

APES Chapter 17 – Human Health and Environmental Risks

Intro: Citizen Scientists

The Chemical Corridor in Louisiana (mainly Shell refineries)

I. Human Health Risk Factors

A. Categories:

1. Disease (Fig. 17.1)

Infectious (virus, bacteria, fungi, protists, parasitic worms)

1. Respiratory (ex: Pneumonia)

2. Viral (HIV AIDS)

3. Diarrheal (Dysentery, Cholera, Giardiasis)

Chronic – heart disease, most cancers...Risk Factors (Fig. 17.2)

Acute – rapid impairment such as Ebola (a hemorrhagic fever)

II. Infectious Diseases

Epidemic

Pandemic

A. History – Plague, Malaria, Tuberculosis

B. Emergent Infectious Diseases

C. HIV/AIDS

D. Ebola Hemorrhagic Fever

E. Mad Cow – Bovine Spongiform Encephalopathy (BSE)

The Human version...Jacob-Creuzfeld Disease (JCD)

F. Avian Influenza (Bird Flu)...H1N1

G. West Nile Encephalitis...the West Nile virus

Mosquito Control (Fig. 17.12)

H. Future of Human Health

III. Toxicology – Study of Chemical Risks

Types of Harmful Chemicals:

- A. Neurotoxins (Fig. 17.13 Lead in children)
- B. Carcinogens (Mutagens)
- C. Teratogens (ex: Thalidomide) chemicals that cause birth defects
- D. Allergens
- E. Endocrine Disrupters (Fig. 17.15)

IV. The Science of Toxicology

A. Dose-Response Studies

Note: be familiar with concept threshold level dose and response.

1. Acute studies
2. LD50 (Lethal Dose to 50% of exposed population in ug/Kg body mass)
3. ED50 (Effective Dose causing harmful, not lethal effects in 50% of subjects)

B. Testing Standards/Protocols

C. Chronic Studies

D. Retrospective Studies – Case studies of people who have been exposed to chems.
Ex: the Bhopal disaster in India (1984) ...following the exposed victims

E. Prospective Studies – Monitoring those who may have future exposures.
Collecting baseline data
Analyzing Synergistic Interactions
Analyzing Antagonistic Interactions

F. Factors that determine an organisms exposure

1. Routes of exposure (Fig. 17.20)

New example: Bisphenol A (BPA) in plastics

2. Solubility of chemicals (in water and tissues such as fat, oil)

Bioaccumulation –

Biomagnification (Fig. 17.21) –

3. Persistence – POP's = Persistent Organic Pollutants

Ex: DDT (an insecticide), PCB (polychlorinated bi-phenyl used as a fluid insulator in electrical transformers)

V. Risk Analysis – (Fig. 17.22)

A. Assessment –

1. Qualitative
perceived vs. actual

2. Quantitative
Risk = prob. of being exposed x prob. of being harmed if exposed

Case Study: PCB's in the Hudson River from General Electric

B. Risk Acceptance

C. Risk Management

D. Worldwide Standards of Risk (Fig. 17.25)

2 Basic Philosophies:

VI. International Agreements

2001 – Stockholm Convention ...controlling the most hazardous chemicals...listed

2007 – REACH (Registration, Evaluation, Authorization, and restriction of CHemicals)

Working Toward Sustainability... The Global Fight Against Malaria

- a) the toll of malaria
- b) the use and failure of DDT
- c) difficulty of eradicating mosquitos
- d) The Gates' Plan (and others such as "Nothing But Nets")
- e) the Future