



# "Environmental Toxicology"

## A Case Study Involving Aflatoxin B1 and Hepatitis Viruses

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### Keynote Speaker

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### Outline of Lecture

- Environmental toxicology primer
- Aflatoxin and Health Effects
- Disease intervention
- Strategies for Prevention of Primary Liver Cancer

### Key message of the session

#### 1. Fundamental Principles of Toxicology

- Toxicology is the study of poisons and toxicokinetics & toxicodynamics of poisons.
- **Toxicokinetics** is the quantitation of what the body does to the agent during the processes of absorption, distribution, metabolism, excretion and storage. The end result of these toxicokinetic processes is a biologically effective dose of the toxicant.
- **Toxicodynamics** refers to what the agent does to the body. Searching for the active form of the agent at the sensitive target refer to the molecular, biochemical, and physiological effects of toxicants or their metabolites in biological systems.
- **Epidemiologists** study the mechanism from disease to exposure while **toxicologists** study the mechanism from exposure to disease. So, the toxicologists identify the mechanism and can lead to better public health interventions.

#### 2. Aflatoxin and Health Effects

- Aflatoxin is very important in Thailand as it is one of the most potent inducers of liver cancer, the top leading causes of cancer incidence and mortality. Hepatitis B virus (HBV) is synergistic in causing Thai liver cancer.
- Aflatoxin is in the environment produced by fungi (*A. flavus*) and contaminated in human food (corn, wheat, rice, peanuts, etc.) due to unsafe food store and eaten leftover food.
- Discovered in 1960, from contaminated peanut meal fed to turkeys in England that caused 100,000 turkeys and rates died of liver cancer.
- The mechanism of Aflatoxin causes a normal cell in the liver to mutate into cancer cell and grows out into a tumor which kills the host.
- Moreover, hepatitis B infection increases aflatoxin liver cancer risk at 60-fold synergy.

#### 3. Disease Intervention

- MIT-Thai study in 1967-1972 showed that the incidence of liver cancer in a specific area correlated with the amount of aflatoxin eaten in that area.
- In China, people exposed to a lot of Aflatoxin (Qidong Province) get cancer earlier (at age 45 yrs) than those in low Aflatoxin areas (70 yrs in Beijing). The disease interventions are to eat agents that induce the Nrf2 pathway (sulforaphane in broccoli and sprouts) to protect against aflatoxin epoxide.

#### 4. Strategies for Prevention

- Immunization with HBV vaccine, and reduce aflatoxin consumption (improves food storage & changes in diary staples).
- Chemopreventive interventions by using nutrition to destroy aflatoxin epoxide (oltipraz, cruciferous vegetable, broccoli, sprouts).