SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT: ALLIED HEALTH SCIENCES

COURSE NAME: PATHOLOGY

Topic: General principles of microbial pathogenesis

Nomenculature

The suffix "-emia" – A suffix meaning "presence of an infectious agent"

Bacteremia = circulation of bacteria in blood

Septicemia = bacteria circulate and multiply in the blood, form toxic products and cause high fever.

Pyaemia = when pyogenic bacteria produce septicemia with multiple absceses in internal organs.

The suffix "-itis"

A suffix meaning "inflammation of"

Pharyngitis = Inflammation of the pharynx

Endocarditis = Inflammation of the endocardium layer

Gastroenteritis = Inflammation of the gastrointestinal tract

Geographic Pattern

- **Endemic:** when a disease is constantly is present in particular locality. Eg typhoid fever in parts of India.
- **Epidemic:** when an infectious disease spreads rapidly and involves many persons in an area at the same time. E.g influenza causing annual winter epidemics in cold countries.
- **Pandemic:** when an epidemic spreads through many areas of the world affecting a large number of people within a short period of time. Eg cholera, influenza and plague.
- **Sporadic:** infections that occur at irregular intervals or only in few places, scattered or isolated.

Transmission of Infection

- There are 3 links in the chain of transmission of communicable diseases.

- RESERVOIR
- MODE OF TRANSMISSION
- MECHANISM OF MICROBIAL PATHOGENICITY.

Reservoir

- Endogenous Infection

- Exogenous Infection
  - From Human Spread
  - From Animal Spread
  - From Insect Spread
  - From Soil and Water
  - From Food
- It refers to any human being, animal, plant, soil or inanimate matter in which parasite lives, multiplies and depends for its survival.

- **Sources of infection: Endogenous sources:**
- organisms of normal flora that are usually non pathogenic but occasionally behave as pathogens outside their habitat.

Reservoir

Exogenous sources: Human cases and carriers Commonest source of infection is man.

- Carrier: person who harbours the pathogenic
- microorganism without suffering from its ill effects.
- **Healthy carrier:** harbours the pathogen but never suffered from the disease caused by particular pathogen.
- **Covalescent carrier:** one who has recovered from the disease but continues to harbour the pathogen in his body. **Temporary carrier:** this carrier state lasts for about 6 months.
- **Chronic carrier:** harbours the pathogen for several years and sometimes for the rest of one's life.
- **Paradoxical carrier:** A person who acquires the pathogen from another carrier
- **Contact carrier:** one who acquires the pathogen from a patient.

Reservoir

- Infectious diseases transmitted from animals to man are called zoonosis.

- Zoonotic diseases may be:
- Bacterial - bovine tuberculosis
- Viral - rabies from dogs
- Protozoal - leishmaniasis
- Helminthic - hydrated disease from dogs
- Fungal- dermatophytes from dogs

Reservoir

- **Insect :**
- Diseases transmitted by insects are called arthropod borne diseases.
  - **Insects transmitting diseases are called vectors.**
- **Mechanical vectors:** carry the organisms on their wings, legs and body.
- **Biological vectors:** the pathogen multiplies in the body of vector.
- **Extrinsic incubation period:** after the entry of pathogen in the vector the time required for the vector to become infective
- Some pathogens survive in the **soil** for long periods. Eg., spores of tetanus and parasites such as roundworm and hookworm.
- Contamination of **water** with vibrio cholera and
  - hepatitis virus act as the source of infection.
- contaminated **food** act as the source of infection in the case of food poisoning gastroenteritis, diarrhoea and dysentery.

Mode of Transmission

- Direct Contact
- Airborne Transmission
- Ingestion
- Inoculation
- Transplacental Transmission
- Iatrogenic Infection

Mode of Transmission

- **Direct Contact -** directly through physical contact. STD such as syphilis, gonorrhoea, herpes simplex type 2 and AIDS.

- **Airborne transmission** - droplets of respiratory
- infection are spread by inhalation.
- Droplet nuclei (1-10 micron diameter) remain airborne as aerosols and act as source of infection
- **Ingestion:** Intestinal infections like cholera, dysentry, food poisoning etc., are acquired by ingestion of food or drink contaminated by pathogens.

- Occurs mostly through carriers engaged in food handling or contaminated water supply.

- **Inoculation:** Direct inoculation in the tissues eg rabies virus inoculation through dog bite

- **Transplacental:** Transmission of pathogen from mother to foetus via placenta. Eg rubella virus, toxoplasma, CMV.
- Also known as **vertical transmission**

- **Iatrogenic infection** -Infections like AIDS and Hepatitis B transmitted during lab and surgical procedures such as lumbar puncture, blood transfusion, dialysis and surgery

Mechanism of Pathogenicity

Exaltation- enhancement of virulence of a strain.

Attenuation- reduction of virulence of a strain.

Determinants of virulence

- Adhesion
- Invasiveness
- Antiphagocytic factors
- Cytotoxin
- Bacterial surface antigen
- Bacterial toxins
- Enzymes

Mechanism of Pathogenicity

Adhesion:

- Specific reaction between surface receptors on the epithelial cells and adhesions on bacteria
- Adhesions usually are pilli and fimbriae
- Helps in penetration of host cells.

Invasiveness

- Ability of organism to spread within the host tissue after establishing infection.
- Highly invasive pathogens produce generalised lesions. Eg., streptococcal infections.

Anti-phagocytic factors

- Capsule- it enhances virulence by preventing phagocytosis

Cytotoxin - interfere with chemotaxis or kill the phagocyte.

Bacterial surface antigen - E.coli enable bacteria to resist phagocytosis

Cont..

Bacterial Toxins

- **Exotoxins**

Neurotoxins

Cytotoxins

Enterotoxins

- **Exotoxins:**

Produced by gram +ve and some gram -ve bacteria

They are highly antigenic

Neurotoxins: Interfere with proper synaptic transmissions in neurons

Cytotoxins: Inhibit specific cellular activities, such asprotein synthesis.

Enterotoxins: Interfere with water reabsorption in the large intestine; irritate the lining of the gastrointestinal tract

Mechanism of Pathogenicity

- **Endotoxin:**

They are lipopolysaccharide in nature

Produced only by gram-negative bacteria

The action of endotoxin requires the presence of the bacteria in the host.

Enzymes

Coagulase - Forms fibrin clot around bacteria and prevents phagocytosis.

Streptokinase - Dissolves fibrin clot

Hyaluronidase - breaks down hyaluronic acid

Collagenase - breaks down collagen in connective tissue.

Reference

Reference

- The text book of pathology author Harsh mohan