Extracellular matrix
Repair, regeneration
Wound healing

Attila Zalatnai

EXTRACELLULAR MATRIX

Complex macromolecules underlying the epithelial cells and filling the intercellular space

collagens

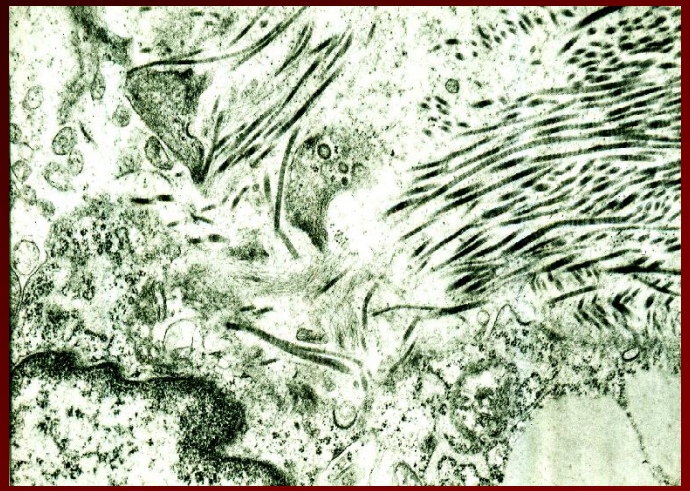
basement membranes

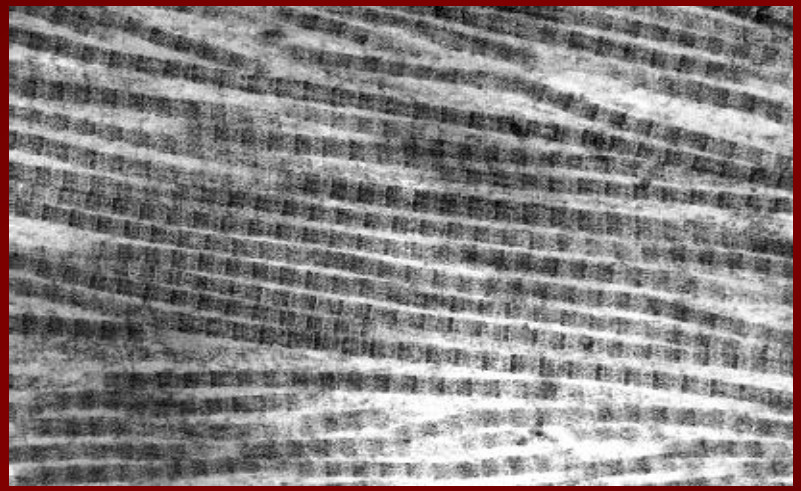
elastic fibers

fibronectin

proteoglycans

COLLAGENS





- provide physical support where tissue strength is neeeded
- products of fibroblasts
- cannot be streched

COLLAGEN FAMILY

(I – X)

Type I	bone matrix
Type II	cartilage matrix
Type IV	basement membrane
Type VI	most interstitial tissues

COLLAGEN BIOSYNTHESIS

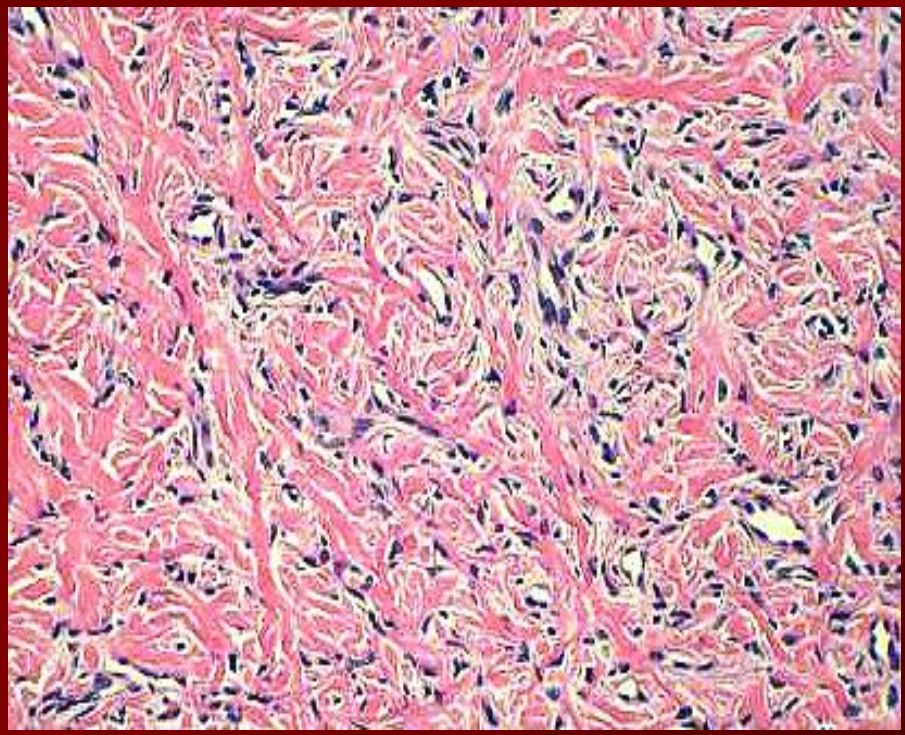
collagen fibrils

↓

collagen fibers

↓

collagen bundles



Hydroxylation requires vitamin C!

DEGRADATION OF THE COLLAGENS

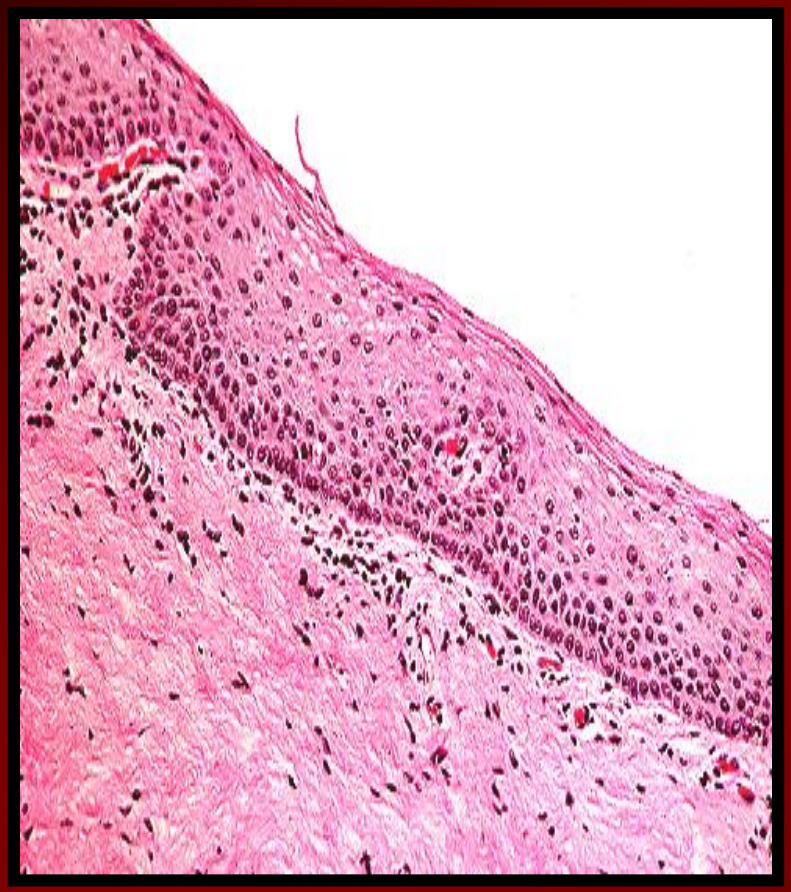
Specific collagenases

(MMPs – matrix metalloproteses)

Source: fibroblasts, macrophages, neutrophils,

endothel cells…

BASEMENT MEMBRANES



Separate cells and stroma

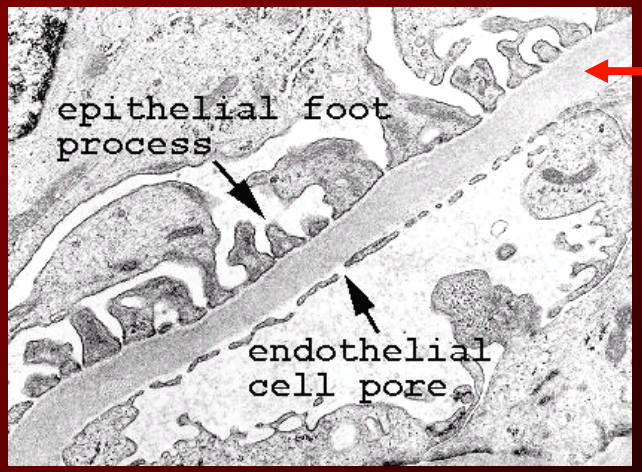
All epithelial cells have them

(except: liver!)

Collagen IV + laminin

PAS-positive staining reaction

In kidneys: primary filters



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FUNCTIONS OF THE BASEMENT MEMBRANES

- physical support
- sites for cell attachment
- in some organs: flltering function

ELASTIC FIBERS

- Provide the elasticity of the tissues and organs

FIBRONECTIN

- found in plasma and in the tissues
- multifunctional binding site for various cell components
- first primitive matrix deposited in the stroma

PROTEOGLYCANS

CELL TYPES ACCORDING TO THEIR REGENERATIVE CAPACITY

Labile cells:

divide continuously

stem cells (germinal layer, crypt cells,

hemopoietic stem cells)

Stable cells:

capable of dividing after proper stimuli (cell loss)

liver, tubules of the kidney

Result: regeneration

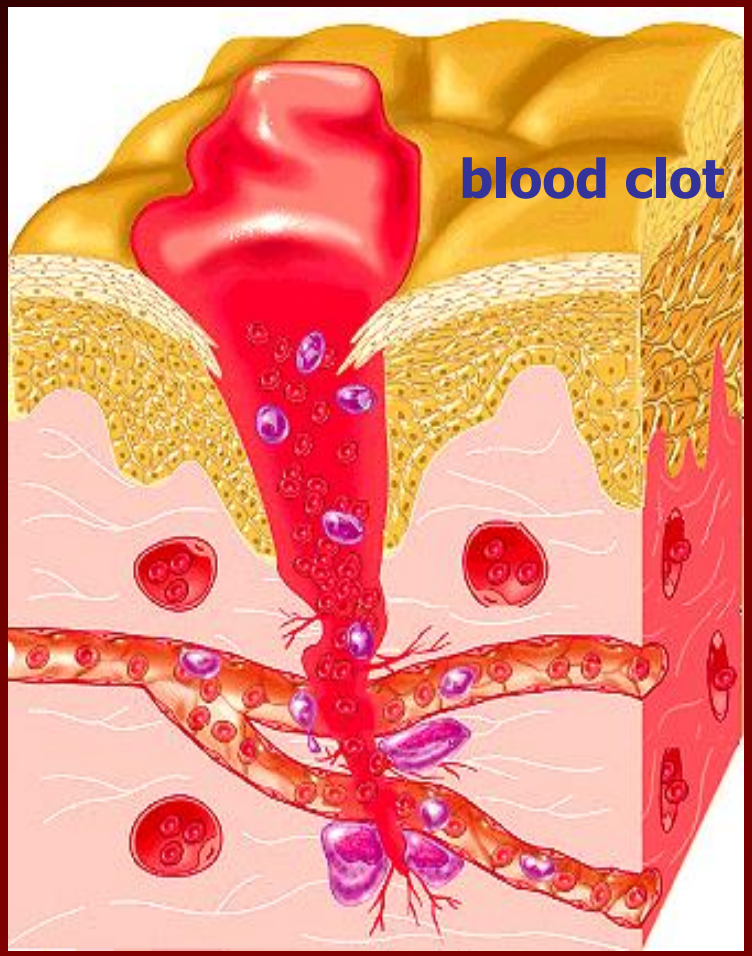
Permanent cells:

unable of dividing

neurons, cardiac and striated muscle, lens

Result: repair

WOUND HEALING



STEP 1 (hemostatic stage):

filling the gap with blood

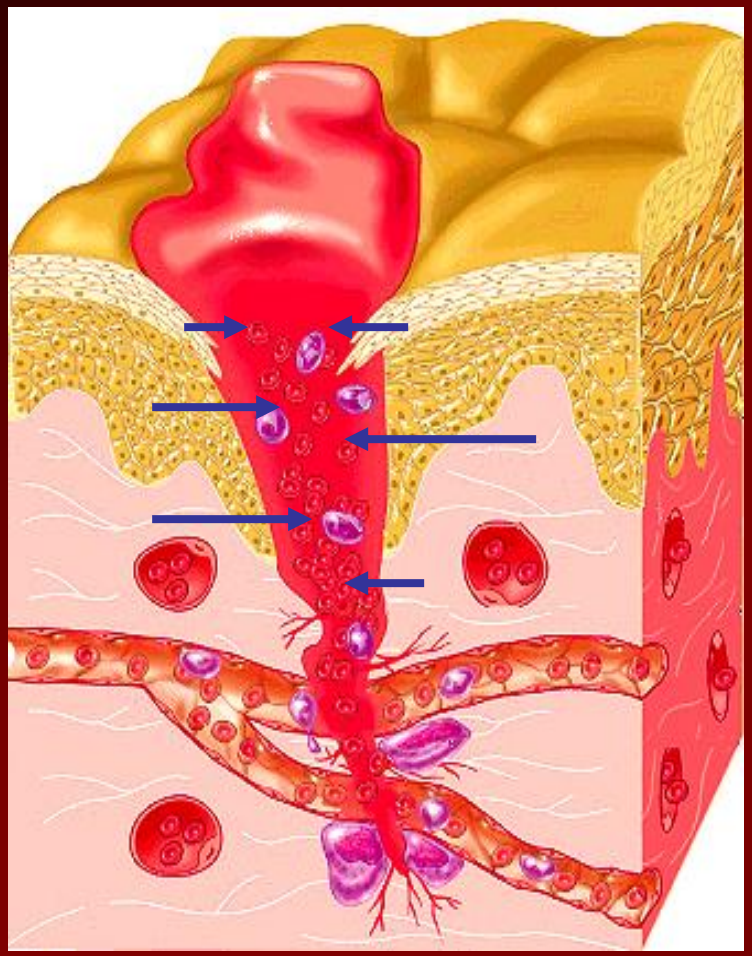
fibrinogen → fibrin

plasma fibronectin deposition

(crosslinking)

early stabilization of the edges

WOUND HEALING



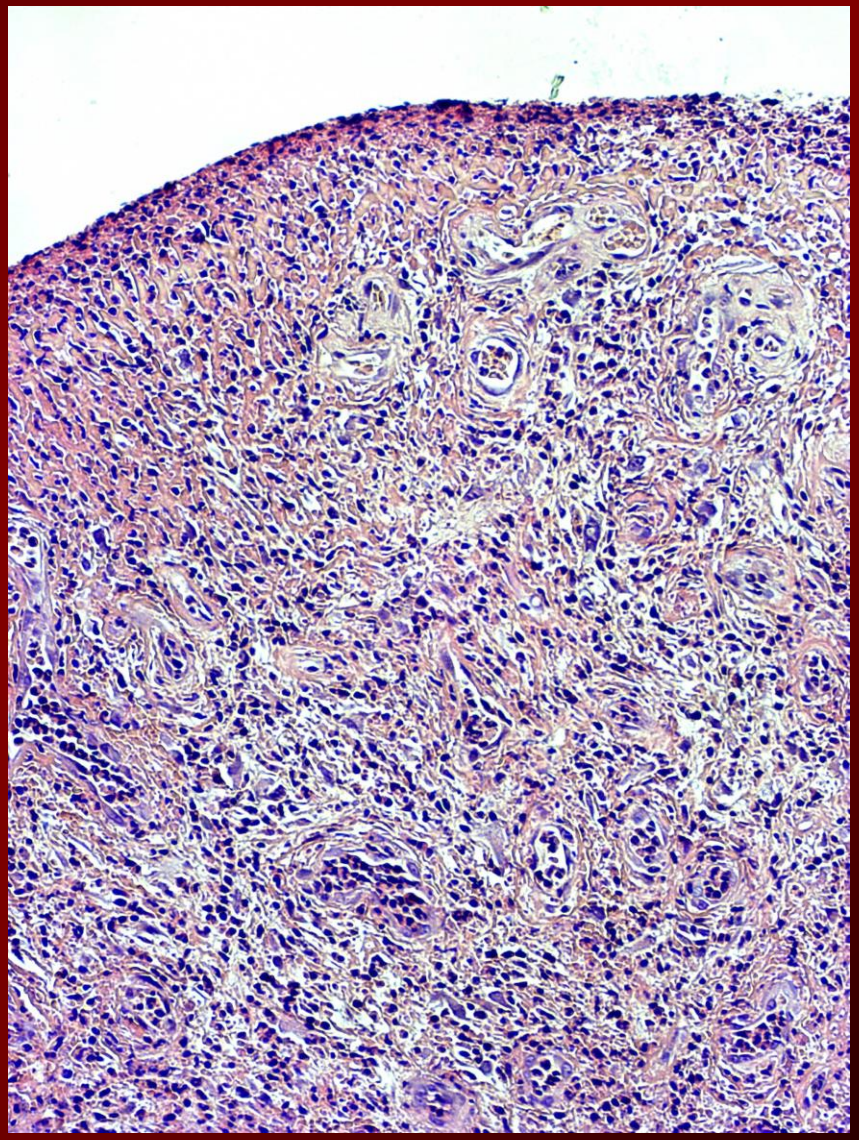
Step 2 (inflammatory stage):

Migration of cellular elements

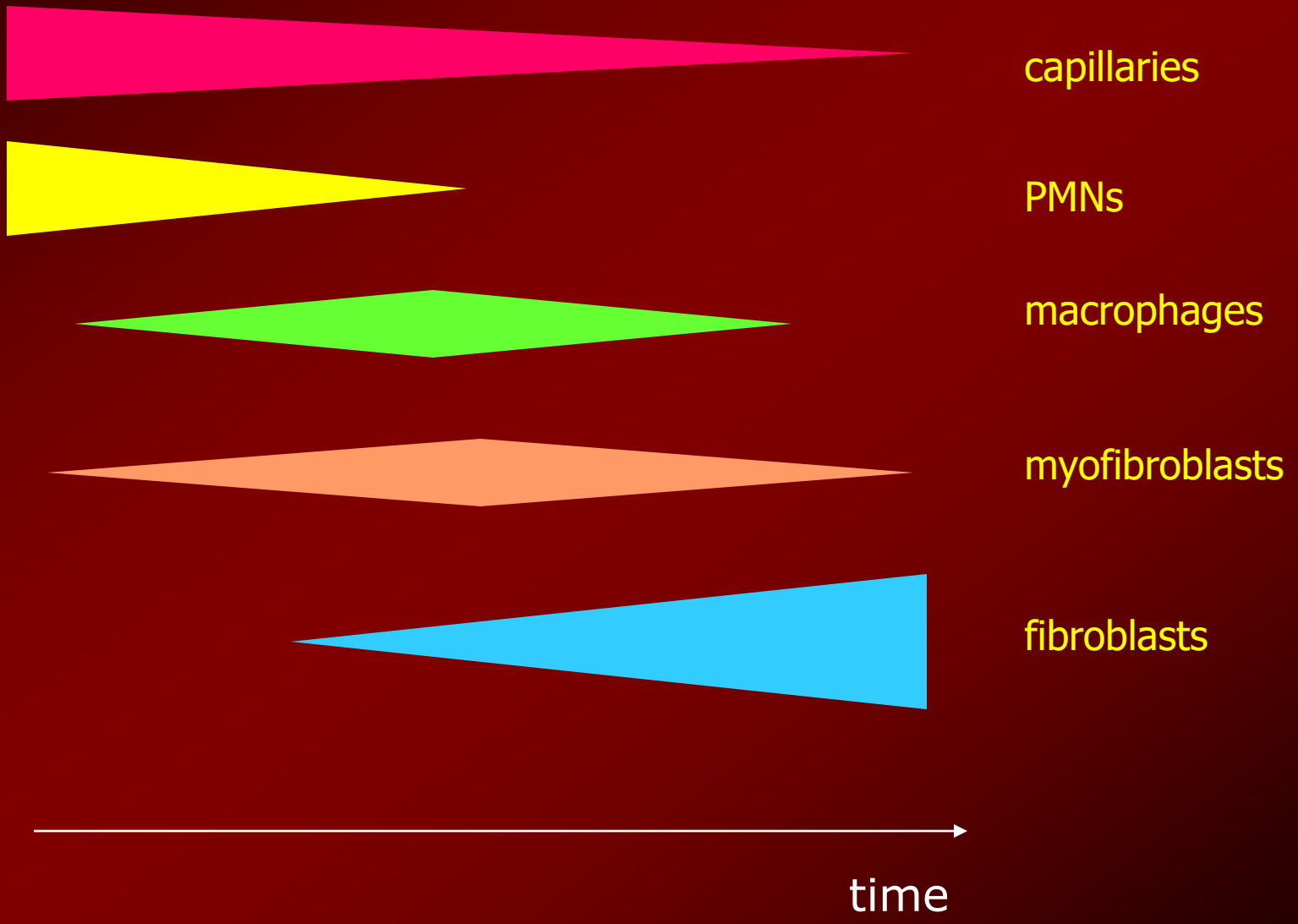
Formation of granulation tissue

- numerous newly formed capillary buds
- PMNs (later on: histiocytes)

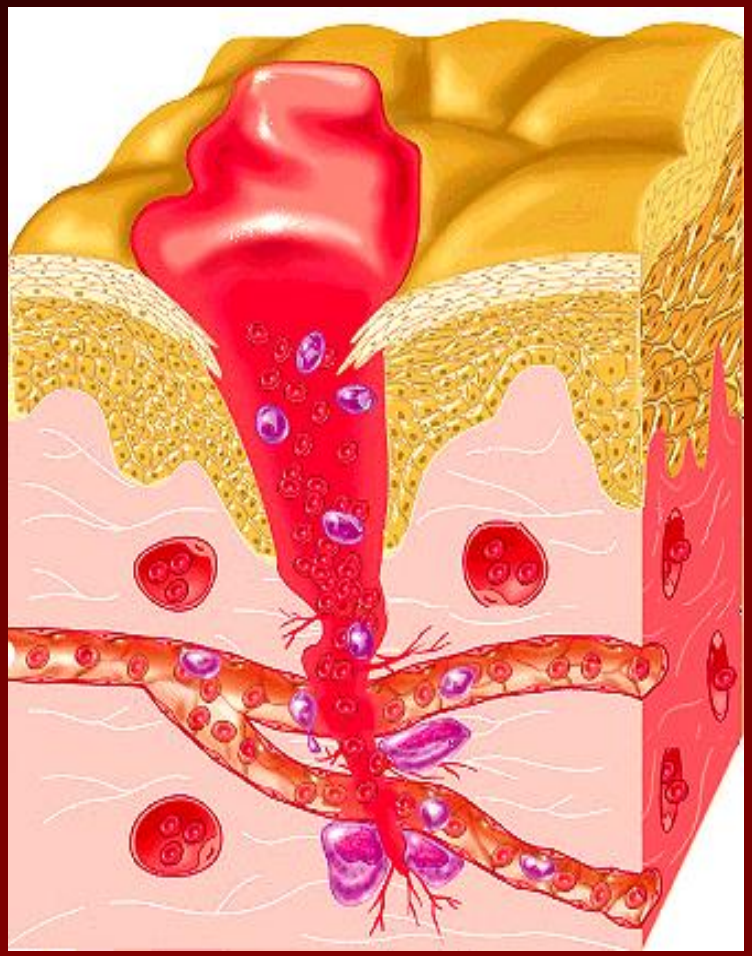
Progressive maturation of the granulation tissue



MATURATION OF THE GRANULATION TISSUE



WOUND HEALING



Step 3 (proliferative stage):

synthesis of the extracellular matrix

Step 4 (stabilization):

collagen deposition

scar formation

hyalinization

4-6 weeks

PRINCIPAL FORMS OF THE WOUND HEALING

Healing by primary intention

sterile (surgical) wounds

closely apposed edges

minimal tissue loss

fine, delicate scar

Healing by secondary intention

infected wounds

great distance between the edges

irregular, deforming scar

IMPAIRED OR DELAYED WOUND HEALING

SYSTEMIC CAUSES

- diabetes mellitus
- hypoproteinemia
- vitamin C deficiency
- malignant tumors
- glycocorticosteroids

LOCAL CAUSES

- mechanical stress (streching)
- inadequate blood supply
- superinfection
- foreign materials

Predispose to wound dehiscence!

ABNORMAL SCAR FORMATION

KELOID

Rough, hypertrophic scar

Especially black people

Stone formation

Stone (calculus): hard concretion of mineral salts in lumina lined by mucosa

Gallbladder: cholelithiasis

Common bile duct: choledocholithiasis

Kidney: urolithiasis / nephrolithiasis

Salivary duct: sialolithiasis

Pancreas: pancreaticolithiasis

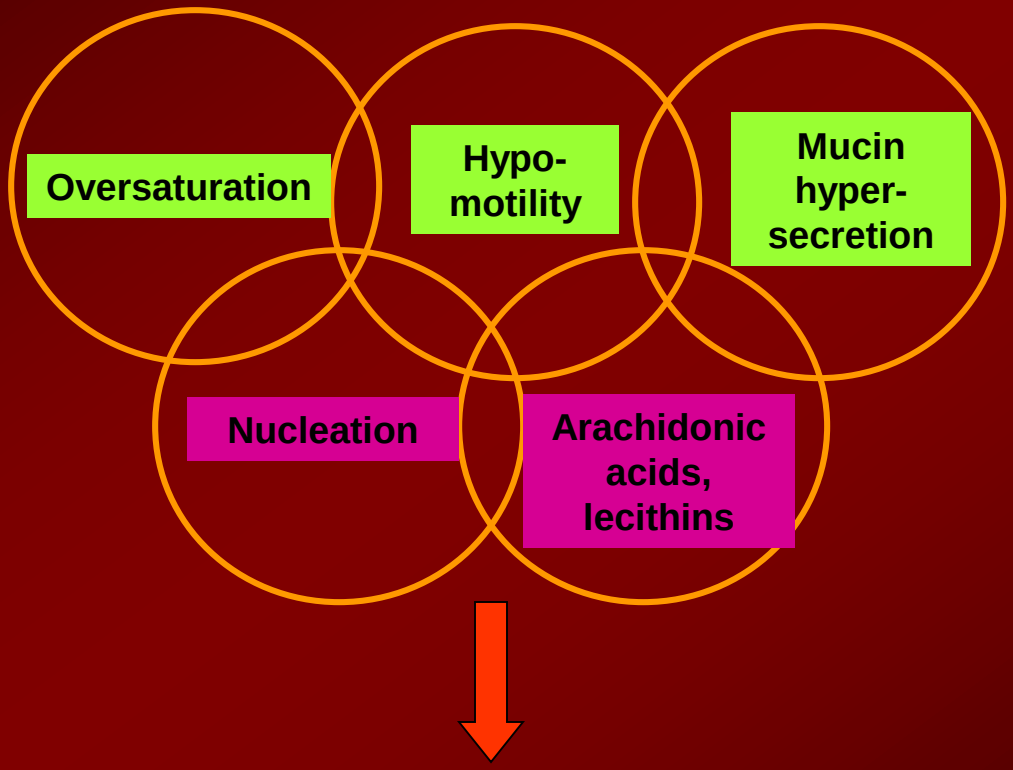
Causes: precipitation of minerals that are otherwise in solution

FORMS OF THE BILIARY STONES

- Pure stones

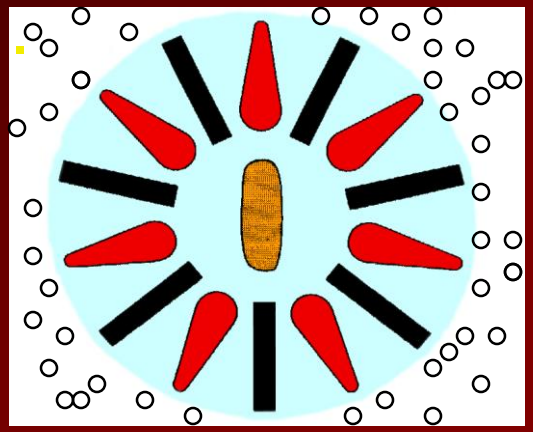
  (cholesterol, bilirubin)
- Mixed stones
- Combined stones

ETIOPATHOGENETIC FACTORS OF THE CHOLESTEROL STONES



MICELLA FORMATION

Cholesterol is kept in solution by means of bile acid salts and phospholipids



Bile stone formation:

Cholesterol concentration ↑

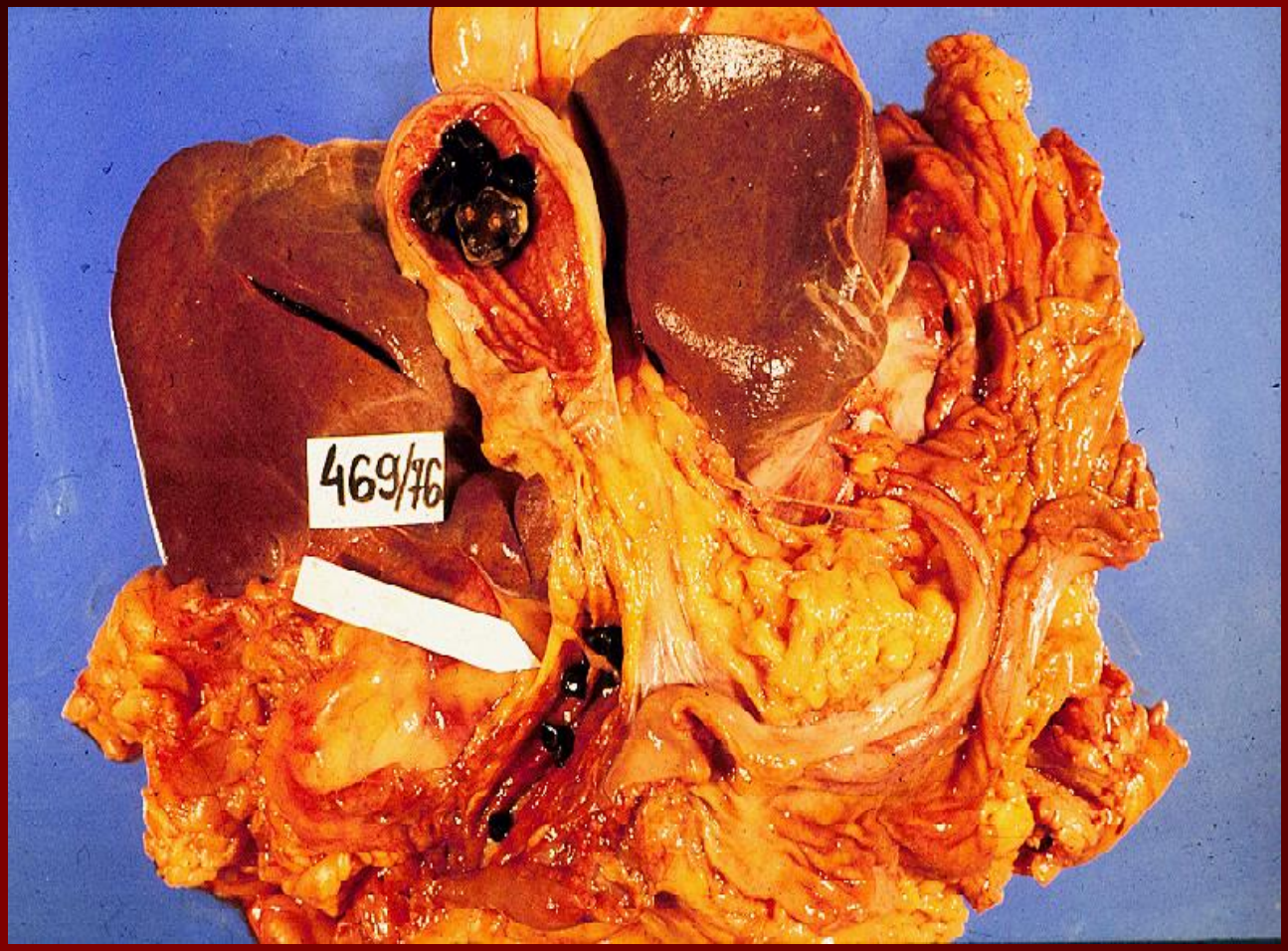
Bile acid salts concentration ↓

bile acid salts (1 : 7)

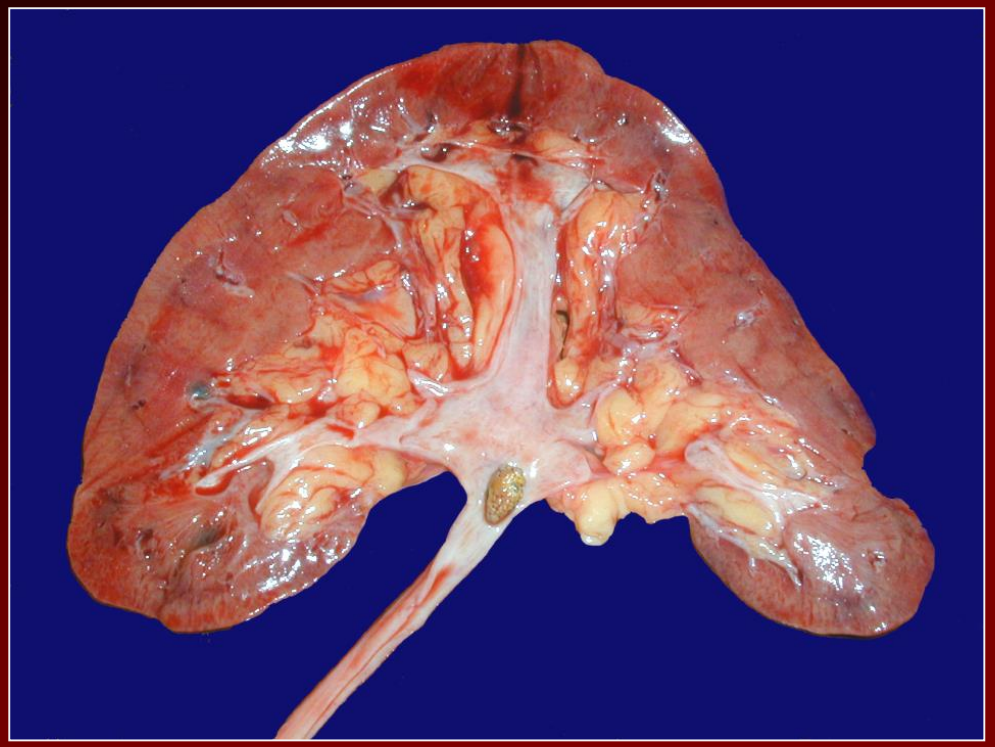
phospholipids

cholesterin

water molecules



Chole - et choledocholithiasis



Urolithiasis (nephrolithiasis)

- Oversaturation
- Outflow block
- pH shift
- bacterial infection

1. 

oxalate stone

(frequent in strict vegetarians)

2. 

urate stone (gout)

3. 

struvit (staghorn) stone (infection)

hematuria

radiating pain

hydronephrosis

bacterial infection (pyelonephritis)