AFLATOXINS
a global public health problem

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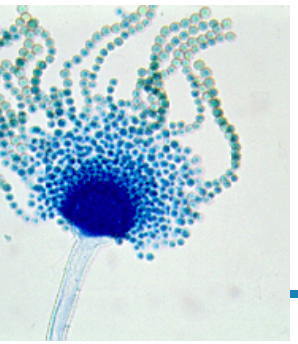
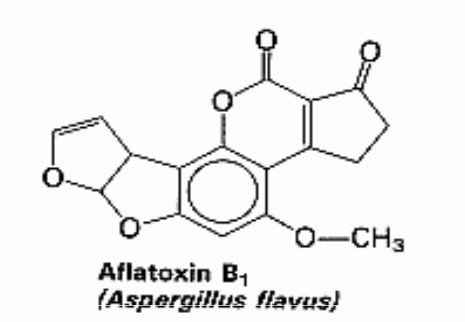


Aflatoxins: scope of the problem

- Produced by *Aspergillus flavus, A. parasiticus*
  - Maize, peanuts, almonds, pistachios, hazelnuts
  - Exposure highest when these foods are dietary staples → Poor nations



Aflatoxin B_1
(Aspergillus flavus)

- Over 5 billion people in developing countries are at risk of chronic AFT exposure
- Health effects (often synergistic with infections, e.g. HBV) pervade in (sub-Saharan) Africa and East Asia
- Over 100 nations have established maximum limits for AFT in food, of limited impact for small and subsistence farmers

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Aflatoxins can cause a variety of health effects

- Human health effects
  - **Liver cancer (fatal in 1-3 months)**
    - Synergizes with chronic **hepatitis B virus** (HBV) infection → much higher cancer risk
  - Acute intoxication
  - Immune system disorders
  - Stunted growth in children
  - Liver cirrhosis

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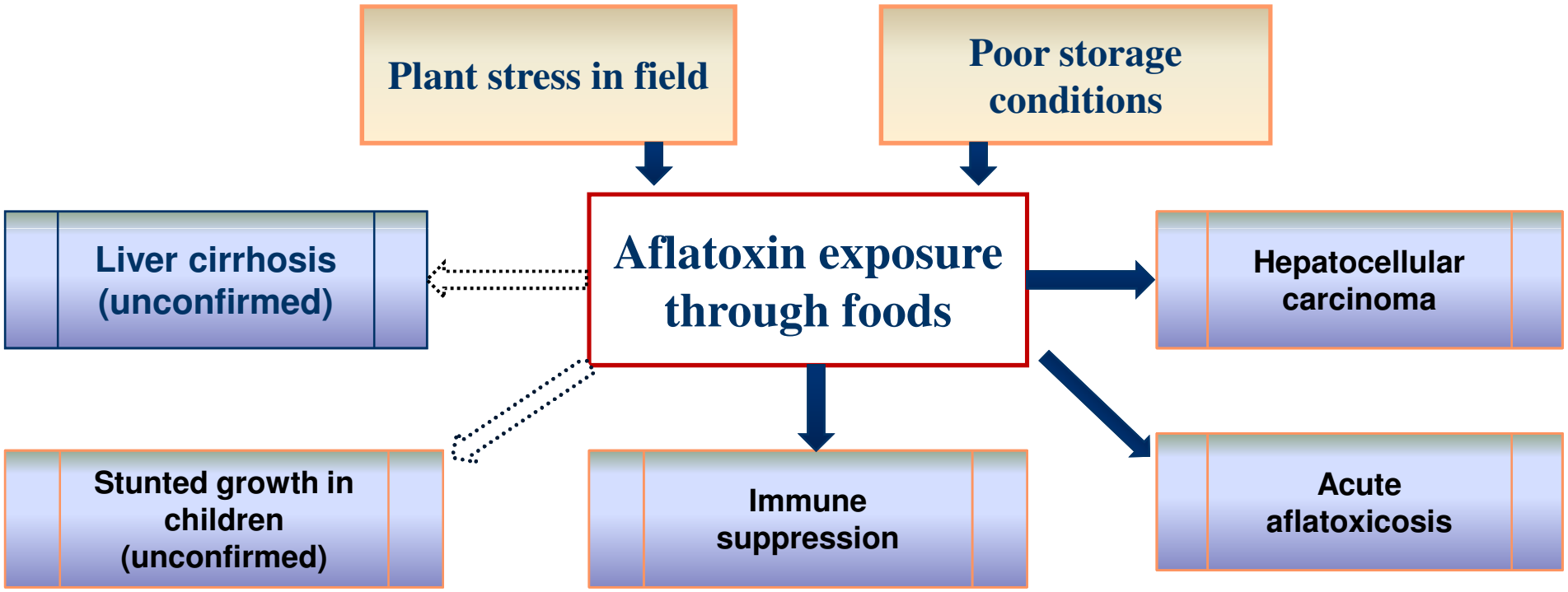
Influence diagram:
How aflatoxins get in our food, and its health effects



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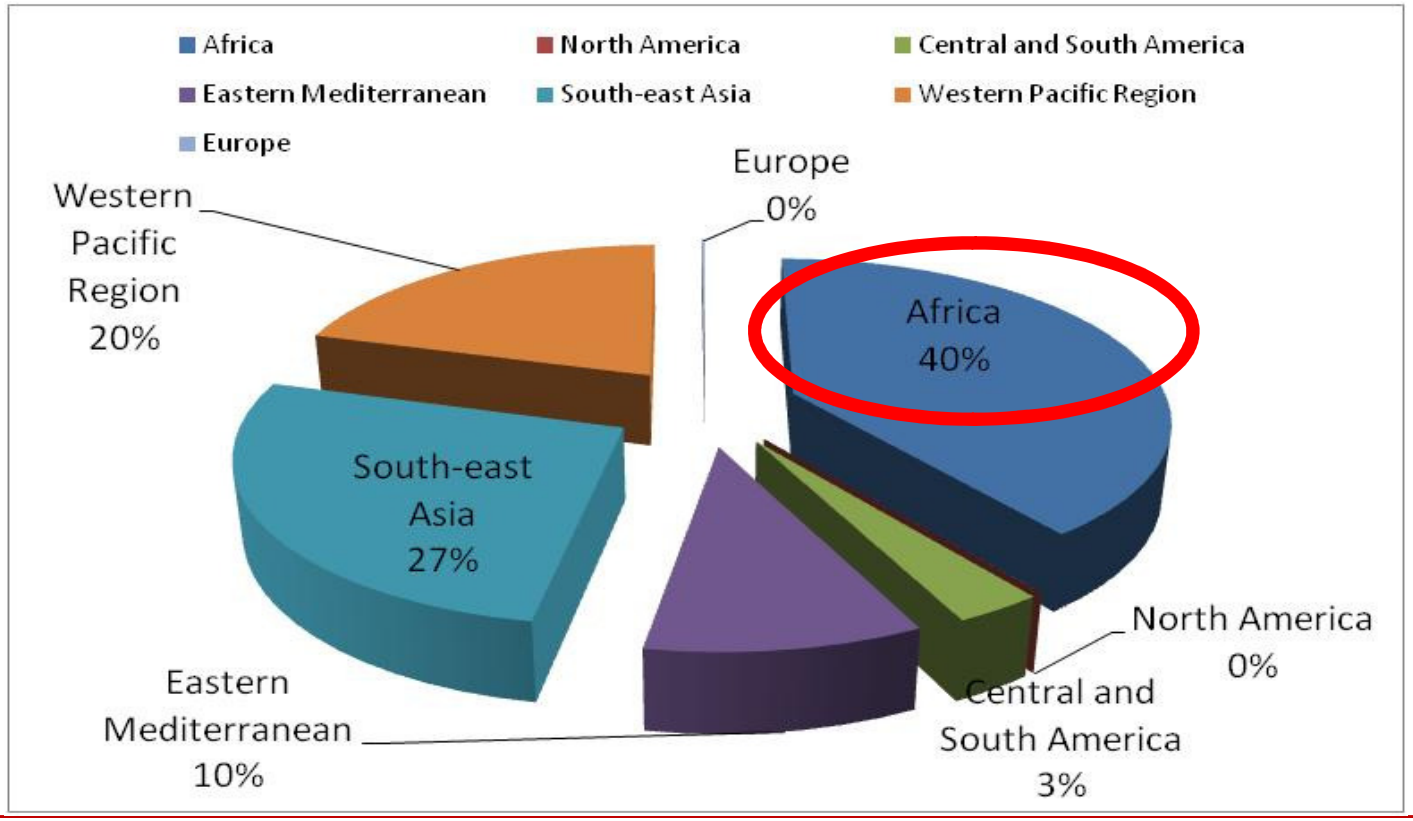
25,200-155,000 **global aflatoxin-induced liver cancer cases/yr**

~5-30% of all liver cancer cases

Where does aflatoxin-induced liver cancer occur?



Liu Y, Wu F. (2010). "Global Burden of Aflatoxin-Induced Hepatocellular Carcinoma: A Risk Assessment." *Environmental Health Perspectives* 118:818-824.

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Acute Aflatoxicosis
potentially huge health burden

- Characterized by hemorrhage, acute liver damage, acute liver failure, edema, death
- Hundreds of outbreaks of acute aflatoxicosis reported in Kenya, associated with highly contaminated home-grown maize
  - 2004: 317 cases reported, 125 deaths; AFT 4'400 ppb; 46'000 ppb
- Overall acute aflatoxicosis outbreaks most likely under-diagnosed and under-reported

Stunted Growth in Children

- Stunting in children <5 yrs one of the main indicators for chronic malnutrition
- Limited recent studies show association of AFT exposure (in utero) and stunted growth
- Preliminary findings, needing further investigation, firm link not yet established
- Confounding factors have to be considered
  - Socioeconomic status, nutrition, hygiene, etc.
- Based on studies in Togo and Benin, large numbers of children may be affected by AFT-associated stunting, potentially contributing to a significant public health burden in developing countries
- Underweight children are significantly at higher risk for infections and diarrheal disease

Immunomodulation

- AFT exposure associated with immunotoxicity in humans
- Mode of action under investigation
- Immunosuppression due to AFT exposure especially problematic in areas with high rates of infections (HBV, HIV, etc..)

Aflatoxins – a significant health problem in developing countries

- **AFT exposure presents a significant health burden in Africa (and East Asi**
- **A number of health effects can occur, that are often interacting with other disease factors (e.g. infection, malnutrition)**

- **25,200-155,000** aflatoxin-induced liver cancer cases globally each year.
  - Of which 40% estimated in Africa

- **Numerous outbreaks of acute aflatoxicosis have been reported**
- **Stunted growth and immune effects are other potentially important health consequences of AFT exposure**
- **Actions are necessary that are also targeted at small and subsistence farmers**
- **Interventions necessary on several levels: food production and storage, education, public health (e.g. HBV vaccination, nutritional supplements, sanitation)**

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WHO activities related to aflatoxins

- **JECFA** (Joint FAO/WHO Expert Committee on Food Additives)
  - quantitative risk assessment for HCC
  - Impact assessment of differetn maximum limits in food

  JECFA website: http://www.who.int/ipcs/food/jecfa/en/

- **Codex**
  - several Codes of Practice have been developed to reduce aflatoxin level is a number of food commodities (peanuts, tree nuts, milk)
  - Codex Maximum Limits for aflatoxins for ground nuts and tree nuts have been adopted
  - a sampling plans for total aflatoxins in peanuts and tree nuts have also been developed.

  Codex website: http://www.codexalimentarius.net/web/index_en.jsp

- WHO Initiative to estimate the **global burden of food borne diseases**: one of the examples prioritized by the Chemicals Task Force to estimate the BoD for aflatoxins.

  http://www.who.int/foodborne_disease/burden/en/index.html

- **GEMS/Food monitoring:** WHO maintains a database to collect global monitoring data for contaminants in food. Aflatoxins are included in this database (currently under reconstruction and data not available publicly)

  http://www.who.int/foodsafety/chem/gems/en/index.html