhea
  - vaccination failures

Aflatoxin

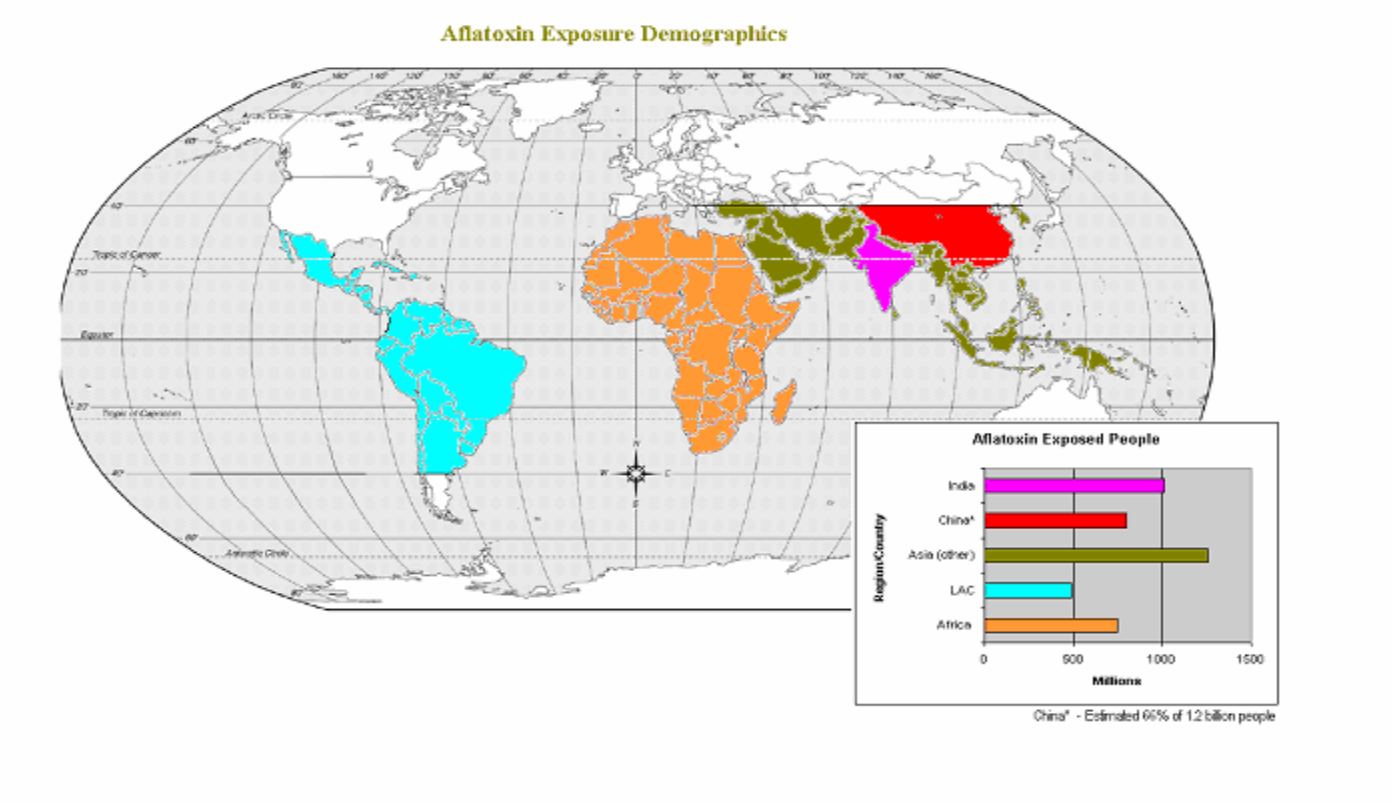
- Common contaminant - result of fungal action
  - Maize
  - Rice
  - Cassava
  - Peanut

- Not destroyed by cooking
- Can develop in all links of the supply chain
- Managed by regulation in developed countries

Toxicity: The dose makes the poison

- All doses accumulate to determine cancer risk
  - Less than 20 ppb – no excess risk
- Chronic exposure (unknown to ~200 ppb)
  - Immunotoxicity
    - Cellular function
    - IGA
  - Nutritional Interference
    - Vitamins A, C, D, E
    - Zinc, Selenium, Iron
    - Protein synthesis
- Acute Toxicity (more than ~ 200)

The risk


Aflatoxin Exposure Demographics
Aflatoxin Exposed People
India
China*
Asia (other)
LAC
Africa
Region/Country
0
500
1000
1500
Millions
China* - Estimated 66% of 1.2 billion people

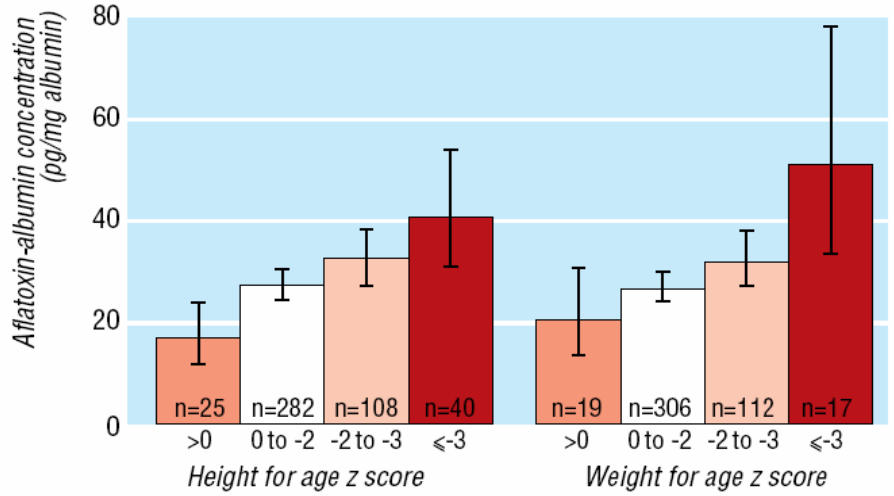
Developing Country Exposure

- Gambia, Benin, Guinea, China
  - > 90% chronic exposure
- Breast milk samples in Africa show 30-40 % of mothers had dietary AF in the last 24 hours.
- Market samples
  - 30-40% of staple grain samples in Nigeria, Uganda could not be sold in the USA.

AF and CMAM

- AF contribution to Acute Malnutrition
  - Vit A deficiency and Vit E deficiency are linear related to AF exposure.
  - AF exposure is a feature of kwashiorkor.
  - Failure to thrive is associated with maternal AF exposure.
  - Susceptibility (pigs) to diarrhea associated with maternal AF exposure.
  - Underweight is dose dependent.

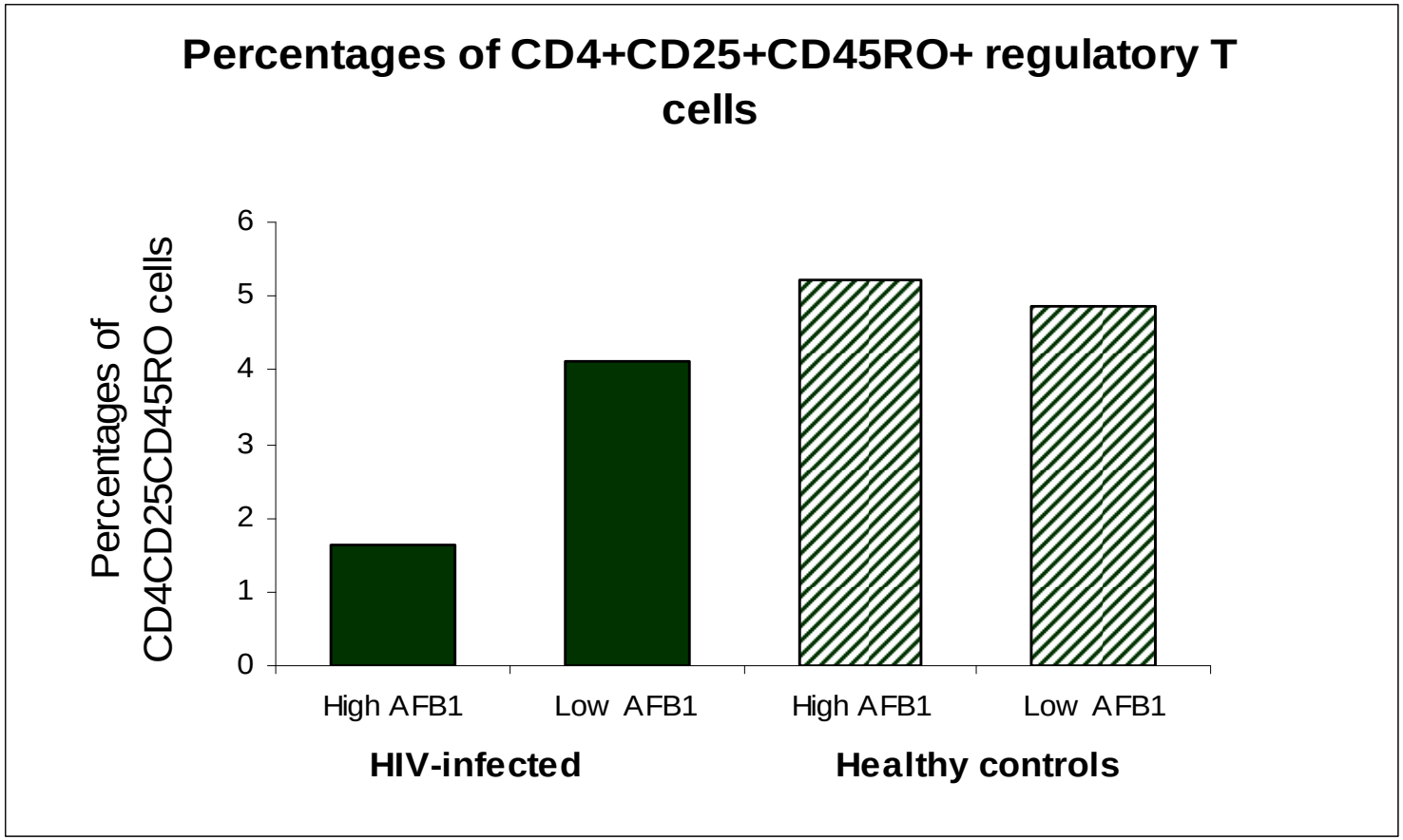
AF and underweight children



Concentrations of aflatoxin-albumin adduct categorised into four groups for height for age and weight for age z scores on the basis of the WHO classification of malnutrition (z score ⩽2) and severe malnutrition (⩽3). Geometric mean adduct concentrations are shown, with 95% confidence intervals, adjusted for weaning status, agro-ecological zone, and socioeconomic status. Height for age and weight for age z scores were significantly associated with aflatoxin-albumin concentration (trend test: F=15.19, P=0.0001, r^2 =0.3766; and F=8.48, P=0.0038, r^2 =0.3680).

Where aflatoxin is in the diet it will increase frequency and severity of Malnourishment.

HIV and AF


Percentages of CD4+CD25+CD45RO+ regulatory T cells
Percentages of CD4CD25CD45RO cells
6
5
4
3
2
1
0
High AFB1
Low AFB1
High AFB1
Low AFB1
HIV-infected
Healthy controls

AF and Surviving Acute Malnutrition

- AF promotes serious malnutrition (usually on a chronic basis) tipping effect when combined with availability issues.
- AF modulates immunity
- Affects of maternal exposure (pig experiments)
  - Zinc deficiency
    - Diarrheas, respiratory infections, malaria
- Therefore fixing AF will increase survival and reduce relapse frequency.

Managing AF for RUTFs

- Detection of aflatoxin
- Options
  - Preventing contamination
    - Action by farmer and storage
    - Economic incentives
  - Removing contamination
    - Detection Challenges
    - Sorting
    - Disposal issues
  - Blocking uptake
    - Novasil as food additive

Aflatoxin Detection

- Detection is a major challenge.
  - Sampling. 10 kg is drawn from multiple locations and ground to paste/meal and mixed before resampling.
  - Extraction – alcohol
  - Antibody cleanup
  - Analysis
    - HPLC or Elisa - Quantitative
    - Dip-sticks - Qualitative
- Infrastructure (lab- staff- refrigeration)

Prevention

- Avoid drought, pests and disease (damage allows fungal access)
- Dry fast
- Keep it dry (< 12% moisture)
- Keep it cool (< 20C)

- Unenforced regulations do not work.

Decontamination

- Very heterogeneous in grains
  - Sampling challenges
  - Key indicators
    - Small and shriveled
    - Discolored
  - Sorting is effective but
    - Costly – Haiti throwing away up to 30%
    - Disposal issues for contaminated grain.

Food Additive Solution

- Very well proven in animals
- FDA GRAS
- Emerging for human application against AF
  - Novasil (bentonite clay)
    - Effective (0.5% provides total protection)
    - Selective (adsorbs no nutrients)
    - Cheap (less than salt)
    - Robust (no cold chain requirements)
    - Safe (no nutritional interferences)
    - Anti-viral (rotavirus binder)
    - Great insurance (mix with micro-nutrient supplement)

CMAM Opportunities for AF interventions

- Local RUTF safety
- General community protection via delivery of food additives
- Education opportunity

Preventing Acute Malnutrition

This child rehab ward with 12 cribs was built in 1990 in response to needs and was empty by 2003 as a result of peanut/cowpea/ cereal recipes.