Episode 2: Modes of Transmission

1. **Describe the 'Chain of Infection'?**

   The chain of infection (also known as the chain of transmission) are six things that must occur for an infection to happen (or a microorganism to be transmitted). These 6 things are best visualized as links in a chain, and the premise is that breaking any one of the links (or more than one) will prevent a microorganism from causing an infection, or breaking a link will stop a microorganism from being transmitted.

   The six links are:

   - The Infectious Agent (microorganism)
   - Reservoir
   - Portal of Exit
   - Mode of Transmission
   - Portal of Entry
   - Susceptible Host

   Describe the Links and how to 'break' a link.

A) The infectious agent
   a. These microorganisms can be bacteria, viruses, fungi or parasites.
   b. To break this link:
      i. identify who has a microorganism of concern and isolate them
      ii. Vaccinate (if a vaccine is available).
      iii. Clean and disinfect (this depends on the reservoir – see below)

B) The Reservoir
   a. Where the infectious agent resides and reproduces. This can include humans (skin, mouth, saliva, nose, gastrointestinal tract, etc.), surfaces such as soil or surfaces that have the human reservoir stuff on it), animals, our food chain. Not everyone will be 'sick' if they have microorganisms in or on them, this is natural and normal. This is also referred to as a carrier, or colonized, or normal flora.
   b. To break this link:
      i. Hand hygiene
      ii. Disinfection

C) Portal of Exit
   a. How the infectious agent leaves the reservoir. This can be coughing and sneezing, talking, vomiting, bleeding (if one has a blood borne pathogen), wound drainage, defecation (having a bowel movement)
   b. To break this link:
      i. Cover a cough or sneeze
      ii. Staunch bleeding or cover a wound
      iii. Use a toilet with a lid

D) Mode of transmission
   a. How the microorganism moves to the Portal of Entry (see below). This can be through several methods.
      i. Contact – Direct – I have an infection on my finger, and touch your sore on your arm. This is also seen with sexually transmitted infections.
      ii. Contact – Indirect – Someone with dirty hands use a doorknob, I use the door getting the microorganism on my hands, and touch a portal of entry (a sore on my arm).
      iii. Droplet: a cough or a sneeze generates droplets. Larger ones, (>5um) will travel 3 – 6 feet and then settle. If someone coughs on my face, this is droplet transmission. If the droplets fall to a surface that I touch, then touch my face, that is indirect contact transmission.
      iv. Airborne: smaller particles, called droplet nuclei, can be carried on air currents and travel a longer distance than 6 feet. They can be inhaled, such as tuberculosis, measles and mumps.
      v. Percutaneous: usually seen in healthcare where someone sticks themselves with a dirty needle
      vi. Common Source: this would be contaminated food, water, medications.
      vii. Vector-borne: mosquitos, ticks, etc.
   b. To break this link
      i. Hand hygiene
      ii. Cover coughs and sneezes (masks, tissues, arm)
      iii. Disinfection of surfaces
      iv. Airflow in a room, so no air goes to other parts of a building (negative pressure)
      v. Good food preparation, water treatment
      vi. Insect repellent

E) Portal of Entry
   a. How the microorganism enters the susceptible host. This can be through our eyes, nose or mouth (mucous membranes), open wounds or areas of our skin, our reproductive organs.
   b. To break this link:
      i. Hand hygiene
      ii. Wearing face protection (mask, goggles, face shield, N95 respirator)
      iii. Wear gloves

F) Susceptible host
   a. Who can get sick. This can depend on the infectious agent,
      i. We can all be susceptible (SARS-CoV-2)
      ii. Very young, very old
      iii. Immunocompromised (bone marrow transplant, cancer treatments)
      iv. Obese
      v. Underlying medical conditions (heart, lungs, etc.)
      vi. Malnourished
      vii. Sleep-deprived

2. How do these germs or pathogens cause infection?

Germs find a susceptible host, establish their reservoir, and begin to grow. Depending on the host's the immune system and the ability to fight off the pathogens, an infection may develop. If the host defenses are compromised, infection can develop.

For some germs, some viruses or bacteria, vaccines have been developed to help build immunity. Measles, Mumps and Rubella, as well as Varicella (chickenpox), Hep A and Hep B all have effective vaccines. Some illnesses have been eradicated through vaccination (Smallpox) or are almost eradiated (polio). To help prevent a form of bacterial pneumonia the Pneumovax vaccine was developed. With the development of the meningitis vaccine, it is rare to hear of case of *Neisseria meningitis* meningitis.

3. TRIZ Exercise- what do I have to do to get sick?

What this means is "if I want to get sick, what do I need to do"- so if you want to get a cold, what would you need to do?

A. Find someone with a cold
   a. Use their tissues after they have used them
   b. Kiss them
   c. Share their toothbrush
   d. Wipe their nose with your hands then wipe your nose

B. Find someone with an infected wound
   a. Clean the wound and don't wash your hands, and pick at your scab
   b. Wipe the wound with your hands then your eyes

We use the methods above to break a link, remove a pathogen so we don't get sick.

4. If I am exposed to a germ (s) will I always get an infection?

A. Can we break a link?
   a. Can I remove the organism by washing my hands?
   b. Can I cover my wound so the germ can't get in my wound?
   c. Can I get a vaccine against the germ?
   d. Can I clean and disinfect surfaces where this germ might be?

e. Can they not leave the germ outside their reservoir, through covering their cough, staying home when sick, wearing a mask if they are coughing?