

Infection and Disease

- A. Definitions
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- D. The Normal Flora of Humans and relationships
- E. Generalized Stages of Infection
- F. Virulence Factors and Toxins

A. Definitions

- Disease and Infectious Disease
 - Disease is any deviation from a condition of good health .
 - Infectious Disease is a disease condition caused by the presence or growth of infectious microorganisms or parasites
 - Infection means the lodgment and multiplication of parasite in or on tissue not always result to disease.

- Pathogenicity and Virulence

- Pathogenicity

- The ability of a microbe to cause disease
 - This term is often used to describe or compare species

- Virulence

- The degree of pathogenicity in a microorganism
 - This term is often used to describe or compare strains within a species

- Acute infection vs. chronic infection
 - Acute Infection
 - An infection characterized by sudden onset, rapid progression, and often with severe symptoms
 - Chronic Infection
 - An infection characterized by delayed onset and slow progression

- Primary infection vs. secondary infection
 - Primary Infection
 - An infection that develops in an otherwise healthy individual by initial infection.
 - Re-infection :-subsequent infectious by same parasite in the host
 - Secondary Infection
 - An infection that develops in an individual who is already infected with a different pathogen

- Localized infection vs. systemic infection
 - Localized Infection(Focal infection).
 - An infection that is restricted to a specific location or region within the body of the host
 - Systemic Infection
 - An infection that has spread to several regions or areas in the body of the host

- Cross infection: When in patient Already suffering from disease new infection is set up from another host or external sources.
- . Nonsocomial infection is Hospital Acquired infections.

- Clinical infection vs. subclinical infection
 - Clinical Infection
 - An infection with obvious observable or detectable symptoms
 - Subclinical Infection
 - An infection with few or no obvious symptoms
 - Latent infections is infections that be hidden or dormant.

- Opportunistic infection

- An infection caused by microorganisms that are commonly found in the host's environment
This term is often used to refer to infections caused by organisms in the normal flora
- The source of infection can be outside body (exogenous infection) or inside body (endogenous).

- The suffix “-emia”
 - A suffix meaning “presence of an infectious agent”
 - Bacteremia = Presence of infectious bacteria
 - Viremia = Presence of infectious virus
 - Fungemia = Presence of infectious fungus
 - Septicemia = Presence of an infectious agent in the bloodstream
 - pyaemia= pyogenic bacteria produce septicemia with multiple abscess in certain organ.

- The suffix “-itis”
 - A suffix meaning “inflammation of”
 - Examples:
 - Pharyngitis = Inflammation of the pharynx
 - Endocarditis = Inflammation of the heart chambers
 - Gastroenteritis = Inflammation of the gastrointestinal tract

- Epidemiology
 - The study of the transmission of disease.
- Communicable Disease
 - A disease that can be transmitted from one individual to another .
- Contagious Disease
 - A communicable disease that is easily spread from one individual to another
- Noncommunicable Disease
 - A disease that is not transmitted from one individual to another

- Endemic Disease
 - A disease condition that is normally found in a certain percentage of a population
- Epidemic Disease
 - A disease condition present in a greater than usual percentage of a specific population
- Pandemic Disease
 - An epidemic affecting a large geographical area; often on a global scale

- Reservoir of Infection
 - The source of an infectious agent
- Carrier
 - An individual who carries an infectious agent without manifesting symptoms, yet who can transmit the agent to another individual
- Fomites
 - Any object capable of being an intermediate in the indirect transmission of an infectious agent

- Animal Vectors

- An animal (nonhuman) that can transmit an infectious agent to humans

- Two types: mechanical and biological

- Biological animal vectors: The infectious agent must incubate in the animal host as part of the agent's developmental cycle; eg, the transmission of malaria by infected mosquitoes

- Mechanical animal vectors: The infectious agent is physically transmitted by the animal vector, but the agent does not incubate or grow in the animal; eg, the transmission of bacteria sticking to the feet of flies

B. Source of infection

- Direct Mechanisms of Disease Transmission
 - Directly From Person to Person(man)
 - Examples:
 - Direct Skin Contact
 - Airborne (Aerosols)
 - The man can patient or carrier, the carrier either healthy carrier or convalescent carrier .

- Indirect Mechanisms of Disease Transmission

- Examples:

- Food & Waterborne Transmission

- Fomites

- Animal Vectors

- Soil

C . Methods of transmission of infection

- Contact
- Inhalation
- Inoculation
- Ingestion
- Insects
- Congenital

C. The Normal Flora of Humans and Relationships

- Normal flora is present in
 - skin
 - upper respiratory tract
 - oral cavity
 - intestine, especially large intestine
 - vaginal tract
- Very little normal flora in eyes & stomach

- Notably absent in most all internal organs
 - Absent in:
 - lower respiratory tract
 - muscle tissue
 - blood & tissue fluid
 - cerebrospinal fluid
 - peritoneum
 - pericardium
 - meninges

- Benefits of the normal flora
 - Nutrient production/processing
eg Vitamin K production by *E. coli*
 - Competition with pathogenic microbes
 - Normal development of the immune system
- Normal flora and opportunistic infections

D .Generalized Stages of Infection

1. Entry of Pathogen

- Portal of Entry

2. Colonization

- Usually at the site of entry

3. Incubation Period

- Asymptomatic period
- Between the initial contact with the microbe and the appearance of the first symptoms

4. Prodromal Symptoms

- Initial Symptoms

5. Invasive period

- Increasing Severity of Symptoms
- Fever
- Inflammation and Swelling
- Tissue Damage
- Infection May Spread to Other Sites

6. Decline of Infection

5. Convalescence

E. Virulence Factors and Toxins

- State of the Host Immune System
- Number of Pathogenic Cells encountered by the Host
 - Infectious Dose
- **Aggressing factor** is substance is make protect from initial attack of immunity of the host

- Aggressing factors include:-
 - 1.Siderophores is iron scavenger molecule produce by most pathogenic bacteria.
 - 2.Capsule e.g like *S. pneumoniae*
 - 3.Extra cellular slim layer e.g like M.protein in of *S. pyogenes*.
 - 4.Plasmid which is not virulence factor but promote other factor like drug resistance.

5. Enzymatic Virulence Factors

– Examples:

- Coagulase (*Staphylococcus aureus*)
- Streptokinase (*Streptococcus pyogenes*)
- Hyaluronidase (Many pathogens)
- Collagenase (Many pathogens)
- Leucocidin (Many pathogens)
- Hemolysin (Many pathogens)

- Adhesion Factors
 - Examples:
 - Protein A (*Staphylococcus aureus*)

- Toxins secreted by bacteria either :-

1.Exotoxins

– A type of bacterial toxin with the following properties:

- May be produced by either gram-positive or gram-negative bacteria
- Is secreted by the bacteria
- The action of the exotoxin does not necessarily require the presence of the bacteria in the host
- Most exotoxins are peptide or protein
- Most exotoxins are heat sensitive (exception: enterotoxin of *Staphylococcus aureus*)

- Exotoxins (cont.)

- Classes of exotoxins: Neurotoxic, cytotoxic, or enterotoxic exotoxins

- Neurotoxins: Interfere with proper synaptic transmissions in neurons
 - Cytotoxins: Inhibit specific cellular activities, such as protein synthesis
 - Enterotoxins: Interfere with water reabsorption in the large intestine; irritate the lining of the gastrointestinal tract

2.Endotoxins

- A type of bacterial toxin having the following properties:
 - Produced only by gram-negative bacteria
 - Endotoxins are a component of the gram-negative cell wall
 - The action of endotoxin requires the presence of the bacteria in the host. The endotoxin may be released from the cell wall as the cells die and disintegrate

- Endotoxins (cont.)

- Endotoxin is composed of Lipid A: Part of the lipopolysaccharide layer
- Mode of action: Irritation/inflammation of epithelium, GI irritation, capillary/blood vessel inflammation, hemorrhaging