

BACTERIAL INFECTION

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- **Acute bacterial infections often lead to a local acute inflammatory reaction at the site of inoculation.**
- **Entry of bacterial toxins or bacteria into the blood may lead to:**

1. Bacteremia

2. Toxemia

3. Septicemia

4. Pyaemia



1- Bacteraemia

- **def.**

It is the transient invasion of the blood by bacteria without significant toxæmia.



Source of bacteraemia

1-Septic focus

(septic skin lesion or skin trauma or tonsillitis, sinusitis)

2-Normal flora in mouth or in colon

Blood (strept viridian or E coli)

3-An integral part of some infections

as typhoid fever



Effects and fate of bacteraemia

- *small numbers of bacteria* reaches the blood they are rapidly eliminated and **destroyed** by members of **lympho-reticular system**.



- large numbers of bacteria enter the blood, it settle in certain organs causing **inflammation**

Ex:

- Septic focus as septic skin lesion or skin trauma

Blood (staph aureus)..... acute haematogenous osteomyelitis

- Normal flora in mouth or in colon
Blood (strept viridian or E coli)



SBE

Pyelonephritis

2-Toxaemia

- **Def.**

It is the circulation of bacterial toxins in the blood with the production of clinical and pathological manifestations.

- **Types of toxaemia**

- According to duration

1. Acute

2. Chronic



A-Acute toxaemia

1- Endotoxic toxaemia

2- Exotoxic toxaemia



The difference between exotoxin and endotoxin

Properties	Exotoxin	Endotoxin
Origin	G + and G -	G -
Release	Secreted from living cells or released upon bacterial lysis	Released upon bacterial lysis
composition	Protein	LPS
Heat-resistance	Sensitive	Resistance
Immunity	High, antitoxin, toxoid	Low, no toxoid
Toxicity	High, tissue specificity	Low, no tissue specificity

Endotoxic toxaemia

- Bacterial endotoxin is a lipopolysaccharide that is a structural component in the outer cell wall of gram negative bacteria. liberated only after the death of bacteria.

- **Mechanism of action**

CNS effect-----Fever, pain all over body, anorexia, headache, malaise

Degenerative changes (fatty change, cloudy swelling)..... Liver, kidney, heart

Damaging capillaries

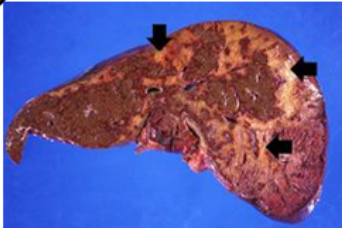
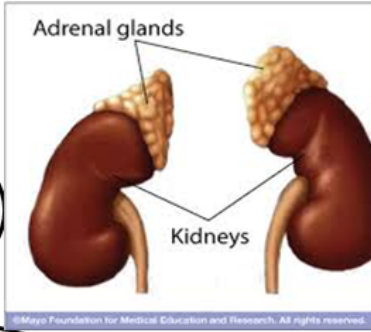
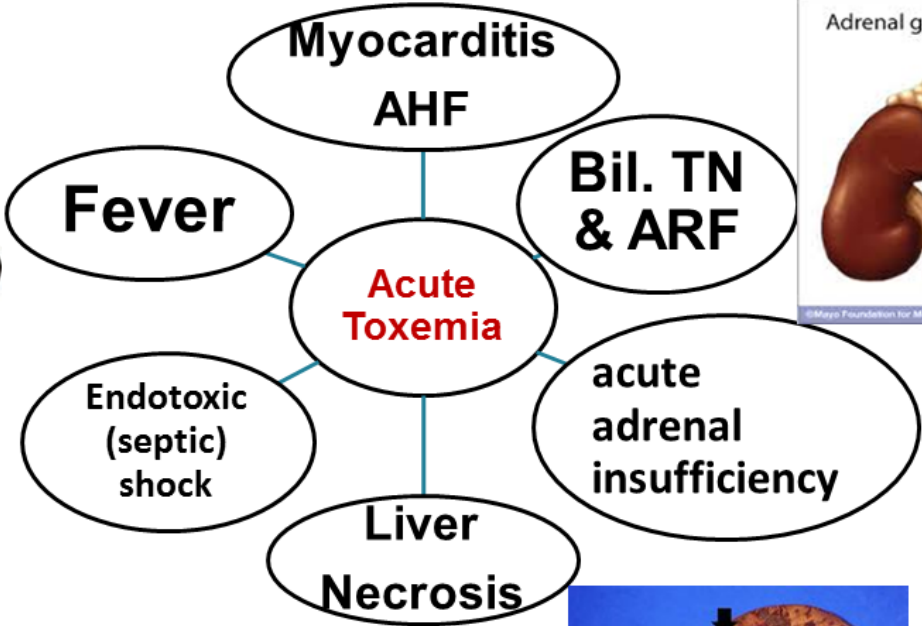
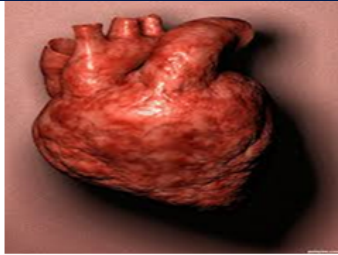
Disturb coagulation system.....DIC

Necrosis of suprarenal cortex.....acute adrenal insufficiency

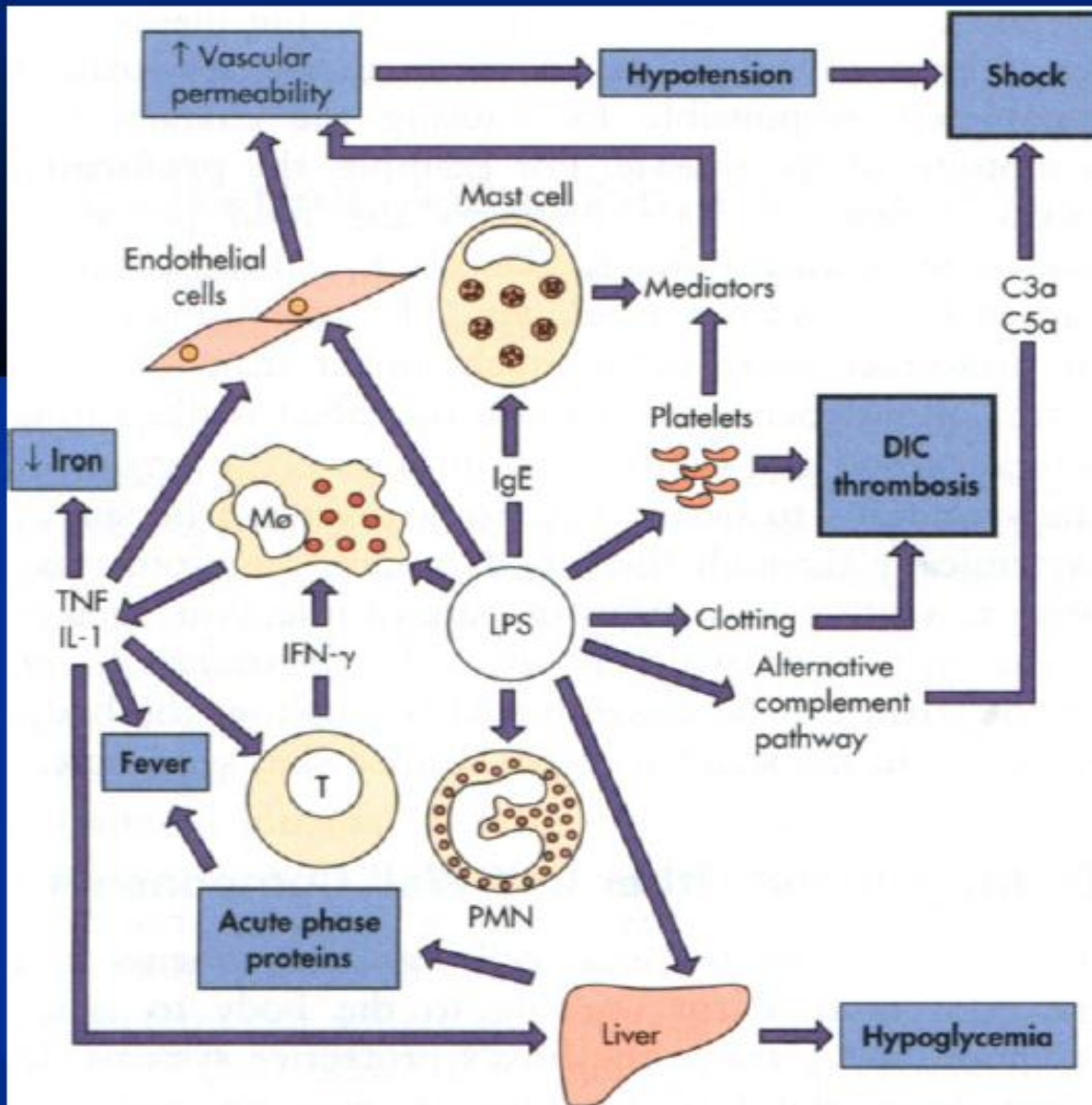
Bilateral tubular necrosis of kidney....acute renal failure

Toxic myocarditis.....acute heart failure

Endotoxic shock



TN :tubular necrosis
 ARF:Acute renal failure



- **Examples**
- Pneumococci
- meningococci



Exotoxic toxaemia

- Bacterial endotoxin produced by **gram positive** organisms produce local tissue damage.

- **Mechanism of action**

Their effects are selective

(specific enzyme activity and organ specific)



- **Cholera toxins**: intestinal epithelial cells
Excessive secretion of fluiddiarrhoea
- **Diphtheria toxins**: neural and myocardial dysfunction
- **Clostridium botulinum toxins** : block release of
cholinergic NT causing progressive paralysis
- **Clostridium tetani toxins**: interfere with inhibitory
NT producing violent muscular contractions (tetanic
spasm)





lockjaw

Rigid paralysis



B- Chronic toxemia

As with chronic infections as T.B

Effects:

Loss of weight

Prolonged low grade fever

Amylodosis

anemia



3-Septicemia

- **def**

It is a **serious** and may be fatal condition in which **large numbers of virulent bacteria** circulate and multiply in the blood with the production **their toxins**.

- **Aetiology**

Septicemia can complicate infections with pyogenic organisms particularly *if the immunity is lowered* so it is more common in extremes of age (neonates, infants and elderly).



- **Examples**

Severe infections as :

meningococcal meningitis,
neonatal umbilical sepsis,
lobar and bronchopneumonia,
post operative infections,
Puerperal sepsis
and neglected infected wounds.



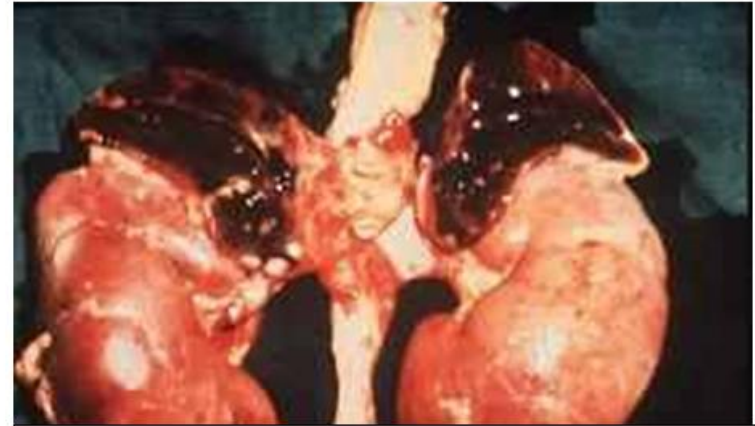
- **Manifestation of septicemia**

- Petechial haemorrhage all over the body.
- Disseminated intravascular coagulation (DIC).
- Toxic myocarditis and acute infective endocarditis.
- Acute respiratory distress syndrome
- Inflammation of the serous membranes.
- Bone marrow depression.
- Acute adrenal cortical insufficiency.
- Septic shock.
- ***Acute splenic swelling (septicemic spleen).***

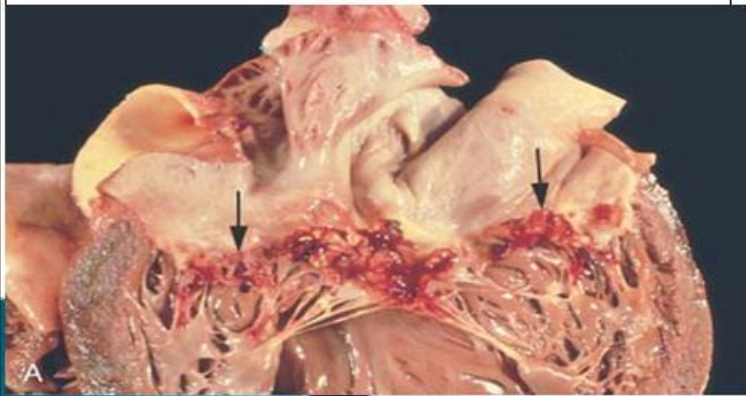




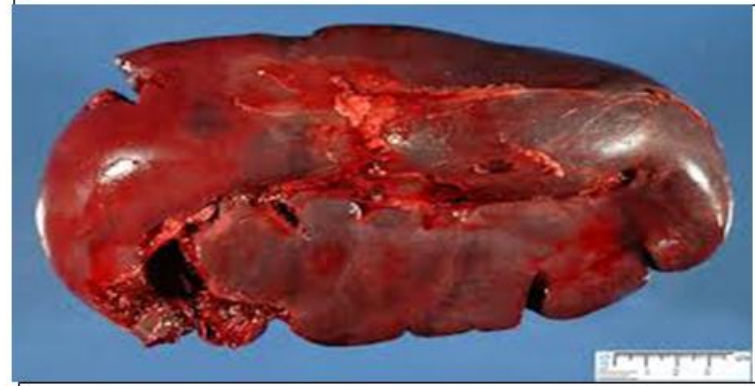
Petechial hemorrhages.



Massive adrenal hges & DIC



Acute bacterial endocarditis



Acute splenic swelling.

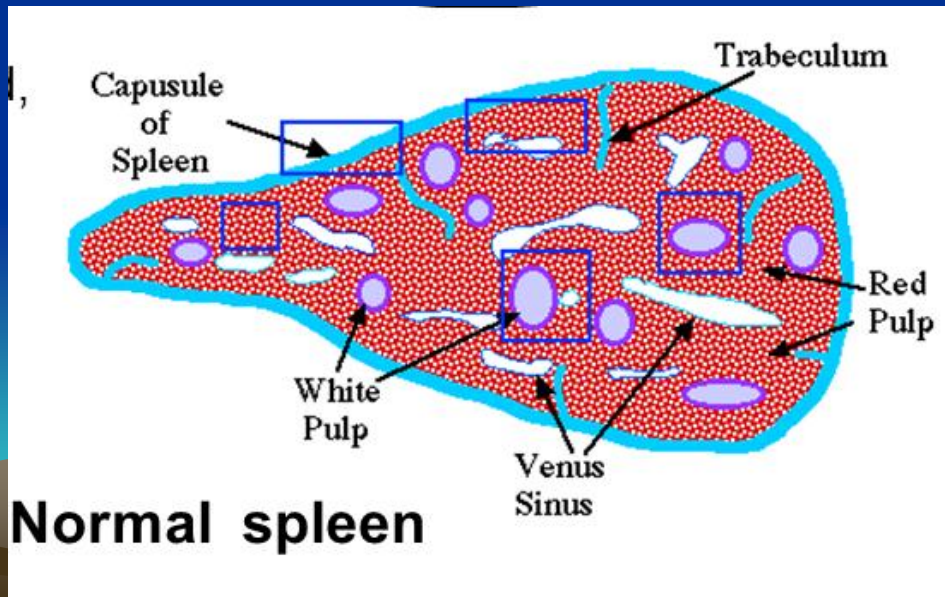
Septicemia spleen

- **Grossly:**
- The spleen is moderately enlarged and extremely soft.
- The red pulp is congested and easily washed out by running tap water (diffluent).

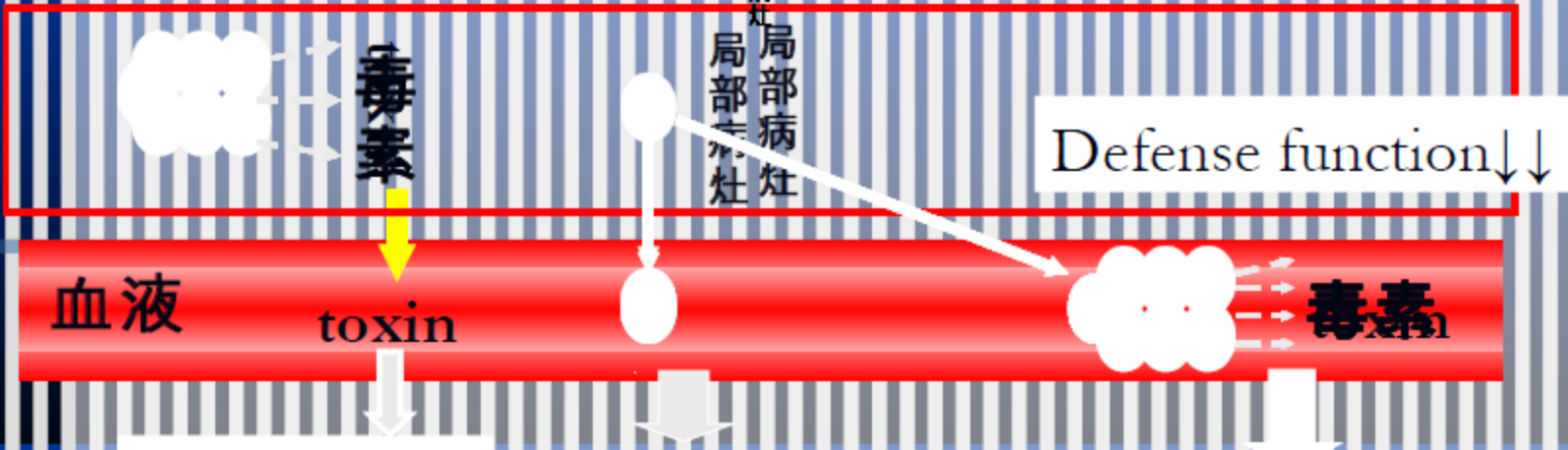


Microscopically,

- Congestion of red pulp,
- White and red pulp it is heavily infiltrated by neutrophils.
- Atrophy of lymphoid follicles



Local lesion



special toxic symptom

Toxemia

e.g.tetanus

pathogenic bacterium can grow in blood

Bacteremia

Organism is seriously damaged, toxic symptom all over the body .

Septicemia

4-Pyaemia

- **Def**

It is the condition in which

multiple small abscesses (pyaemic abscesses) form within one or more organs

as a result of

impaction of septic emboli (derived from septic thrombi)



- **Pathogenesis:**

- 1. Injury of venous endothelium or valvular endocardium by bacterial toxins followed by thrombosis.
- 2. Infection of thrombus by bacteria.
- 3. Fragmentation of infected thrombus by proteolytic enzymes from neutrophils leading to the formation of septic thrombotic emboli which circulate in the blood stream.
- 4. Impaction of septic emboli in small blood vessels in various organs leading to pyemic abscesses

- **Characters of pyaemic abscesses**

They are usually numerous,

- small,

- superficial,

- nearly of the same size,

- usually peripheral containing some pus and surrounded by a zone of congestion.



- **Source**

1-Pulmonary pyaemia:

Ost.M- PS- OM

2-Systemic pyaemia:

ABE

3-Portal pyaemia:

A ch- A app- infec. piles



Sites of pyaemic abscesses

- Pulmonary pyaemia ----- lungs.
- Systemic pyaemia ----- lungs, liver, brain, kidneys, spleen
- Portal pyaemia ----- liver.



Pyemia

systemic

pulmonary

portal
eg. GIT



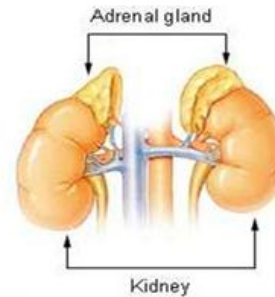
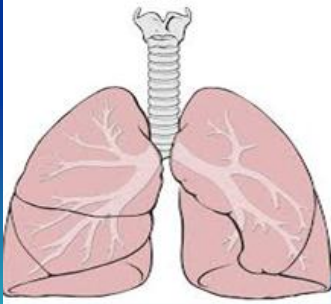
Into venous
side

Into arterial
side
eg. left side of heart
lung

To liver

To lung

To brain, liver, kidney, spleen



Thank you

