INFECTION CONTROL AND PERSONAL WELLNESS

CHAIN OF INFECTION

- For the infection to escalate to an epidemic means that all components or links are favorable to the pathogenic microbe.
- The chain of infection is a set of 6 intertwined links that allow for communicable diseases to spread.
  Each step of the chain is required to effectively transmit infectious illness.
  Breaking any one of the 6 links can slow the spread of infectious disease.

Six Components of Chain Infection

1. Infectious (Causative) Agent

- Pathogens are microorganisms that cause disease. Without pathogens, we would not have transmissible, infectious disease.

- Ex:
- Bacteria, Viruses, Fungi, Parasite

2. Reservoir

- serves as a place in the environment where a pathogen lives, replicates and thrives.

- Ex:
- Human, Animals, Insects, Environment

Human Reservoir

- In humans, there are two forms of reservoirs: **Symptomatic infection and asymptomatic carriers.**
- Symptomatic infections are more likely to be recognized. This means that the patient's contacts and normal activities will normally be restricted.
- Carriers do not display any signs or symptoms of illness. They are asymptomatic but can still spread disease (ex: Typhoid Mary, COVID 19)

Animal and Insect Reservoir

- Any infectious disease that is naturally transmitted from animal or insect to human is considered a zoonotic disease.

- Ex:
- Lyme disease (ticks)
- Rabies (animals)
- Salmonella (raw meats, eggs, and dairy)
- Dengue

ENVIRONMENTAL RESERVOIRS

Environmental reservoirs harbor many infectious diseases

Ex:

- Soil (which acts as a reservoir for Clostridium tetani, the causative agent of tetanus); and
- Water (which is a reservoir for Legionella pneumophila, the causative agent of Legionnaire's disease.)

3. Exit Pathway/Portal of EXIT

- **A way or manner where an infectious agent can leave the reservoir host**
- This depends entirely on the characteristics of the reservoir.

- Ex:
- In humans, the main portals of exit include:

  Alimentary: vomiting, diarrhea, saliva
  Genitourinary: sexual contact
  Respiratory: secretions from coughing, sneezing, or talking
  Skin: open wounds

4. Mode of Transmission

- Airborne, direct or indirect contact , droplets, vector (insect) and vehicle (food, water or drugs)

Direct Contact

- Is usually considered person-to-person contact. Without physical contact, pathogens that rely on direct contact spread cannot be passed on

- **Examples of direct contact include:**
- Skin-to-Skin contact (like touching)
- Kissing
- Sexual contact
- Contact with oral secretions
- Contact with body lesions

- **Pathogens that are spread by direct contact include:**
- Gonorrhea
- Mononucleosis
- Bacterial Conjunctivitis
- COVID-19

Droplets

- Requires a pathogen to be transferred through the air from its reservoir in a droplet of body secretions. These droplets are relatively large and usually will fall from suspension after 3-6 feet of travel. The droplets will rapidly fall on nearby surfaces (tables, door knobs, telephones, elevator buttons, etc.), and may remain viable. The survivability of the pathogen depends on its type. Some pathogens will live for a few minutes to hours, while others may survive for a few days, outside of a host.

- **Droplet transmission occurs when a droplet from coughing, sneezing or talking carry the pathogen to the hosts body. The transmission is completed by:**
- Inhaling droplets
  Droplets entering the mucous membranes of the face
  A host touching droplets that have settled on surfaces and then touching their face (mouth, eyes, nose).

- **Examples of illnesses caused by droplet transmission are:**
- Strep Throat
  Influenza
  The common cold
  COVID-19

Blood-Borne

- Some pathogens are transmitted directly through blood. These pathogens require that infected blood from the reservoir be directly exposed to the blood of the susceptible host.
- This can be accomplished by blood from a needlestick and blood entering mucous membranes or other open wounds.

- **Examples of blood-borne pathogens include:**
- Human Immunodeficiency Virus (HIV)
- Hepatitis-B Virus
- Hepatitis-C Virus

Airborne

- occurs when pathogens smaller than five microns in size remain suspended in the air long after the infected person has left the area. A host then enters the space where the pathogen is suspended and has the potential to become infected.

- Example of an airborne illness:
- Measles can remain suspended in the air for up to 18 hours after the infected individual coughs, sneezes, or talks.
- Tuberculosis can remain suspended for up to six hours.

Vector

- utilizes insects to transport the pathogen. Insects such as fleas, ticks, and mosquitos are unharmed by the pathogens they potentially carry but can transmit the bacteria or virus when they bite a host.

- **Examples:**
- Mosquito: West Nile Virus
- Fleas: Bubonic Plague (*Yersinia pestis*)
- Ticks: Lyme Disease (*Borrelia burgdorferi*)

5. Entry pathway/ Portal of entry

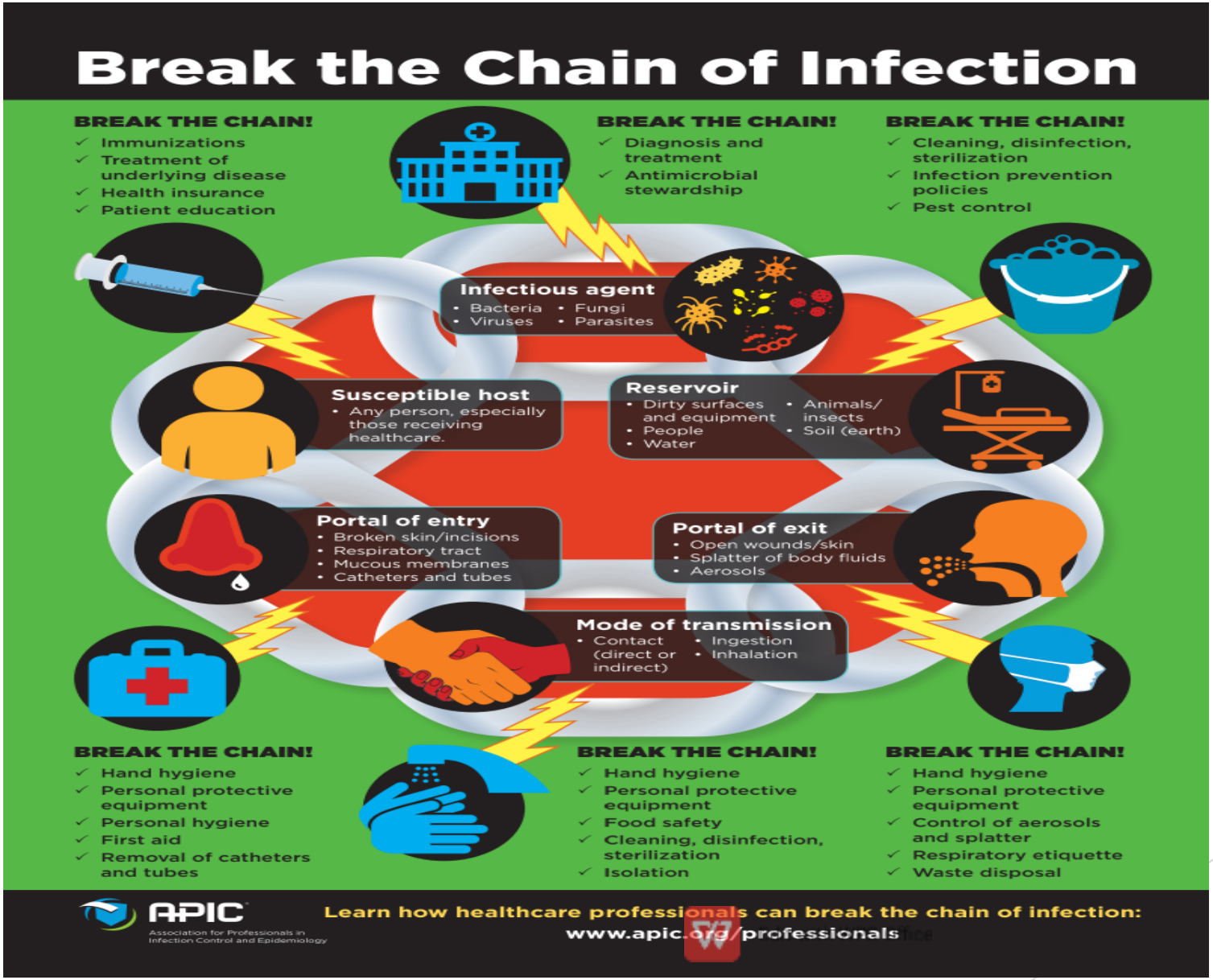
- Refers to the way an infectious agent enters a host that is susceptible to infection which includes body orifices.

- **Examples include:**
- Inhalation (via the respiratory tract)
- Absorption (via mucous membranes such as the eyes)
- Ingestion (via the gastrointestinal tract)
- Inoculation (as the result of an inoculation injury)
- Introduction (via the insertion of medical devices)

6. Susceptible Host

- Someone who is prone to infection due to age, health or immune status. They usually include the elderly, newborn, patients who are immune suppressed.
- General resistance factors:
  Intact mucous membranes and skin, and robust cough and sneeze reflexes help defend against invading pathogens.

- **How susceptible a host may be, depends on many factors:**
- Age
  - The very young or very old are usually more susceptible.
- Health status
  - Malnourished, dehydrated, or otherwise unhealthy persons are more at risk
- Medication usage
  - Immune suppressing drugs allow pathogens to take hold more freely


Break the Chain of Infection
BREAK THE CHAIN!
✓ Immunizations
✓ Treatment of underlying disease
✓ Health insurance
✓ Patient education
BREAK THE CHAIN!
✓ Diagnosis and treatment
✓ Antimicrobial stewardship
BREAK THE CHAIN!
✓ Cleaning, disinfection, sterilization
✓ Infection prevention policies
✓ Pest control
Infectious agent
• Bacteria • Fungi
• Viruses • Parasites
Susceptible host
• Any person, especially those receiving healthcare.
Reservoir
• Dirty surfaces and equipment • Animals/ insects
• People • Soil (earth)
• Water
Portal of entry
• Broken skin/incisions
• Respiratory tract
• Mucous membranes
• Catheters and tubes
Portal of exit
• Open wounds/skin
• Splatter of body fluids
• Aerosols
Mode of transmission
• Contact (direct or indirect) • Ingestion • Inhalation
BREAK THE CHAIN!
✓ Hand hygiene
✓ Personal protective equipment
✓ Personal hygiene
✓ First aid
✓ Removal of catheters and tubes
BREAK THE CHAIN!
✓ Hand hygiene
✓ Personal protective equipment
✓ Food safety
✓ Cleaning, disinfection, sterilization
✓ Isolation
BREAK THE CHAIN!
✓ Hand hygiene
✓ Personal protective equipment
✓ Control of aerosols and splatter
✓ Respiratory etiquette
✓ Waste disposal
APIC
Association for Professionals in Infection Control and Epidemiology
Learn how healthcare professionals can break the chain of infection:
www.apic.org/professionals

Inside Laboratory

STANDARD PRECAUTIONS:

- Do not eat, drink, smoke or apply cosmetics.
- Do not insert or remove contact lenses
- Do not bite nails or chew pens
- Do not mouth pipet
- Assume all patients are infectious
- Avoid production of aerosols in centrifuge

Exposure control plan

Needle stick or other sharp injury:

- Carefully remove the shards or foreign object.
- Wash the site thoroughly with soap and water for at least 30 seconds.

Exposure Control Plan

Mucous membrane exposure:

1. Flush with water or saline for at least 10 minutes.
2. For the eyes, use eyewash station for flushing. Remember to remove the contact lenses (if there are any) and make sure to disinfect them.
3. Report the incident to the immediate supervisor and the provider so that evaluation, treatment and counseling can be provided.

Decontamination

- For surface decontamination, use of 1:10 bleach solution or other disinfectants for the specimen collection and processing areas. Remember to wear gloves and use an absorbent material when cleaning the area to avoid spreading the spills over a wider area. As a precaution, all non-reusable items contaminated by blood or other body fluids should be placed in biohazard waste containers for proper disposal.