Eighth Lecture

Learning Objectives for the Lecture:

At the end of the lecture the student is going to be able to:

1. Define environmental epidemiology.
2. Describe the uses of environmental epidemiology.
3. Differentiate between risk assessment, vulnerability and sensitivity.
4. Define occupational assessment.
5. Describe types of occupational hazards.
6. Identify the Benefits of the Application of Occupational Epidemiology.

Environmental and Occupational Epidemiology

Environmental Epidemiology

Environmental epidemiology is the branch of epidemiology concerned with discovery of the environmental exposures that contribute to injuries, illnesses, developmental conditions, disabilities, and deaths, and identification of public health and health care actions to avoid, prepare for, and effectively manage the risks associated with harmful exposures.

Environmental epidemiology study the external factors that affect the incidence, prevalence, and geographic range of health conditions.

These factors may be naturally occurring or may be introduced into environments where people live, work, and play.

Environmental exposures can be broadly categorized into:

1. A proximate exposure (e.g. directly leading to a health condition), including chemicals, physical agents, and microbiological pathogens occur through air, food, water, and dermal contact.
2. A distal exposure such as social conditions, climate change, and other environmental changes. Distal exposures cause adverse health conditions.

Common Environmental Factors that could Affect Health

Chemicals: dust, drugs, tobacco, foods

Psychological: Stress, work patterns human relationships

Accident Hazards: speed, alcohol, drugs

Biological: Bacteria, viruses, parasites

Physical: Noise, climate, lighting, radiation,

Epidemiological Triad (Environmental Factors, Agents, and Host Factors)

<u>Agent factors</u>

Organisms
Chemicals
exogenous
endogenous
Nutrients
Physical forces
Psychological factors
<u>**Environmental Factors**</u>

   1-Physical (Temperature& Wind pattern)
2- Biologic
3-Socioeconomic
4—Geology (Hydrogeology)
<u>**Host Factors**</u>

Age, sex
Disease history
Immunologic response
Host behavior, diet, activity, nutritional, exposure status
Genetic
**Agents have characteristics such as infectivity, pathogenicity, virulence**

 Epidemiologic Triad serves as useful tool to frame and identify risk factors

1. Adverse effects are manifested through an interaction of:
  - the host such as humans (or organisms)
  - the environment
  - the agent
2. This interaction is a function of hazard, exposure, and response
The environmental health hazard pathway:

The environmental health hazard pathway

Adapted from Briggs et al, 1996

Epi 9
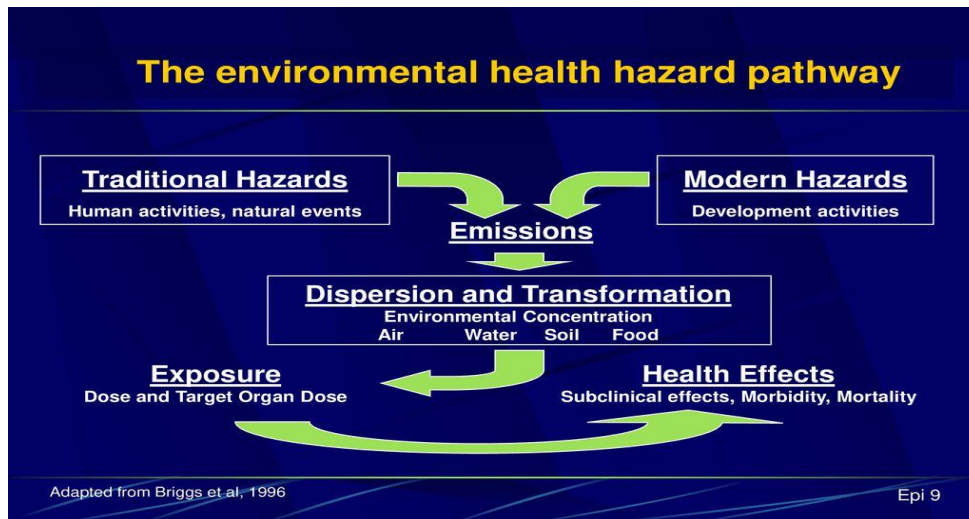
Traditional Hazards

  - Human activities, natural events

Modern Hazards

  - Development activities

Emissions

Dispersion and Transformation

Environmental Concentration

Air Water Soil Food

Exposure

Dose and Target Organ Dose

Health Effects

Subclinical effects, Morbidity, Mortality

Occupational Epidemiology

Occupational epidemiology: Involves the application of epidemiologic methods to populations of workers at the work place.

Occupational epidemiologic studies may involve looking at workers exposed to a variety of chemical, biological or physical (e.g., noise, heat, and radiation) agents to determine if the exposures result in the risk of adverse health outcomes.

The work is an important determinant of health. It can influence health positively or negatively. For most people work is essential for economic, social as well as physical wellbeing.

Hazards and Risks in the Workplace:

Hazard: is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work.

Risk: is the likelihood of a harmful effect in specified circumstances It is important to distinguish between hazard and risk..

Hazards in the workplace include the following:-

Physical

1-   Non-ionizing radiation e.g. microwaves, infra-red,

Light.
2. Ionizing radiation e.g. X-rays, gamma rays, beta   particles, alpha   particles.

3. Noise and vibration.

4. Temperature, humidity etc.

Chemical

1. Inorganic - e.g. lead, arsenic, silica.

2. Organic - e.g. solvents, glues, fluxes, vapors and gases.

Biological

1. Allergens of biological origin:- laboratory animals, insects, mites, wood and other plant material, fungal spores.

2. Infections: Bacteria: Tuberculosis, Brucella, Leptospira etc. Viruses: e.g. Hepatitis B from needle stick injuries.

Psychological : Various aspects of work organization may be **stressors.**

Employee Exposure is an exposure to chemical, physical or biological agents that occurs in the workplace regardless of the use of personal protective equipment.

Exposure Assessment is the qualitative or quantitative determination made by an Indus-trial hygienist or other appropriately trained individual of an employee's exposure to a chemical biological or physical agent.

1. Negative Exposure Determination is the qualitative or quantitative determination made by an experienced industrial hygienist that an employee is not exposed at or above the action level. In many cases, this determination can be made without sampling data.

2.Positive Exposure Determination is the qualitative or quantitative determination made by an industrial hygienist that an employee is exposed at or above the action level for a chemical, biological or physical agent. Monitoring may be conducted to verify the determination.

The Benefits of the Application of Occupational Epidemiology

1. **Benefit for the workers**
   Occupational epidemiology has a great deal to contribute to the reduction of risks to health from work, through reducing exposure, and in other ways.

 2. **Benefit for the Community at Large**

   Various direct and indirect benefits can accrue to the community at large, for example through the derivation and application of exposure limits.   An example for that is the recommendations of the **Expert Panel on Air Quality Standards** in relation to safety from benzene were largely based on occupational epidemiology.