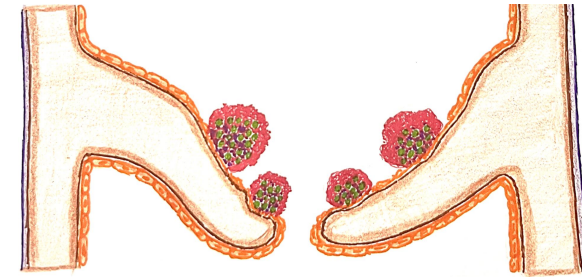


# INFECTIVE ENDOCARDITIS – I

## ETIOPATHOGENESIS AND MORPHOLOGY



Dr.V.Shanthi,

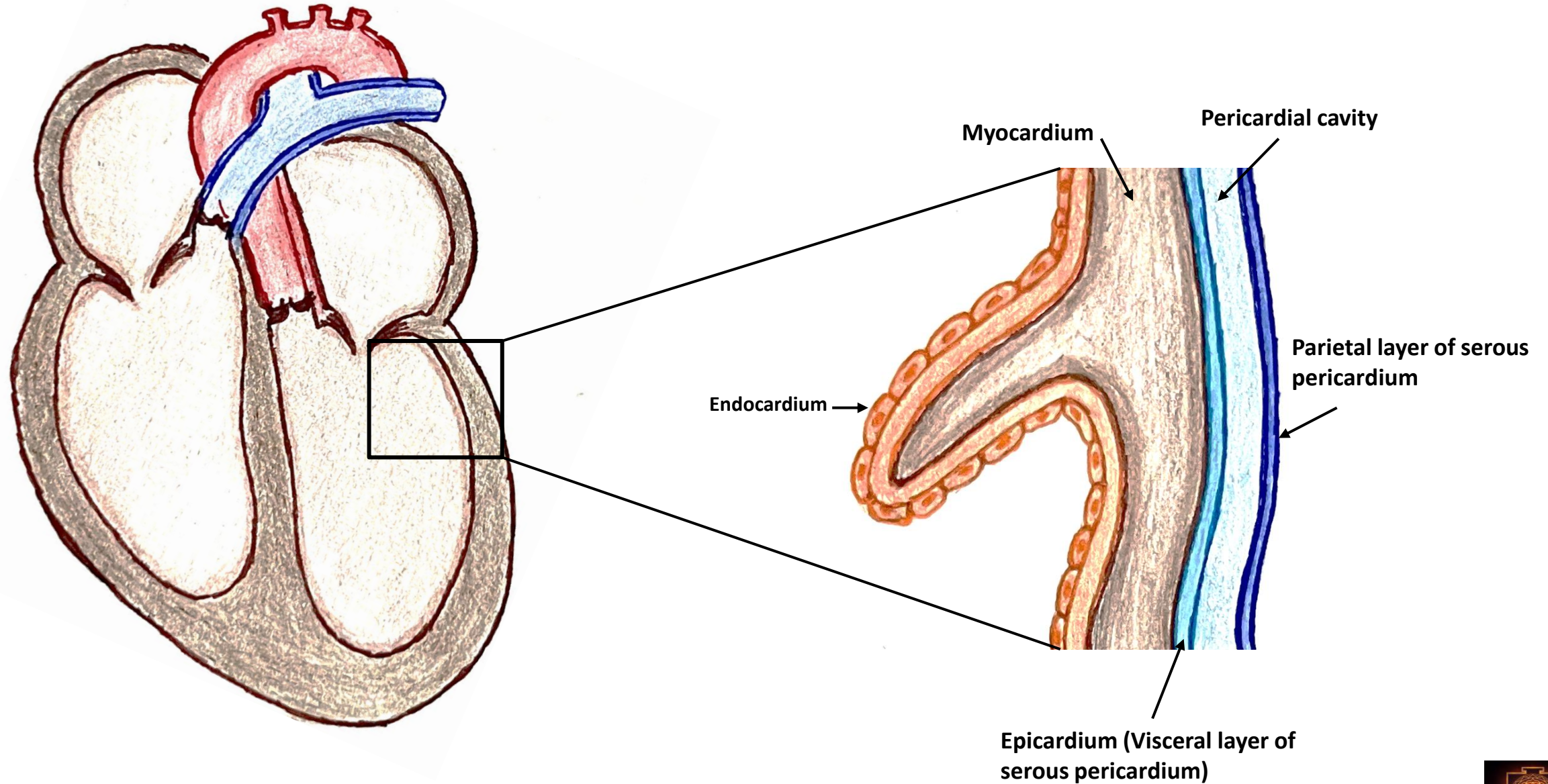
Associate Professor, Pathology

Sri Venkateswara Institute of Medical Sciences

Tirupathi

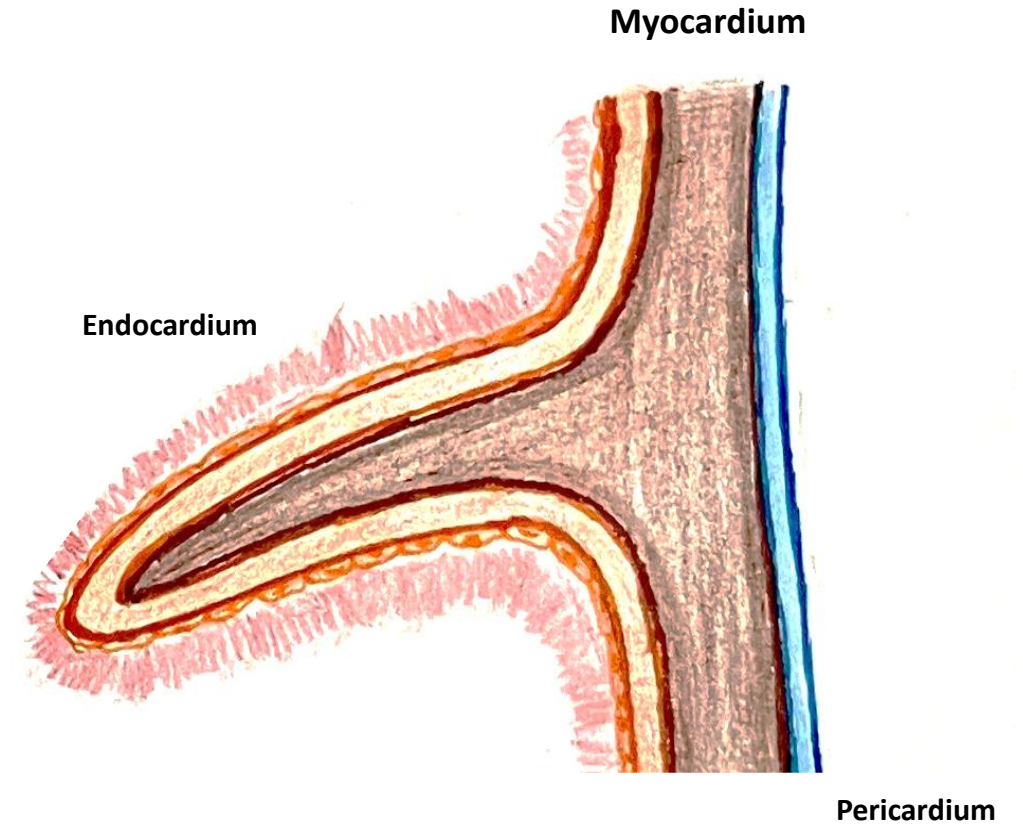


# NORMAL MORPHOLOGY OF HEART

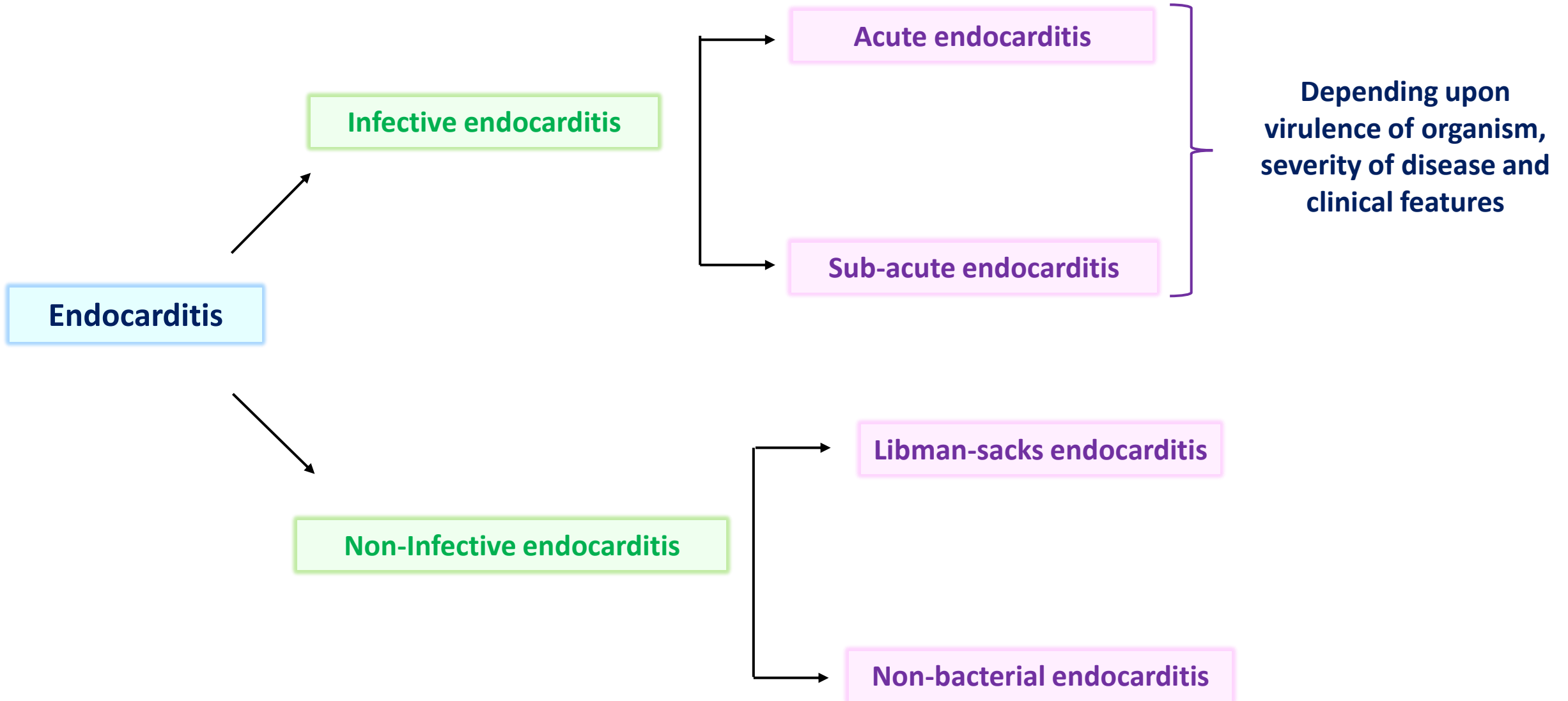


# INFECTIVE ENDOCARDITIS

Endocarditis is the inflammation of the endocardium



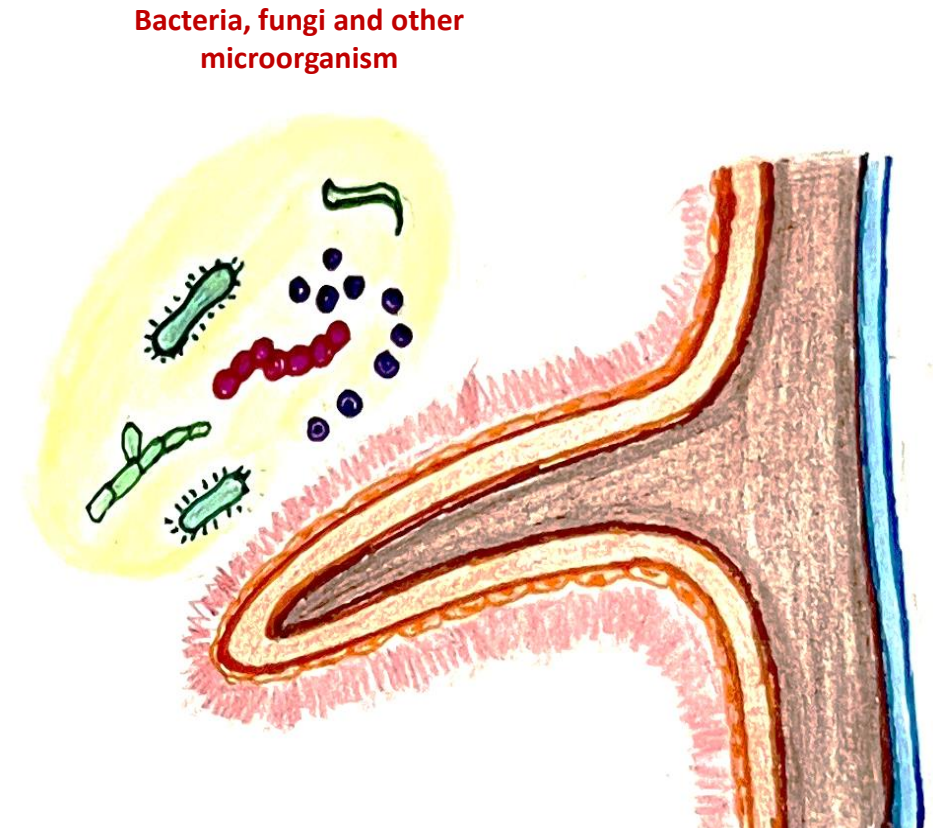
# INFECTIVE ENDOCARDITIS



# INFECTIVE ENDOCARDITIS

## Definition

- Infective endocarditis is a **microbial infection of the heart valves or mural endocardium** that leads to the **formation of vegetations composed of thrombotic debris and organisms, often associated with destruction of the underlying cardiac tissue**

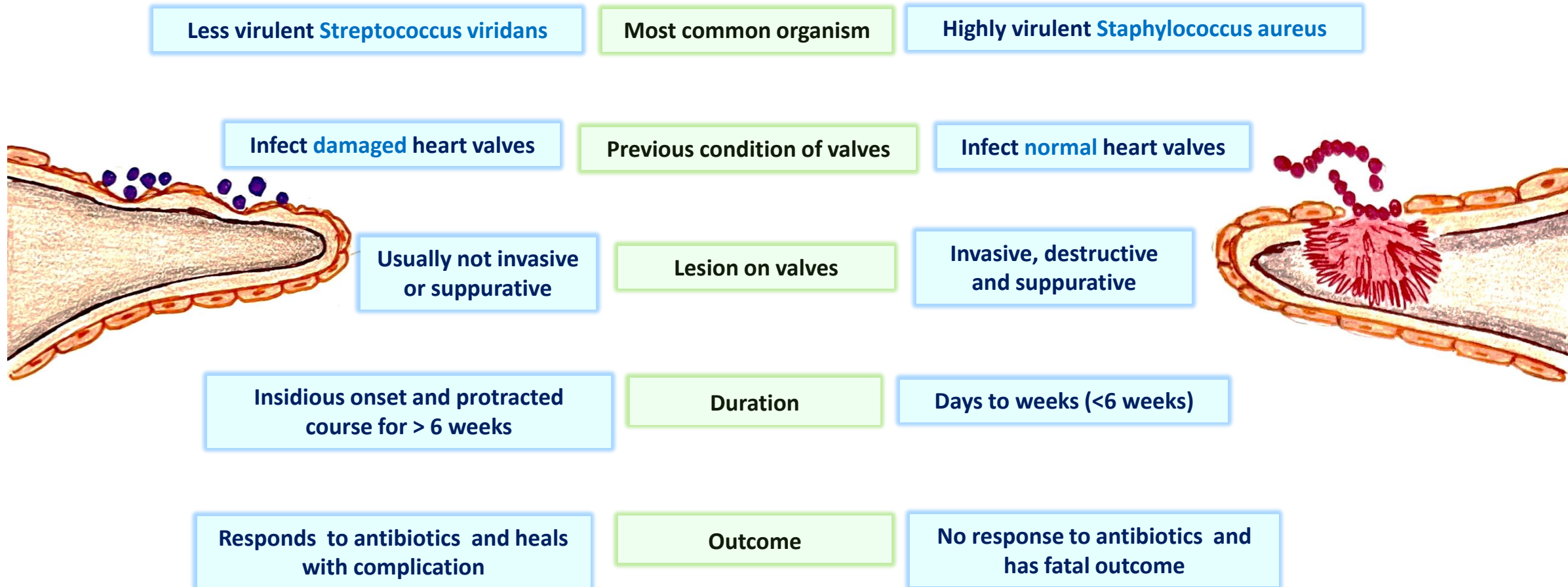


# INFECTIVE ENDOCARDITIS

- Infective endocarditis is classified on clinical grounds into **acute and subacute forms** indicating the severity of disease which depends upon the virulence of infecting organism

## SUB ACUTE INFECTIVE ENDOCARDITIS

## ACUTE INFECTIVE ENDOCARDITIS



# INFECTIVE ENDOCARDITIS

## Pathogenesis

## Predisposing causes

- **3 main types of predisposing factors leading to bacterial endocarditis are**
  - **Underlying heart disease**
  - **Conditions that causes seeding of microorganisms into the blood (Bacteremia or Fungemia)**
  - **Impaired host defenses**



# INFECTIVE ENDOCARDITIS

## Predisposing factors

### UNDERLYING HEART DISEASE

Valvular diseases

Congenital heart diseases (20% of cases)

Rheumatic valvular disease  
50% of cases

Mitral valve prolapse

Degenerative calcific  
valvular stenosis

Bicuspid aortic valve

Prosthetic or  
artificial valves

Patent Ductus arteriosus

Ventricular Septal defect

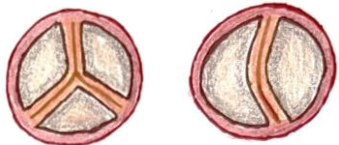
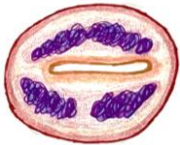
Coarctation of aorta

Subaortic stenosis

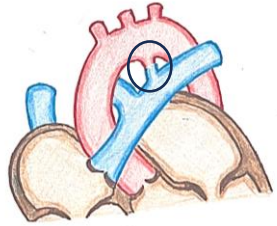
Pulmonary stenosis



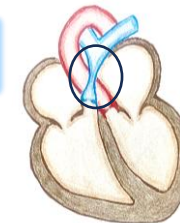
Normal mitral valve    Prolapsed mitral valve



Normal aortic valve    Bicuspid aortic valve



Normal aorta



Other causes - Syphilitic valvular disease, atherosclerotic valvular disease, floppy mitral valve





# INFECTIVE ENDOCARDITIS

## Pathogenesis

Organisms causing are

- 50% to 60% of cases affecting **previously damaged or otherwise abnormal valves – Streptococcus viridans** (normal component of oral cavity flora)
- 20% to 30% of cases affecting **healthy or deformed valves – Staphylococcus aureus**
- **IE in IV drug abusers – Staphylococcus aureus**
- **Other bacterial causes include Enterococci and HACEK group**
  - **H – Haemophilus**
  - **A- Actinobacillus**
  - **C – Cardiobacterium**
  - **E – Eikenella**
  - **K - Kingella**



# INFECTIVE ENDOCARDITIS

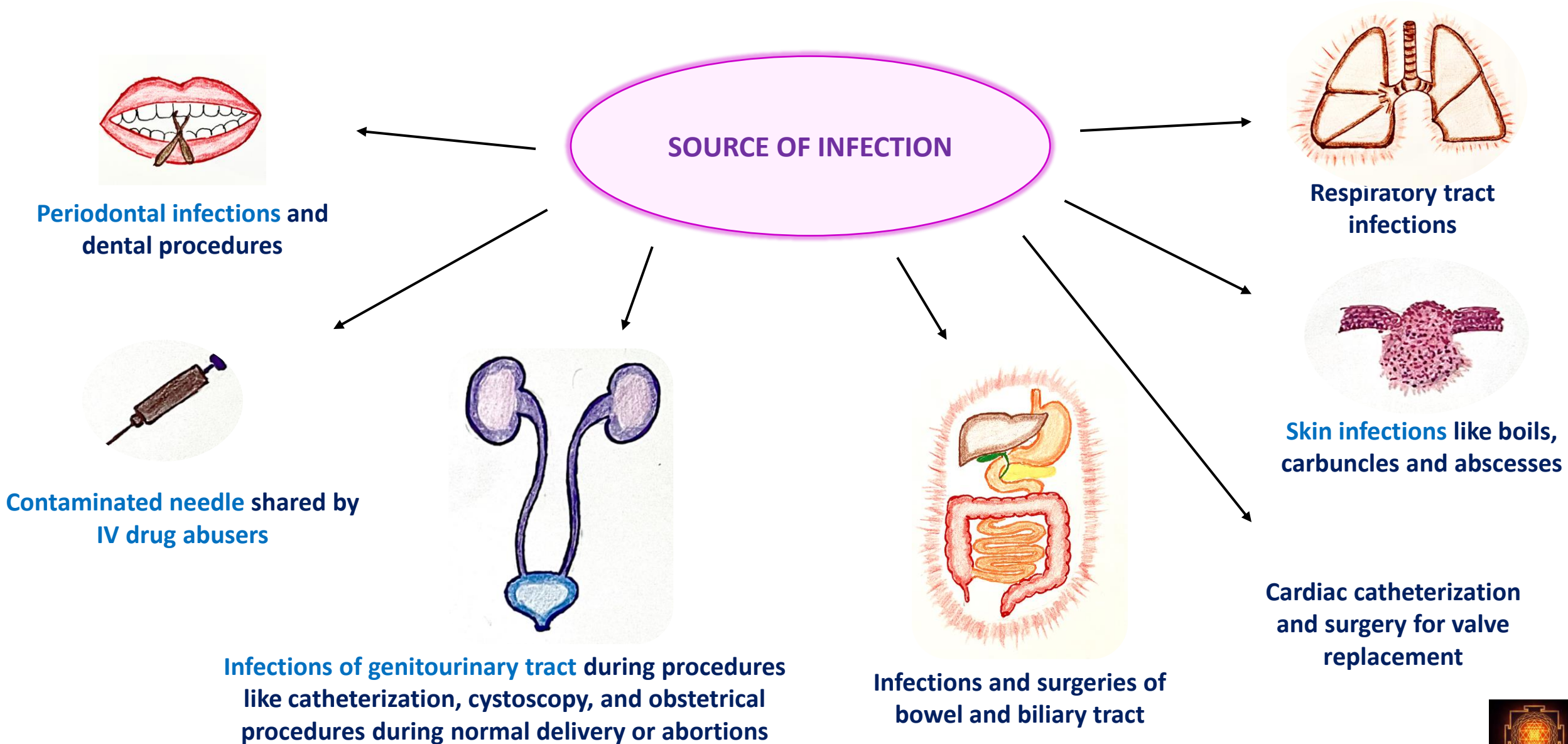
## Pathogenesis

- Other agents causing endocarditis include – Gram negative bacilli and fungi
- In 10% of cases – no organism is identified (“Culture negative” endocarditis)
- Causes for the culture negative endocarditis are
  - Prior antibiotic therapy
  - Difficulty in isolating the offending agent
  - Organism is deeply embedded in enlarged vegetation that it cannot be released into blood



# INFECTIVE ENDOCARDITIS

## Predisposing factors



# INFECTIVE ENDOCARDITIS

Source of infection	Organisms
Dental procedures	Streptococcus viridans
Drug abuse	Staphylococcus aureus, pseudomonas, candida and enterococci
Previously damaged or otherwise abnormal valves	Streptococcus viridans
Healthy or deformed valves	Staphylococcus aureus
Artificial valves within 60 days	Staphylococcus epidermidis, candida, HACEK
Artificial valves more than 60 days	Staphylococcus aureus and enterococci
IV catheterization	Staphylococcus aureus
Urinary catheter	Enterococci
Colonic cancers or ulceration	Streptococcus bovis
Immunocompromised patients or after antibiotic therapy	Fungi



# INFECTIVE ENDOCARDITIS

Culture positive organisms	Culture negative organisms
Staphylococcus aureus	HACEK group
Streptococcus viridans	Aspergillus (fungi)
Staphylococcus epidermidis	Legionella
Enterococci	Coxiella burnetti ( causes Q fever)
Streptococcus bovis	Bartonella (infection from cats)
Fungi - candida	Brucella (unpasteurized milk)
	Coxiella psittaci (infection from birds)
	Tropheryma whipplei (causes whipples disease)

# INFECTIVE ENDOCARDITIS

## Predisposing causes

### Impaired host defenses

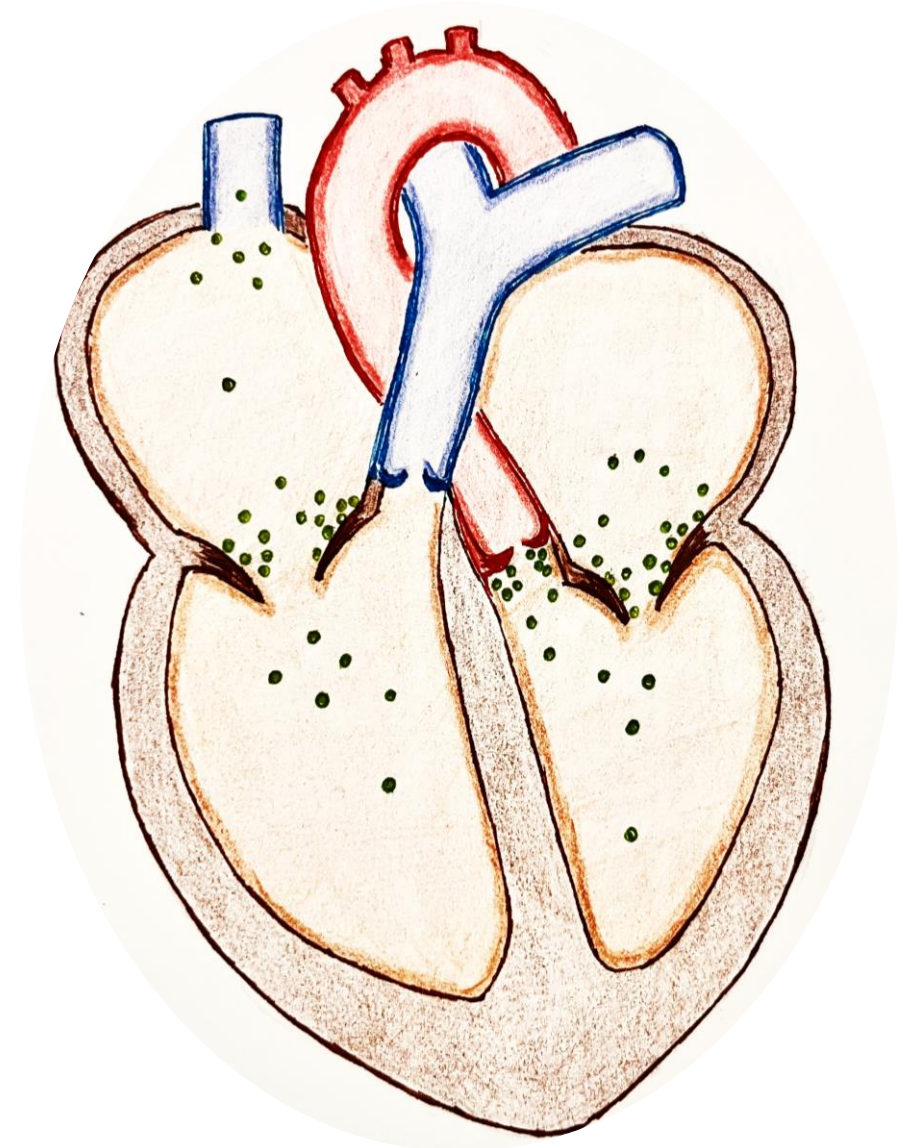
- Impaired specific immunity in lymphomas and leukemias
- Cytotoxic therapy for cancer patients and transplant patients
- Deficient functions of neutrophils and macrophages



# INFECTIVE ENDOCARDITIS

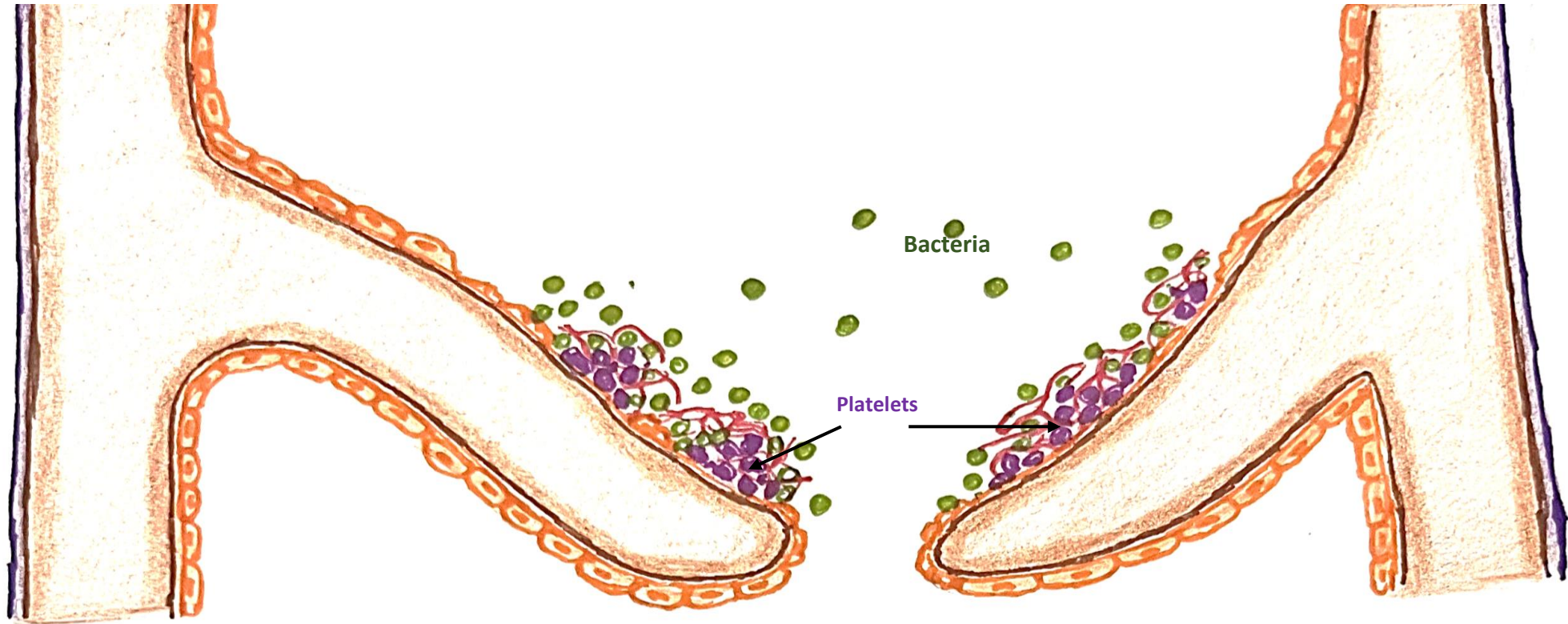
## Pathogenesis

- Bacteria from blood stream in any of the above mentioned routes are implanted on the cardiac valves or mural endocardium as they have surface adhesion molecules which mediate their adherence to endocardium



# INFECTIVE ENDOCARDITIS

Damage to endothelium on valves, favoring the formation of platelet-fibrin thrombi which get infected from circulating bacteria where they proliferate





# INFECTIVE ENDOCARDITIS

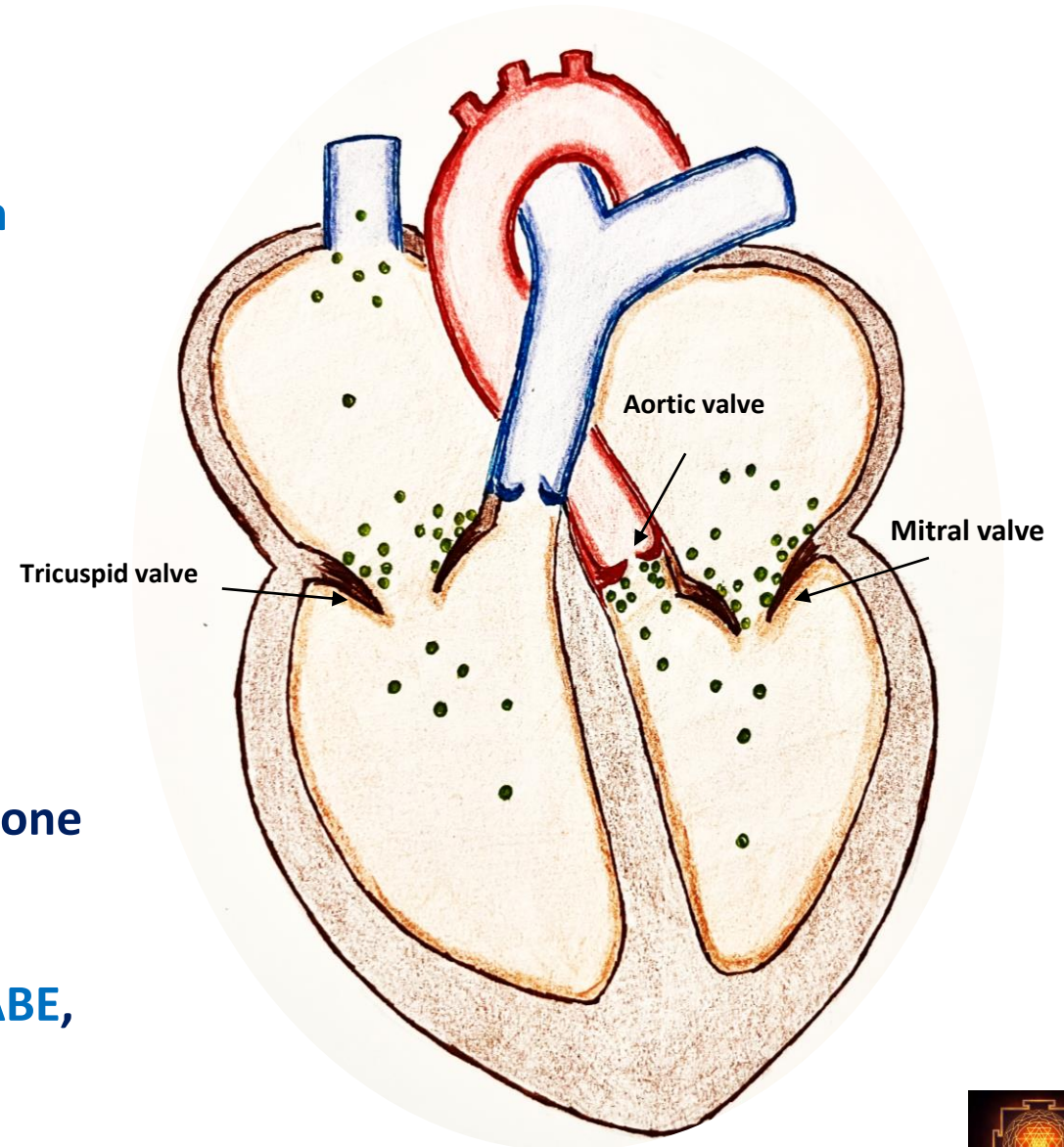
Bacteria proliferate in the platelet fibrin thrombi and form vegetations on valves



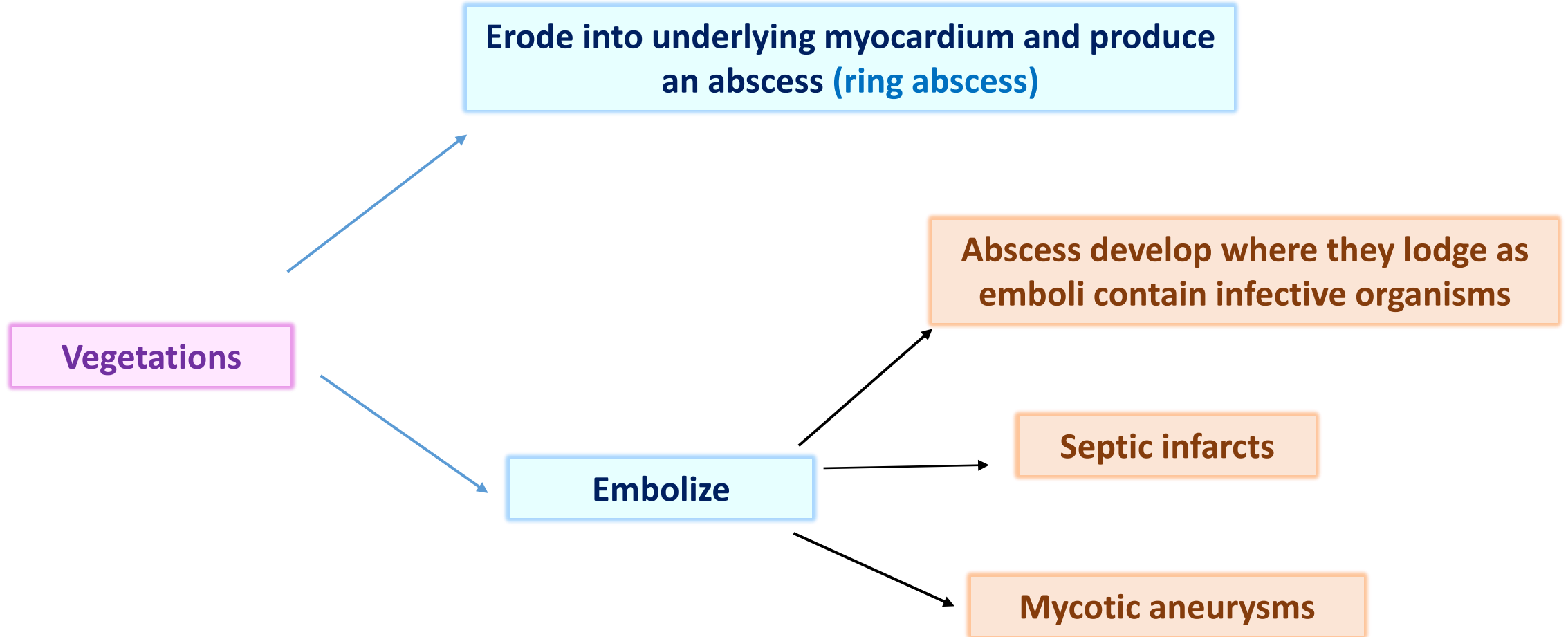
# INFECTIVE ENDOCARDITIS

## Morphology

- Classic hall mark of Infective endocarditis is **vegetations on heart valves**
- **Common sites of vegetations are valves of left heart**
  - **Aortic and mitral valves**
  - **Valves of right heart are involved in intravenous drug abusers**
- They can be single or multiple and may involve more than one valve
- In **SABE**, vegetations are found on **diseased valves** and in **ABE**, vegetations are found on **previously normal valves**



# INFECTIVE ENDOCARDITIS

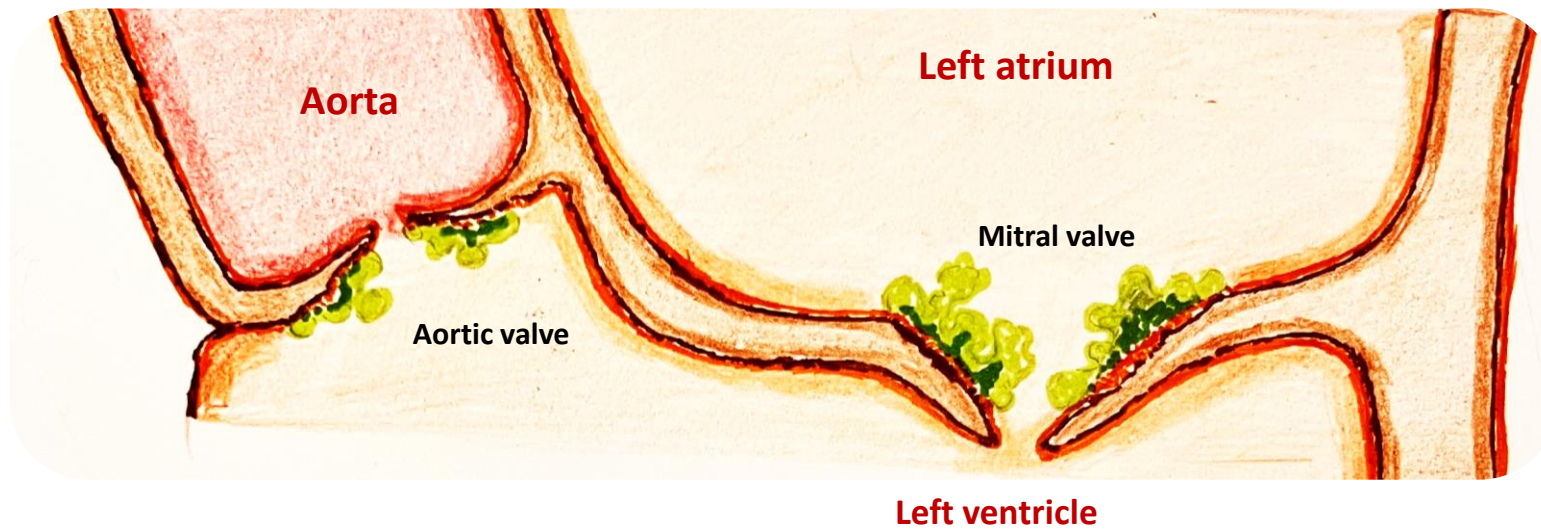


Vegetations of subacute endocarditis are associated with less valvular destruction than acute endocarditis



# INFECTIVE ENDOCARDITIS

**Location** – on the atrial surface of atrioventricular valve and ventricular surface of semilunar valves

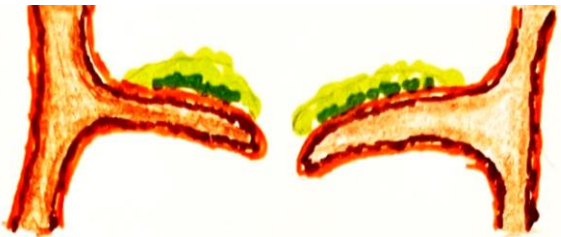


# INFECTIVE ENDOCARDITIS

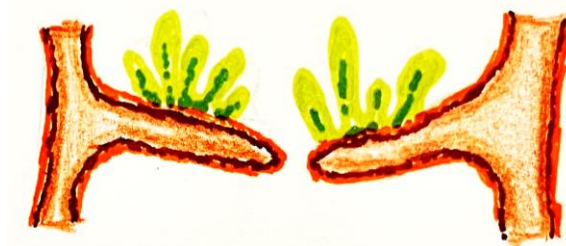
## Vegetations

### Gross

- **Size** – from few mm to several centimetres
- **Appearance** – Flat, filiform, fungating or polypoidal
- **Grey-tawny to greenish, irregular, single or multiple and typically friable present along the closure of cusps**



Flat vegetations



Filiform vegetations



Fungating vegetations

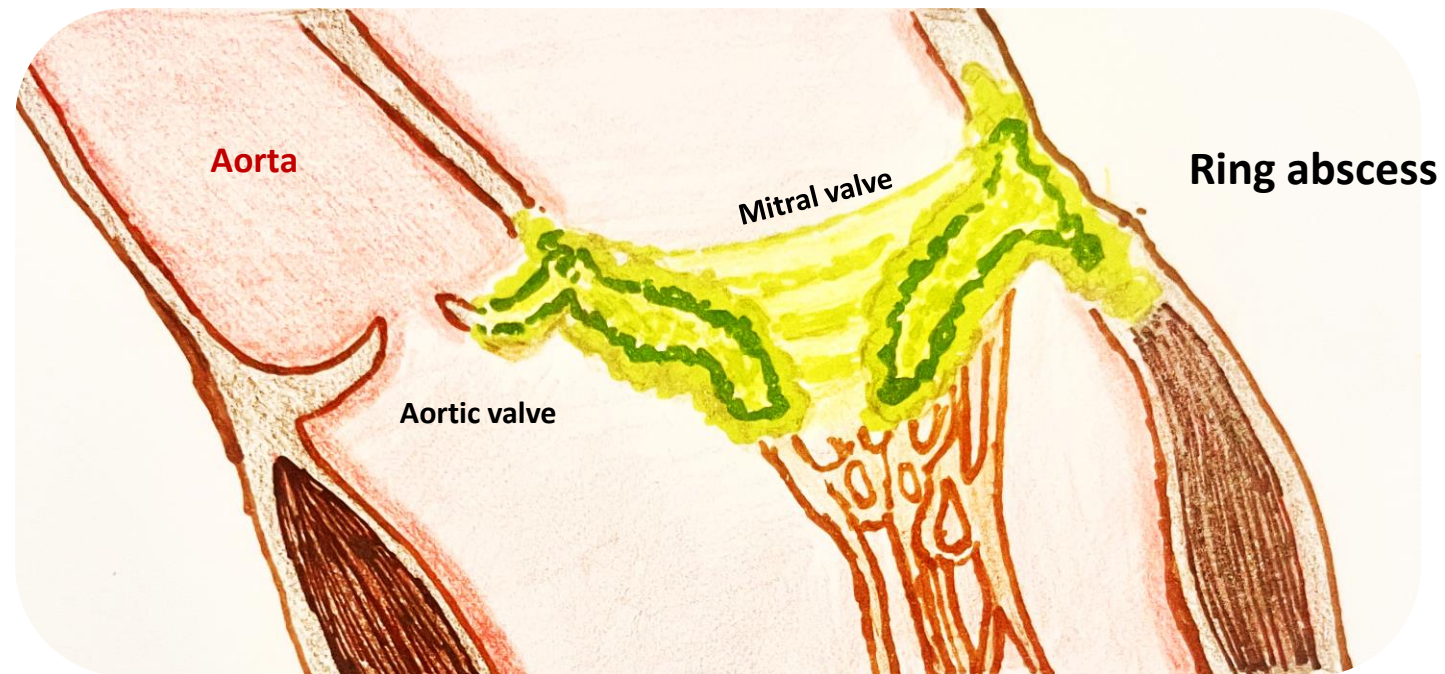


Polypoidal vegetations

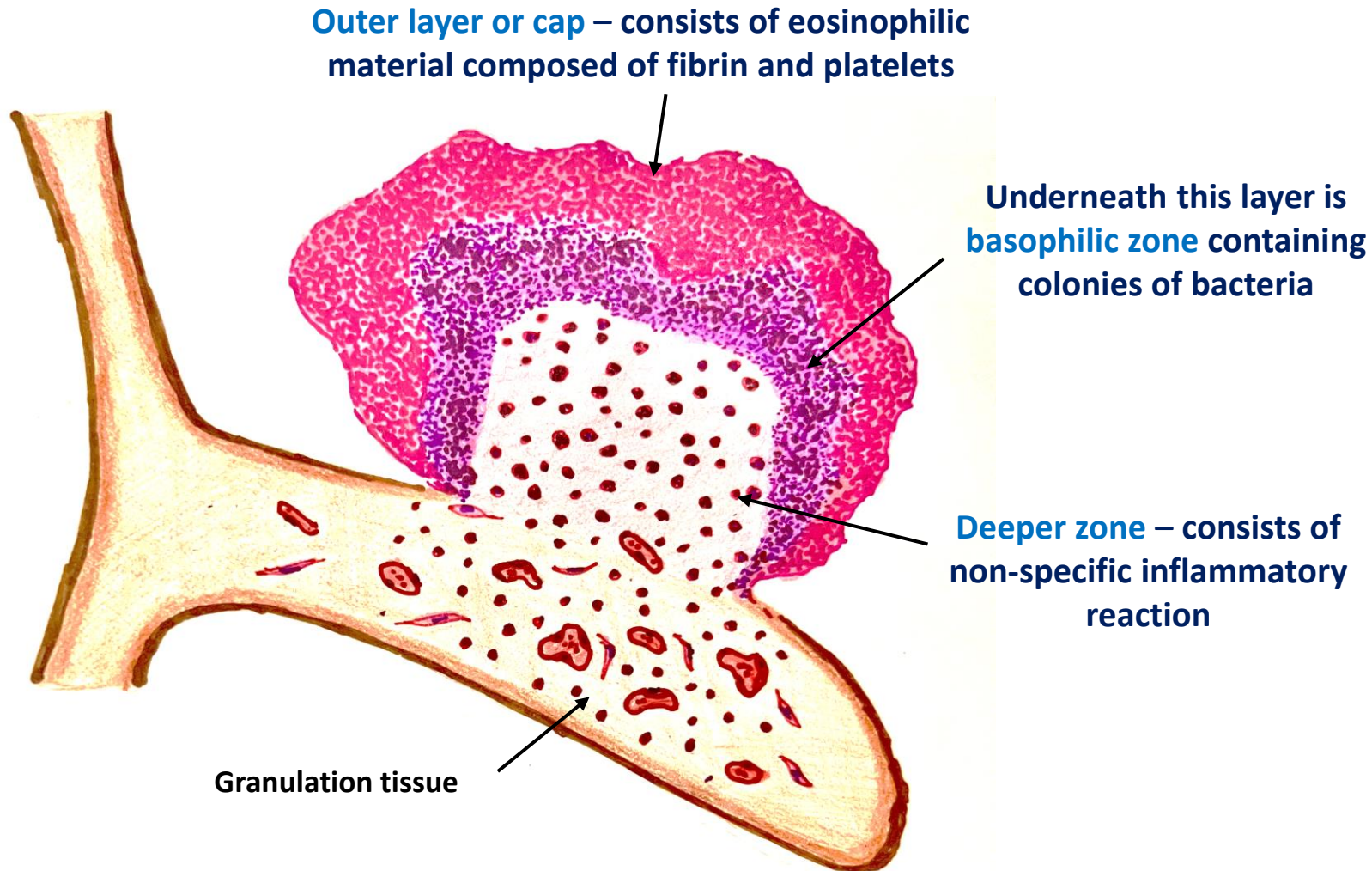


# INFECTIVE ENDOCARDITIS

- Vegetations in ABE are bulkier and globular than those of SBE.
- Vegetations in ABE may cause ulceration or perforation of the underlying valve leaflet or may produce ring abscess and myocardial abscess



# Vegetations - Microscopy

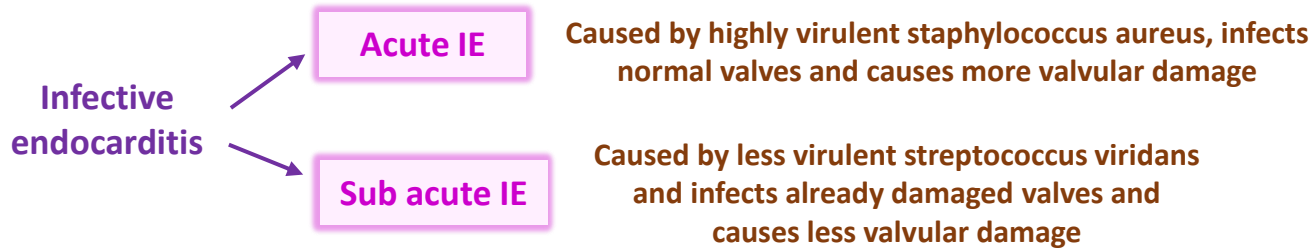


- Vegetations consists of 3 zones
  - Outer layer or cap
  - basophilic zone
  - Deeper zone
- In SABC there may be granulation tissue (evidence of repair)
- In Acute BE – inflammatory infiltrate consists mainly of neutrophils and is accompanied by tissue necrosis and abscess in the valve ring
- In Subacute BE – healing by granulation tissue with mononuclear infiltrate and proliferating fibroblast are present



# INFECTIVE ENDOCARDITIS

**Definition :** inflammation of valvular and mural endocardium

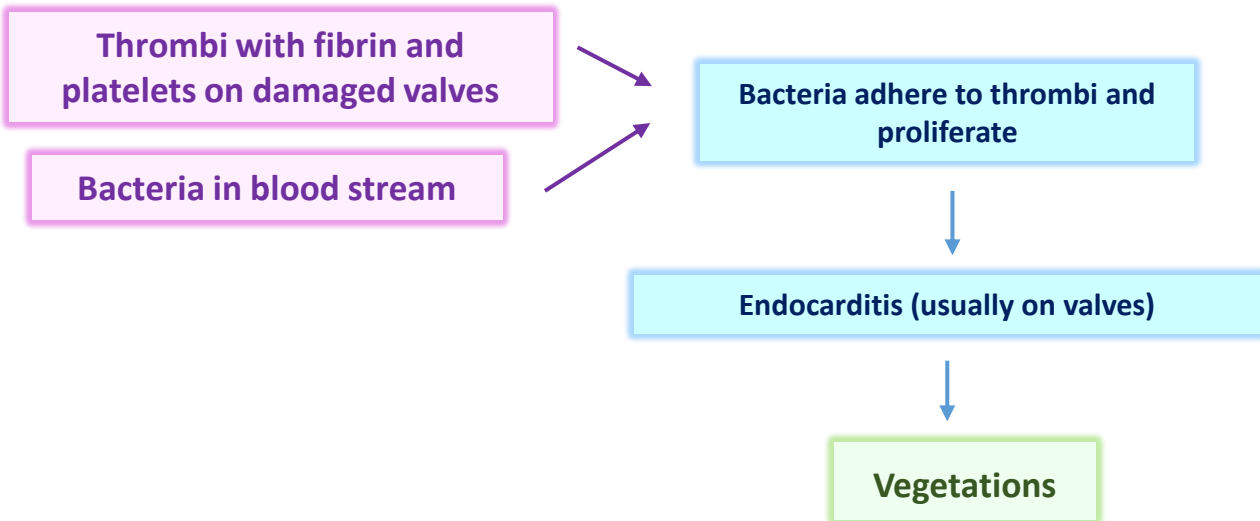


**Predisposing factors**

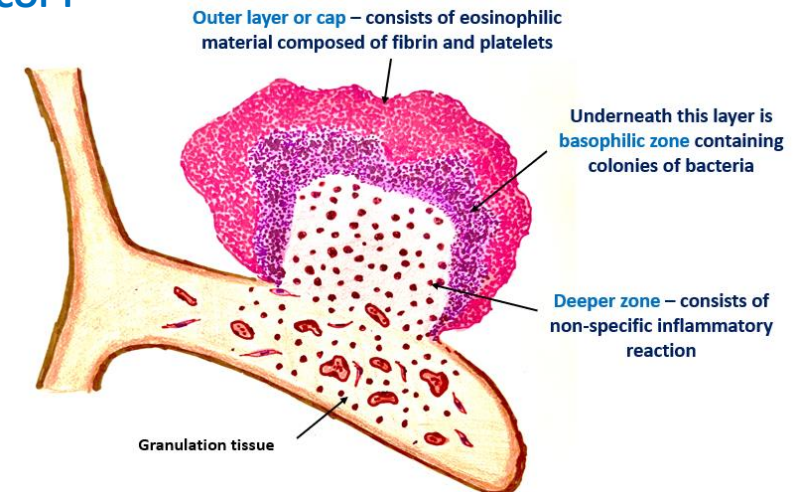
- Underlying heart diseases- valvular disease and congenital heart disease
- Source of infection – dental, contaminated needles, GIT pancreatobiliary, GIT, RT, cardiac catheterization, skin infections
- Impaired host defense

Culture positive organisms	Culture negative organisms
Staphylococcus aureus	HACEK group
Streptococcus viridans	Aspergillus (fungi)
Staphylococcus epidermidis	Legionella
Enterococci	Coxiella burnetti ( causes Q fever)
Streptococcus bovis	Bartonella (infection from cats)
Fungi - candida	Brucella (unpasteurized milk)
	Coxiella psittaci (infection from birds)
	Tropheryma whipplei (causes whipples disease)

**PATHOGENESIS**



**MICROSCOPY**





The background features a white surface with several clusters and individual blue forget-me-not flowers with yellow centers. A large, light blue oval with a thin dark blue border is centered on the page. The text "THANK YOU" is written in a bold, dark blue, sans-serif font within this oval.

**THANK YOU**

