General effects of Infections

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11.03.2024

Introduction

Subject outlines

- General considerations
- Factors affecting development of infection
- Effects of infections
- Routs of infections
- Types of infectious microbes
- A focus on bacterial infection
    1. Bacteremia
    2. Toxemia
    3. Septicemia
    4. Pyaemia

Introduction

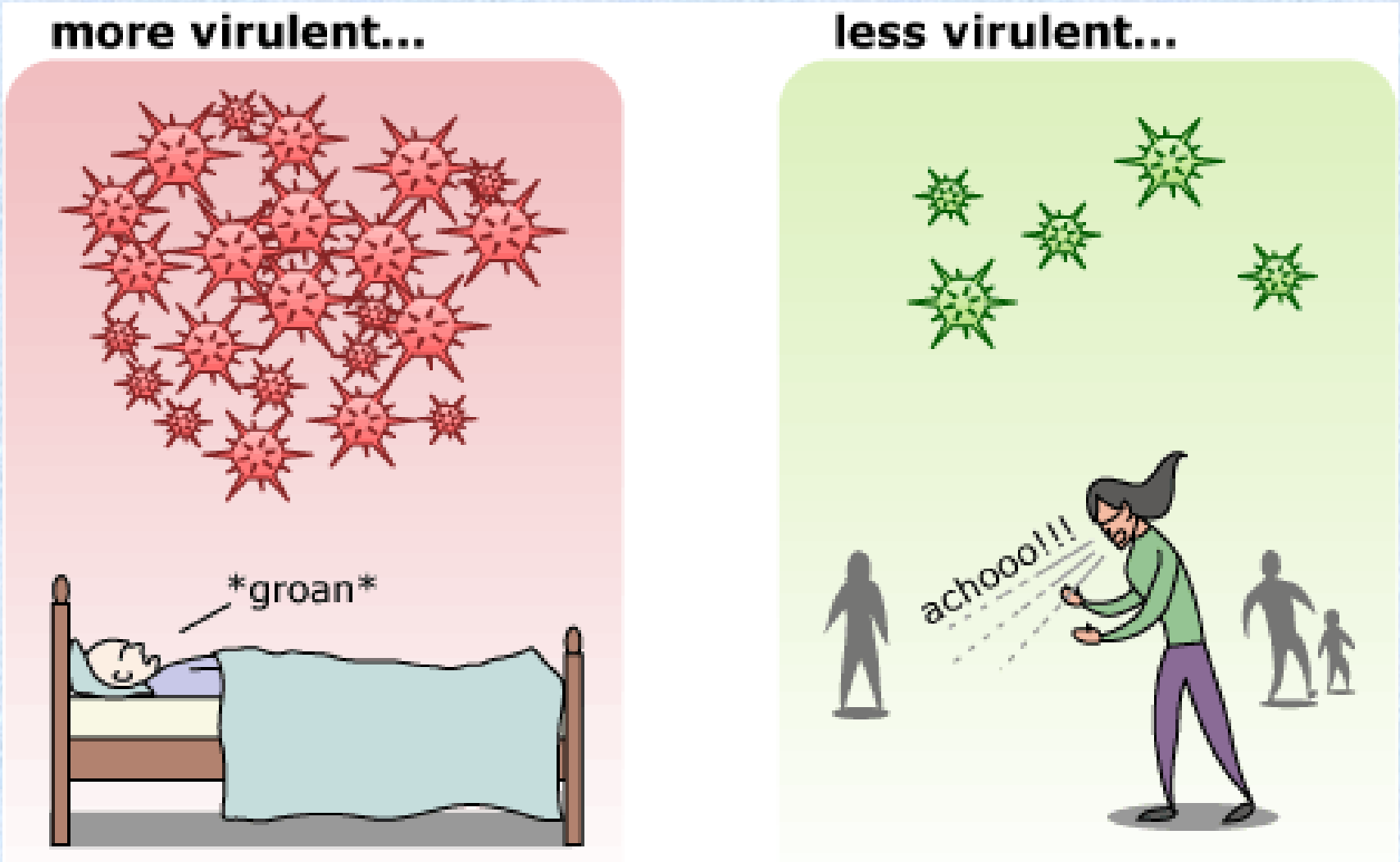
General considerations

- **Infection**: invasion of tissues by micro-organisms with induction of pathological effects.
- **Organism virulence**: ability of the microbe to resist body defense and cause damage of the host tissue.
- **Organism pathogenicity**: capacity of micro-organism to cause a disease.
  - **Pathogenic**: penetrate and damage the host tissue
  - **Non pathogenic**: live on the surface epithelium without tissue damage as bacterial flora and commensals

Non-pathogenic **Reduced immunity** → Pathogenic

Introduction

Organism virulence



Introduction

Normal bacterial flora

Skin

Eyes (i.e.Cunjunctiva)

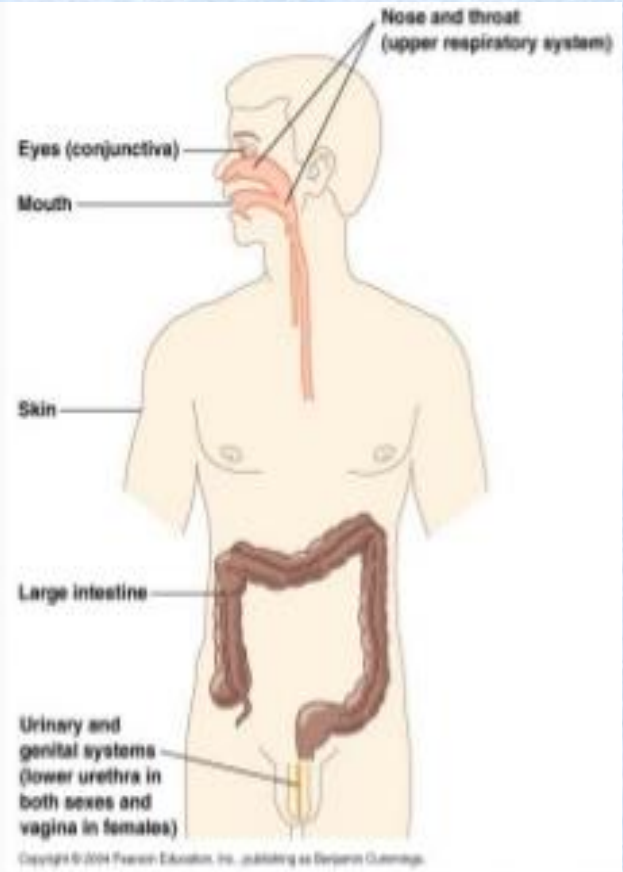
Nose (i.e. Respiratory tract)

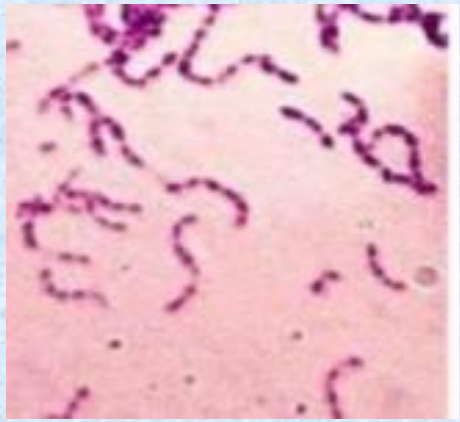
Mouth (i.e Human Oral Cavity)

Ears

Urogenetal tract

Elementry tract





Introduction

Factors affecting development of infection

- **Organism factors:**
  - Portal of entry
  - Virulence of the microorganism
  - The dose of infective microbes
- **Host factor:**

General and natural resistance

- Mechanical barriers: skin and mucosa
- Glandular secretions.
- Phagocytic cells.

Acquired immunity

Due to previous exposure to the infectious agent.

Introduction

Effects of infection

- **Unsuccessful (failed) infection:** non-virulent microbe and normal body defense mechanism.
- **Sub-clinical infections:** Infections occur with no symptoms of the host. The host may change to a carrier status
- **Clinically manifested infections:** the organism is virulent enough to cause tissue damage

Introduction

Effects of infection

Morphological (tissue) effects

See with each disease

Clinical effects

- Presentation: symptoms and signs
- Spread (complications)

Introduction

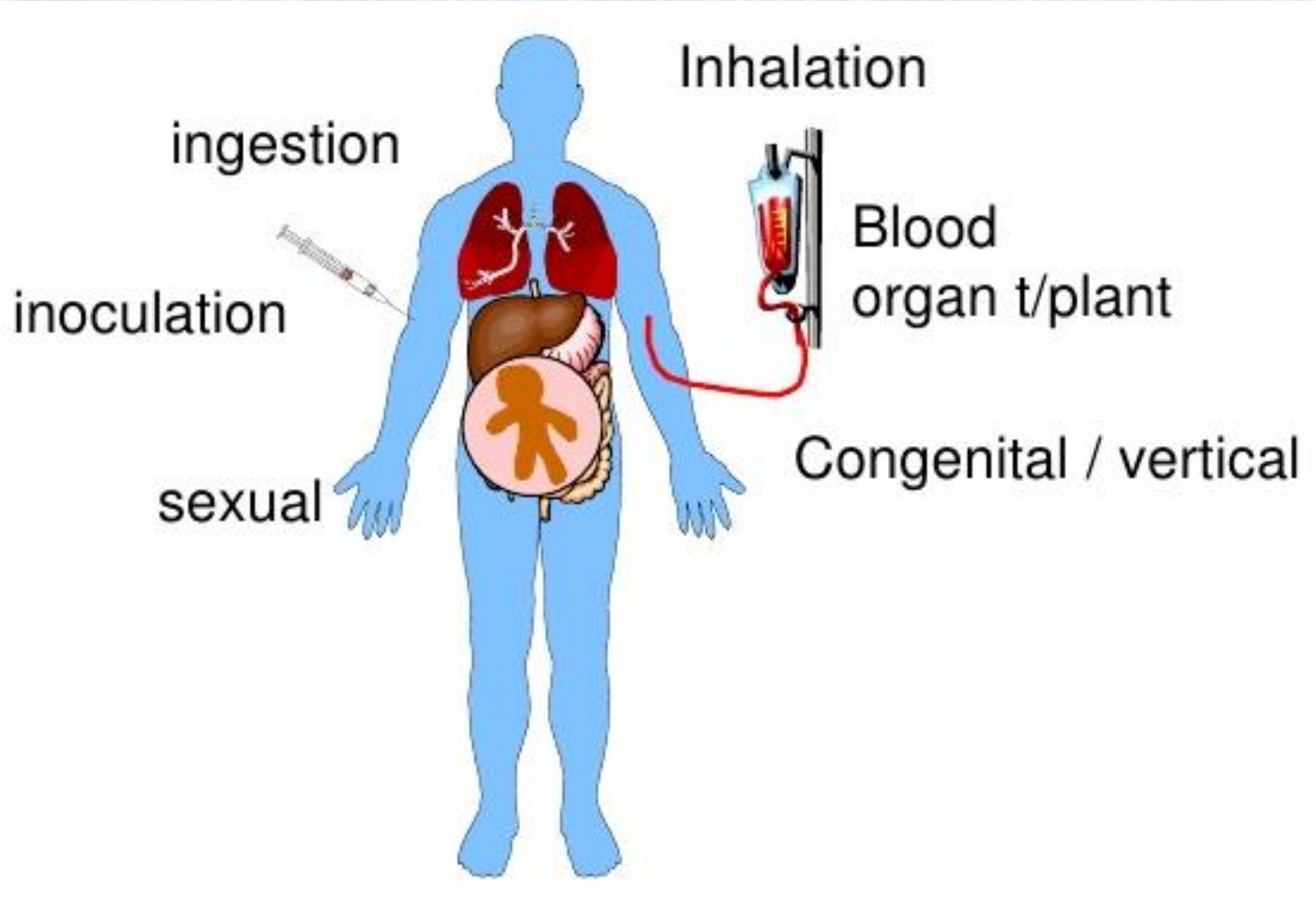
Routs of infections

- **Exogenous:**
  1. Direct: inoculation on wounded skin or mucosa
  2. Ingestion: through food and water
  3. Inhalation: with inhaled air
  4. Sexual.
  5. Parenteral: blood transfusion and from mother to fetus

- **Endogenous:** from normal commensals on reduced immunity (opportunistic infections)

Introduction

Routs of exogenous infections



Introduction

Types of infectious microbes

I. Bacterial infections

II. Viral infections

III. Parasitic infections

IV. Fungal (mycotic) infections

A focus on bacterial

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infections

Bacterial infections

- **Pathogenicity of bacteria occurs due to:**
  1. Adhesions of bacteria to cells causing their damage
  2. Production of toxins (endotoxins and exotoxins) leading to cell injury
  3. Induction of hypersensitivity reactions mainly IV

- **Effects of bacterial infections:** Bacterial infections can lead to:

1- Cell injury
2- Inflammation
3- Toxemia
4- Hypersensitivity

5- Invasion of blood stream
a. Bacteremia
b. Septicemia
c. Pyemia

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Bacterial infections

Toxemia

- **Definition:** Circulation of bacterial toxins in blood stream

- **Types of bacterial toxins:**
  1. **Endotoxins:** part of bacterial wall that is released from dead bacteria to host body and induce immune response
  2. **Exotoxins:** synthesized and secreted from living bacteria and has strong damaging effects

Bacterial infections

Toxemia

- **Types and manifestation of toxemia:**

Acute toxemia

- **Examples**: abscess, pneumonia, typhoid, meningitis & diphtheria.
- **Manifestation:**
  - General features: high grade fever, rigor, and weakness
  - Severe acute tissue damage that is fatal: as adrenal cortex, lung, myocardium, renal tubules

Chronic toxemia

- **Examples**: TB and chronic abscesses.
- **Manifestation:**
  - General features: low grade fever, anemia and general weakness
  - Chronic tissue damage as liver fatty change or cloudy swelling of renal tubules

Bacterial infections

Bacteremia

- **Definition:** circulation of small numbers of bacteria in blood stream.

- **Sources:**
  - After minor surgical procedures as tooth extraction.
  - In a patient with chronic septic focus as chronic tonsillitis and chronic sinusitis
  - During incubation period of some infections as typhoid

Bacterial infections

Bacteremia

- **Effects**
  - Low virulent bacteria with good immunity: eliminated by immune cells with NO harmful effects
  - More virulent organism may localize in certain tissues leading to serious effects; as
    - Endocarditis: inflammation of endocardium
    - Abscess of internal organs as lung or brain
    - Osteomyelitis

Bacterial infections

Septicaemia

- **Definition:** circulation and multiplication of large number of virulent bacteria and their toxins in blood stream
- **Causative organism:** Streptococci, staphylococci, gonococci, and bacillus proteus.
- **Common causes (sources of bacteria):**
  1. Meningococcal meningitis.
  2. Puerperal sepsis
  3. Osteomyelitis
  4. Severe acute abscess

Bacterial infections

Septicaemia

- **Effects: a fatal condition due to sever toxemia**

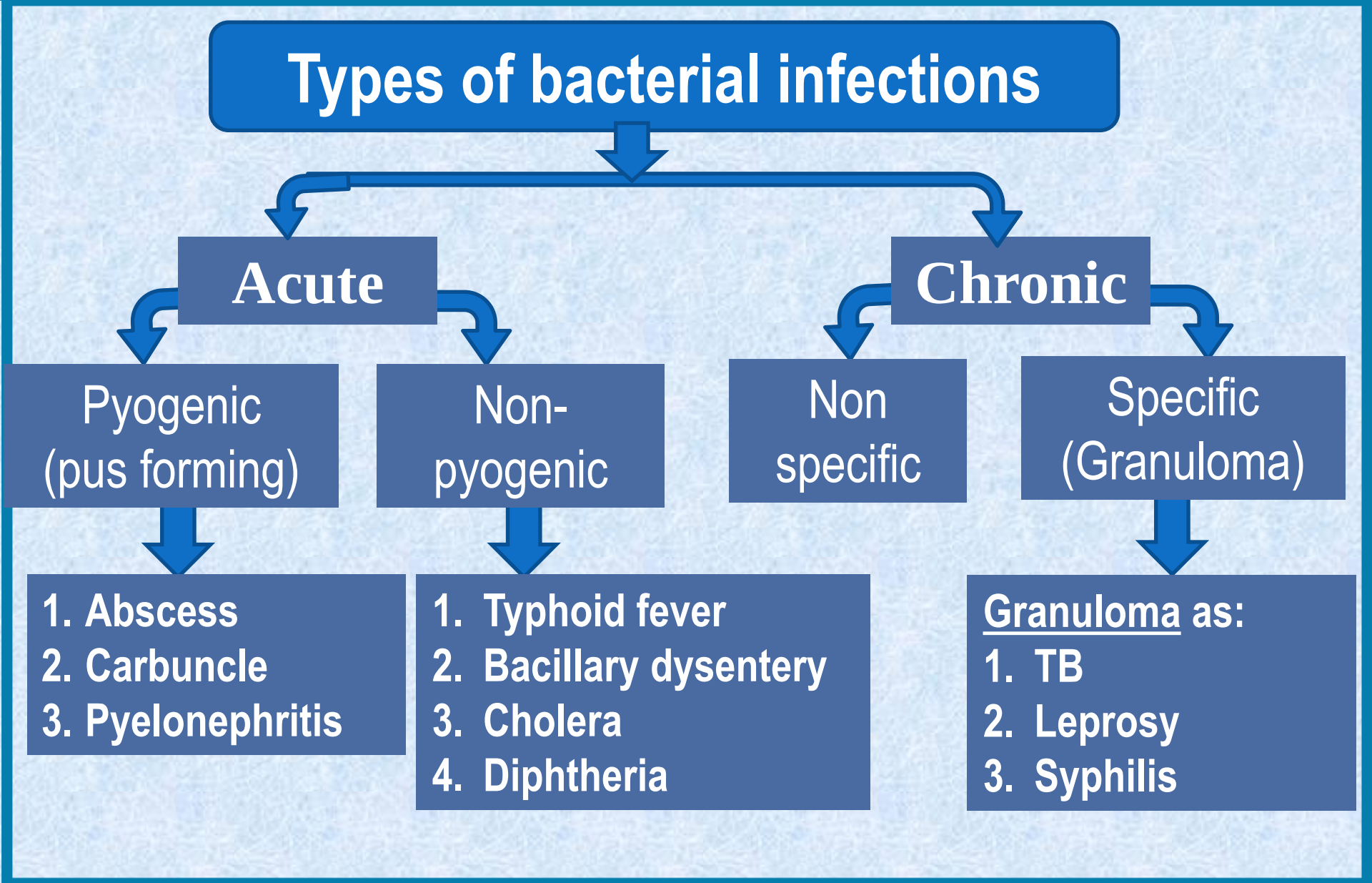
1. Symptoms: fever, rigors, pallor ….
2. Tissue necrosis:
   - Adrenal cortex necrosis (acute adrenal insufficiency).
   - Renal tubular necrosis: acute renal failure
   - Toxic myocarditis: acute heart failure
3. Hemolysis of RBCs and capillary damage.
4. Spleen: acute splenic swelling.

Bacterial infections

Septicaemia

	Bacteremia	Septicemia
• Blood bacteria	• Small number of bacteria in the blood	• Large number of multiplying bacteria in the blood
• Toxemia	• Toxemia is absent	• Severe toxemia
• Clinical symptoms	• Mild or absent	• Severe
• Immunity	• Good immunity	• Low immunity
• Prognosis	• Good prognosis	• Bad prognosis

Bacterial infections



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Thank you