

General Pathology Of Infectious

Diseases:

Lecture 1

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Introduction:

Despite vaccination and antibiotics, infectious diseases continue to have a heavy role in patient on immunosuppressive drugs or those with AIDS.

In developing countries, unsanitary living condition and malnutrition lead to massive burden of infectious diseases especially respiratory and diarrheal infections caused by viruses and bacteria.

Host-organism interactions:

Commensal: These are the microorganisms that live on the expense of the host without doing harm e.g.

1. Bacteria living on the skin.
2. Vitamin K producing intestinal bacteria flora, which are normal inhabitant.

Pathogens: These are microorganism that injured the host, they include viruses, bacteria, fungi, protozoa (e.g. Entameba) and metazoa (e.g. worms).

Pathogenicity: These are the capacity of a particular microorganism to cause diseases.

Virulence: This is the degree of Pathogenicity.

Note: The *site* of presence of microorganism is important e.g.

- E.coli is a normal inhabitant of G.I.T. but when introduced into urinary tract through for e.g. urinary catheter it becomes pathogenic and leads to severe urinary tract infection.

Infections:

Definition: It's the presence of microorganism in a part of body where it's normally absent and where if it allows to multiply, it stimulates a host response and cause infectious disease.

The outcome depends on balance between the microorganism aggressiveness' and the host defense.

Effects of infection: It's either:

1. Local effects: This is seen in form of inflammation acute, sub acute or chronic and this inflammation may be purulent, suppurative or non-purulent, non-suppurative or with abscess formation.

2. Systemic effects: Usually the infection spread to other part of the body by many ways, these are (i.e. methods of spread of microorganism):

A. Direct spread by contiguity so it's called cellulites.

B. Spread by lymphatic and regional lymph node that drain site of infection will also become inflamed and this will produce *lymphangitis* (i.e. inflammation of lymphatic vessels) and *lymphadenitis* (i.e. inflammation of lymph node).

C. Spread by other natural passage, e.g. tonsillitis may lead later on if untreated to trachities, bronchitis and pneumonia.

D. Spread by blood stream: This will cause different type of infection like bacteremia, septicemia, pyaemia and toxemia.

Bacteraemia: Its circulation of bacteria in the blood stream without clinical evidences of their presence. In the blood culture we can detect the bacteria but the patient here is not suffering from any signs and symptoms.

Septicaemia: When the bacteria and their toxin are present in the circulation and are associated with clinical manifestation of their presence in the blood stream and this bacterial toxin shows signs and symptoms such as chills, fever, sweating, weakness, muscle and joint pain.

Pyæmia: Its type of septicemia caused by pyogenic bacteria (i.e. bacteria which produce pus) are spread by blood stream and result in formation of multiple abscesses in various tissues and organ in the body , its also associated with sever clinical manifestation.

Toxaemia: It's the effect of circulating bacterial toxin on the tissues weather or not bacteria are circulated in the blood e.g. Diphtheria in which bacteria grow in the region of mouth, tonsil's, and pharynx when they produce false membrane. Also it produces exotoxins which enter the blood stream and affect the tissue, which may be fatal.

How infectious agents cause diseases?

After breaking host barrier, infectious agents injure cells and cause tissue damage by three general mechanism:

1. Infectious agents can come into contact with or enter host cells and directly cause cell deaths.
2. Pathogens can:
 - Release endotoxins or exotoxins that kill cells at distance.
 - Release enzymes that degrade tissue components or
 - Damage tissue through ischemic injury.
3. Pathogen can induce host cell response that may cause additional tissue damage usually by immune mediated mechanism.

Mechanisms of bacterial-Induce injury:

Bacteria damage to the host tissue depends on the ability of bacteria to:

1. Adhere to and enter host cells.
2. Deliver toxins.

Bacteria adhere to host cells by adhesins which are molecules that bind bacteria to host cells , next they will inhibit protein synthesis of target cells, this is followed by multiplications of the bacteria with lyses of the host cells.

Types of bacterial toxins:

It's of two types:

1. Endotoxins.
2. Exotoxins.

1. Endotoxins: This is a lipopolysaccharides that are structural components of the outer cells wall of gram negative bacteria.

By using of gram stains most of bacteria divided to either gram positive or gram negative.

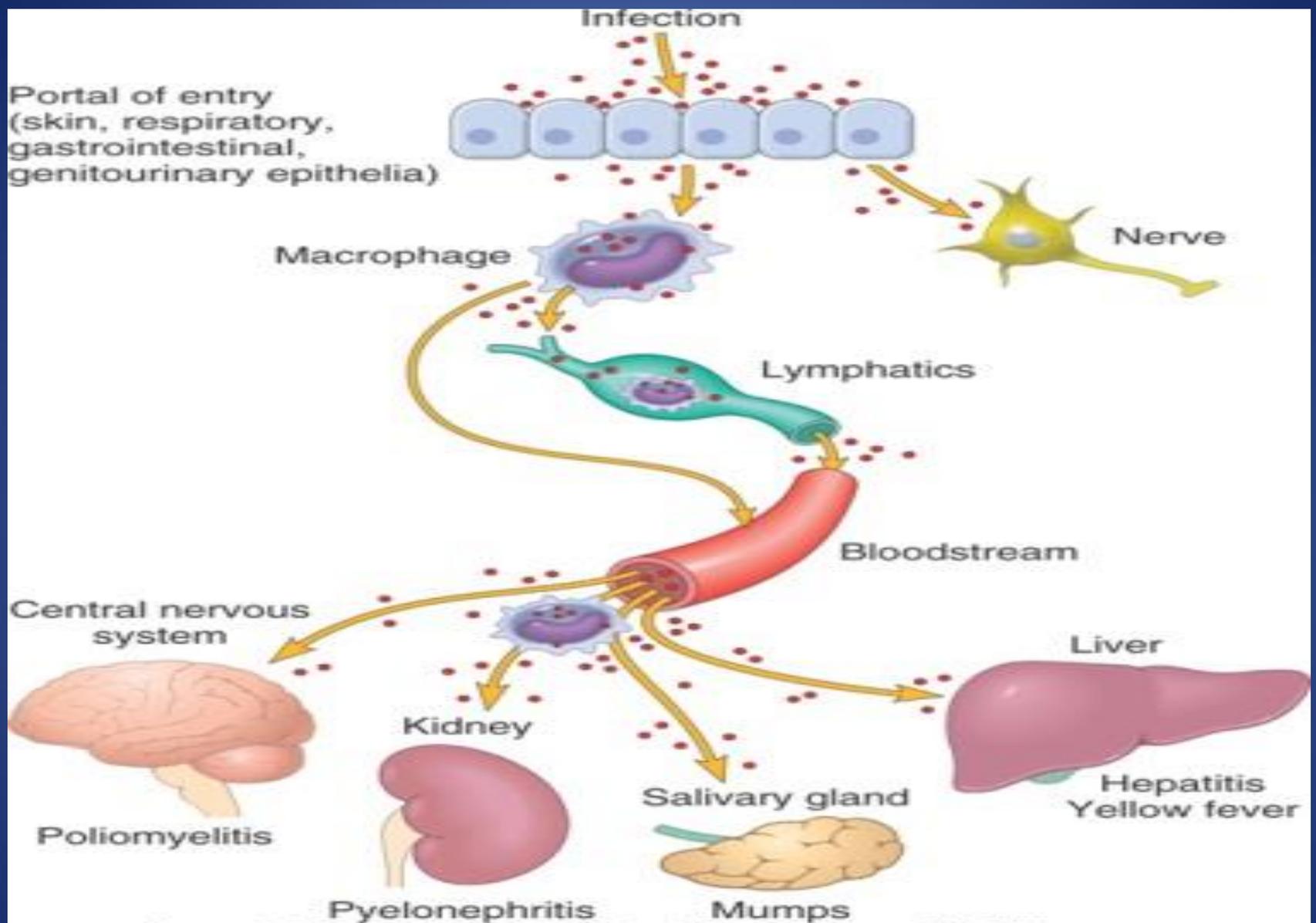
e.g. of gram negative are E.coli and salmonella typhi.

e.g. of gram positive are staphylococcus.

2. Exotoxins: This is secreted proteins that are directly cause cellular injury and cause disease manifestation e.g. include:

A. *Diphtheria toxin* which secreted by corynebacterium diphtheria, this toxin cause neural and myocardial dysfunction.

B. *Tetanospasmin* which is toxin secreted by clostridium tetani that contaminate wound. This toxin cause violent muscular contraction (tetanus).



Routes of entry and dissemination of microbes. To enter the body microbes penetrate the epithelial or mucosal barriers. Infection may remain localized at the site of entry or spread to other sites in the body. Most common microbes (selected examples are shown) spread through the lymphatic's or bloodstream (either freely or within inflammatory cells). However, certain viruses and bacterial toxins may also travel through nerves.

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