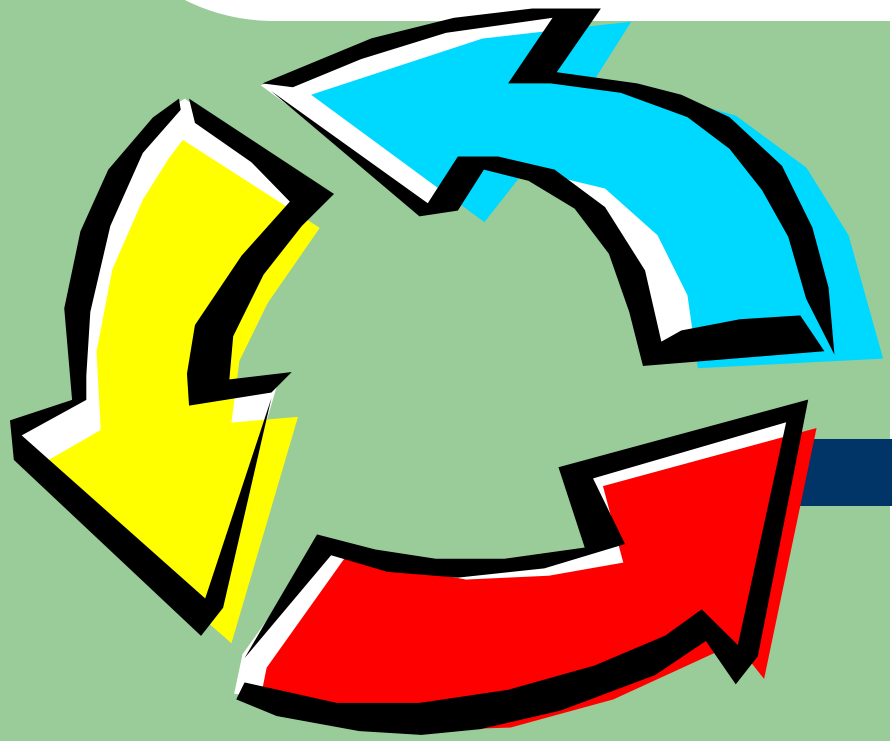
Module Two

Routes of Exposure



Objectives

Upon completion of this module, you will be able to:

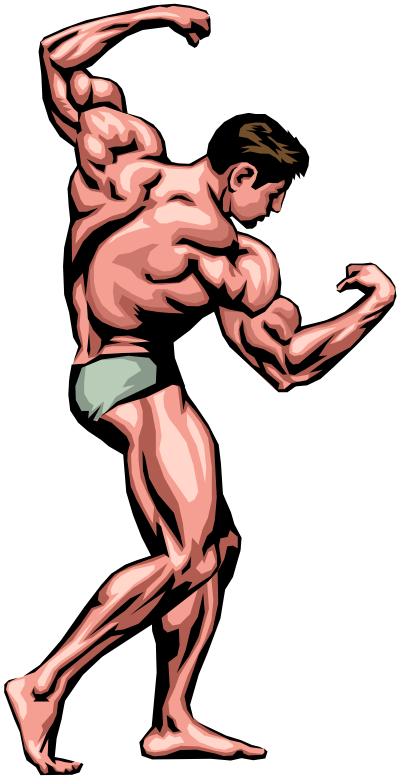
- Define and understand the types of environments
- Identify the protective barriers of the body
- Identify the routes of exposure
- Identify the pathways of exposure
- Identify the types of exposure
- Understand local and systemic exposures
- Identify the pathways for excretion of toxins

Environment

- Inner vs outer environment
- Personal vs ambient environment
- Gaseous, liquid, and solid environment
- Chemical, biological, physical, and socioeconomic environments

Inner vs Outer Environment

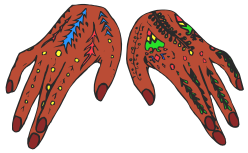
- Refers to the human body
- Consists of the inner and outer body
- Has three protective barriers
  - Skin
  - Gastrointestinal Tract
  - Lungs



Inner vs Outer Environment (continued)

Protective Barriers

- Skin, which protects the body from contaminants (toxins) outside the body



- Gastrointestinal tract, which protects the inner body from some ingested contaminants

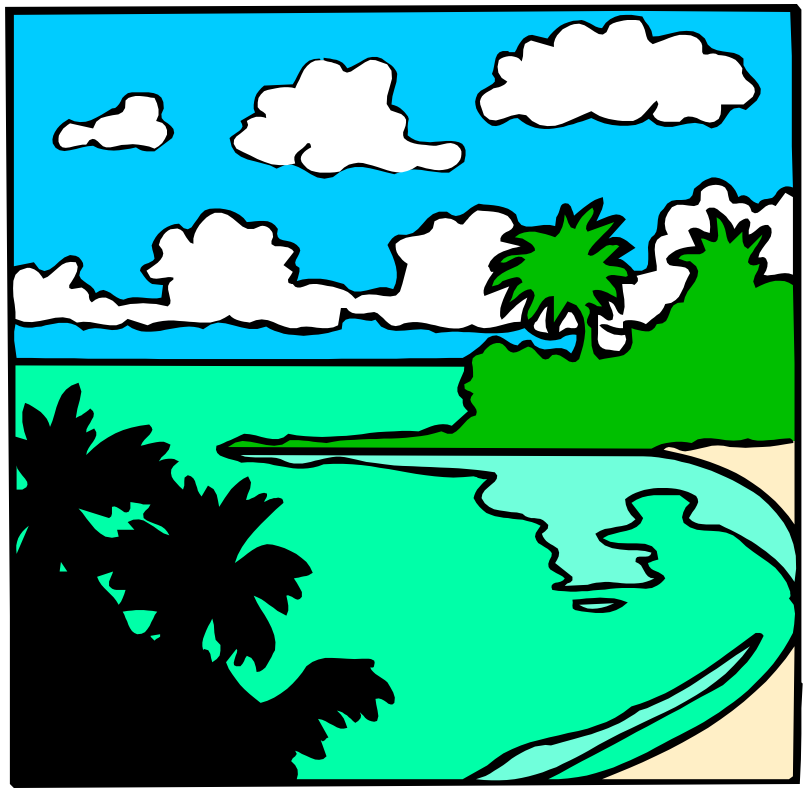
- Lungs, which protect the body from contaminants inhaled

Personal vs Ambient Environment

- Personal environment
  - The environment you control
- Ambient environment
  - The environment you cannot control

Gaseous, Liquid, Solid Environment

- Gaseous (Air)
- Liquid (Water)
- Solid (Land, Soil)

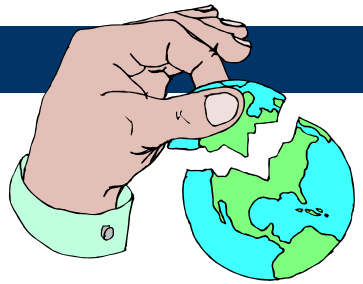


Chemical, Biological, Physical, and Socioeconomic Environments

- Chemical factors and contaminants (Toxic waste pesticides in the environment)
- Biological factors (Disease organisms in food and water)
- Physical factors (Elements influencing health and well-being)
- Socioeconomic factors (Economic status directly affecting health)

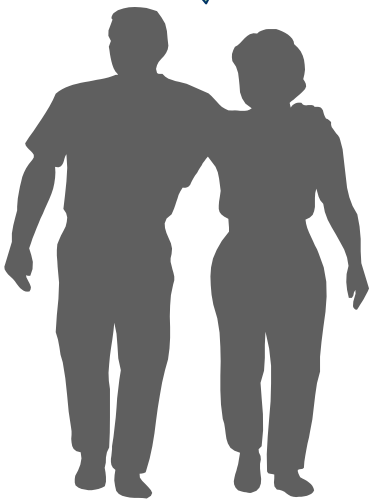
Routes of Exposure

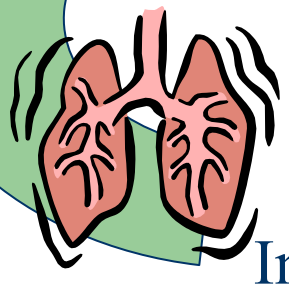
Exposure Routes



DERMAL (skin)

Ingestion (stomach or digestive tract)





Inhalation (respiratory tract)

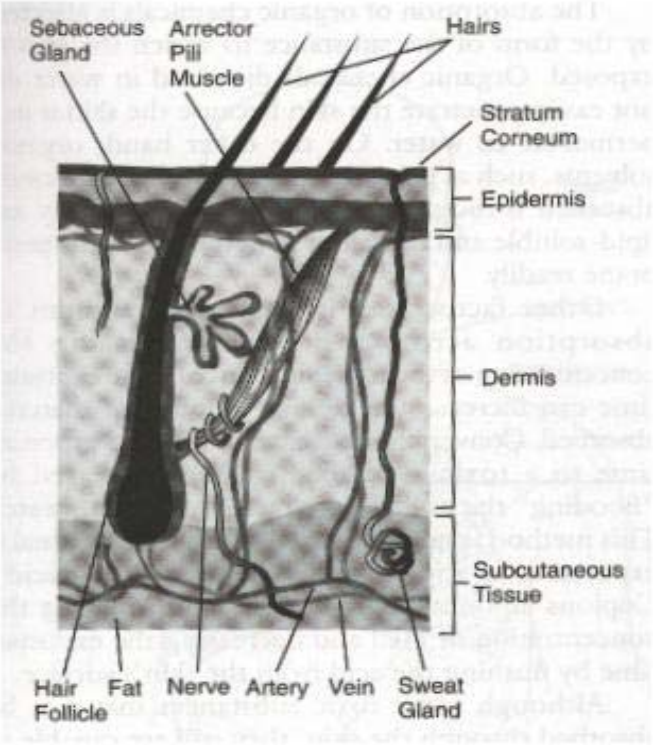
Dermal Absorption Route

Skin

- Route of exposure is absorption
  - This is the most common path of toxic substances exposure

Layers of the Skin

- Epidermis (outer layer)
  - Stratum corneum
- Dermis (inner layer)
- Subcutaneous fatty tissue



Factors Affecting Dermal Absorption

- Condition of the skin

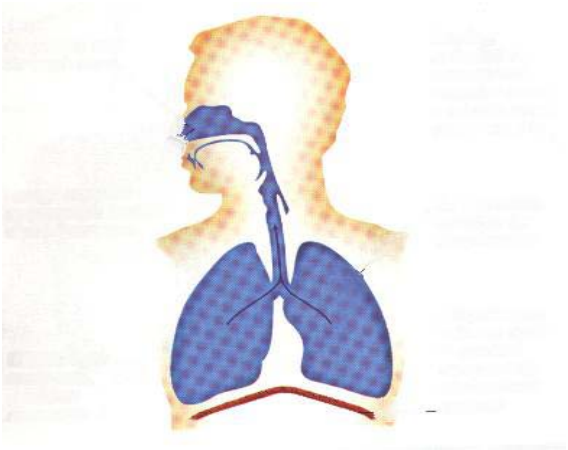
- Chemical makeup

- Increased toxic substance concentration

Inhalation Route

Respiratory Tract

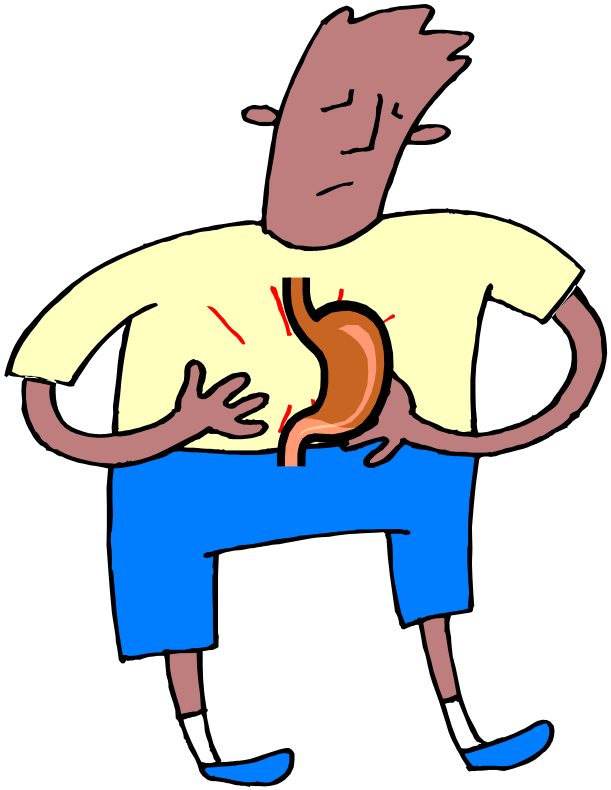
- Route of exposure is inhalation (breathing)
  - This is the easiest and fastest means of exposure



Factors Affecting Respiratory Absorption

- Concentration of toxic substance in the air
- Solubility of the substance in blood and tissue
- Respiration rate/respiratory tract condition
- Length of exposure
- Size of toxic particle

Ingestion Route



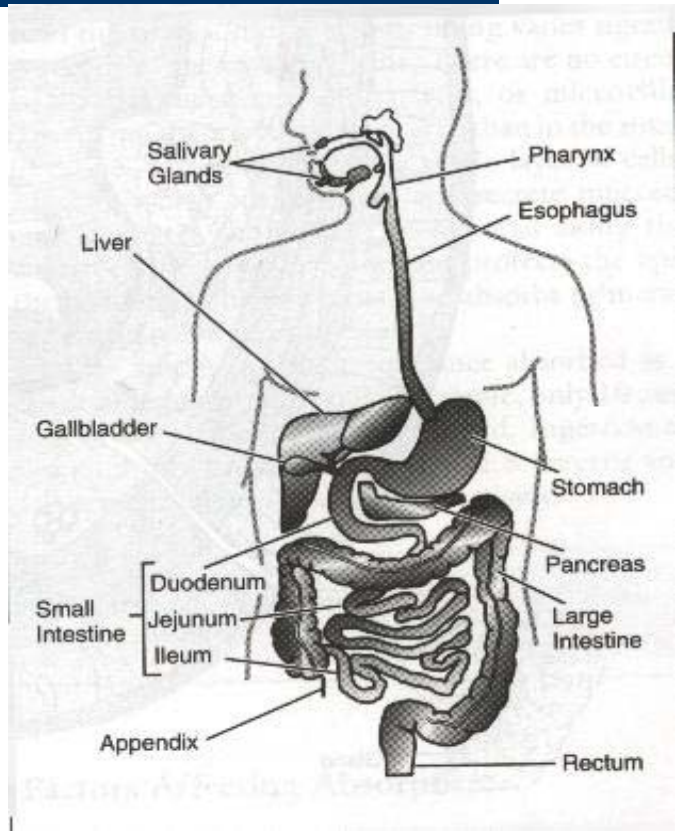
Digestive Tract

- Route of exposure is ingestion (swallowing or eating)

  - Ingestion of toxic substances occurs accidentally or unknowingly

The Digestive Tract

- Mouth and pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine

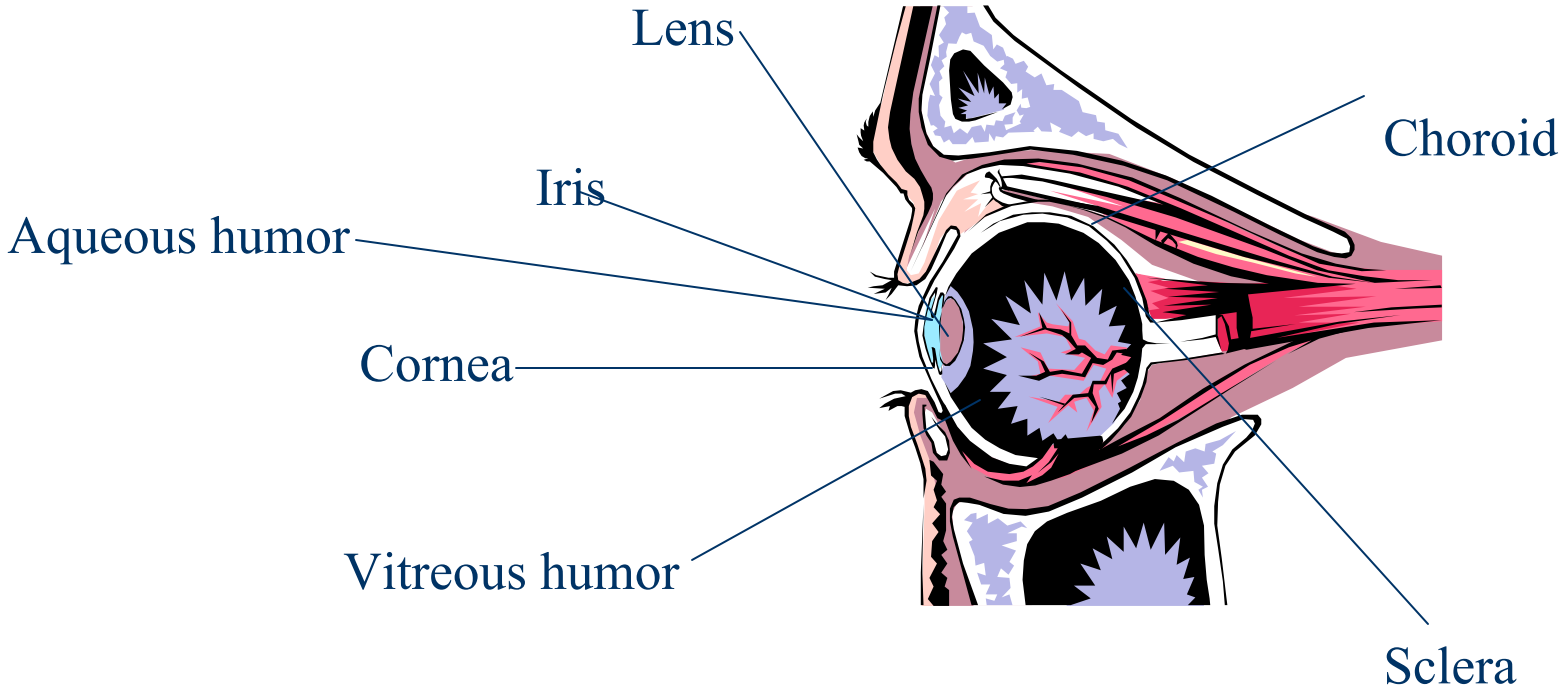


Factors Affecting Absorption (Ingestion)

- Physical
  - The small intestine surface area
- Chemical
  - The size of particle/substance
  - The length of time food containing the substance remains in the body

Other Routes of Exposure

The Eye


Lens
Choroid
Iris
Aqueous humor
Cornea
Vitreous humor
Sclera

Injections

- Intravenously (into a vein)
- Intramuscularly (into the muscle)
- Intraperitoneally (into the peritoneal cavity)
  - Covers wall of organ and inner lining of stomach
- Intradermally (into the skin)
- Subcutaneously (under the skin)

Length of Exposure

- Acute (≤ 24 hours)
- Chronic (> 3 months)
- Sub-acute (≤ 1month)
- Sub-chronic (between 1 and 3 months)

Effects After Exposure

- Local
- Systemic
  - Biotransformation
  - Excretion
  - Target tissues

Excretion of Toxins

Toxins leave the body through:

- Kidney (Urine)
- Feces
- Lungs (e.g., mucus, breathing out)

Question and Answer Period