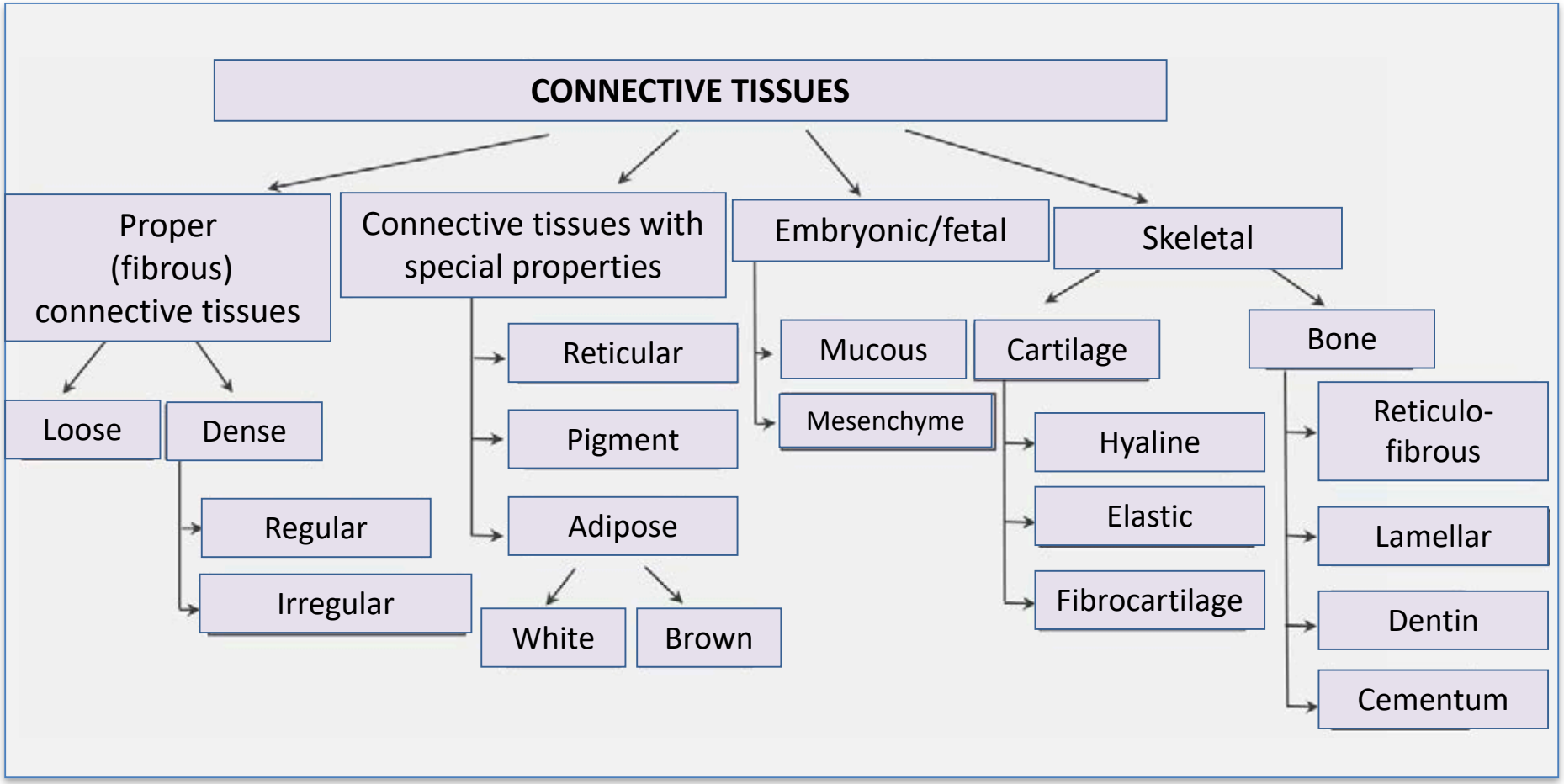
CONNECTIVE TISSUES

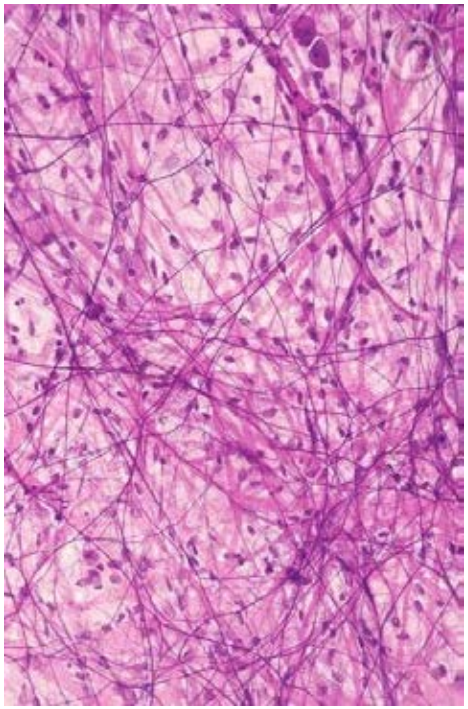
Department of Histology, Embryology, and Cytology
of the General Medicine Faculty, RNMR

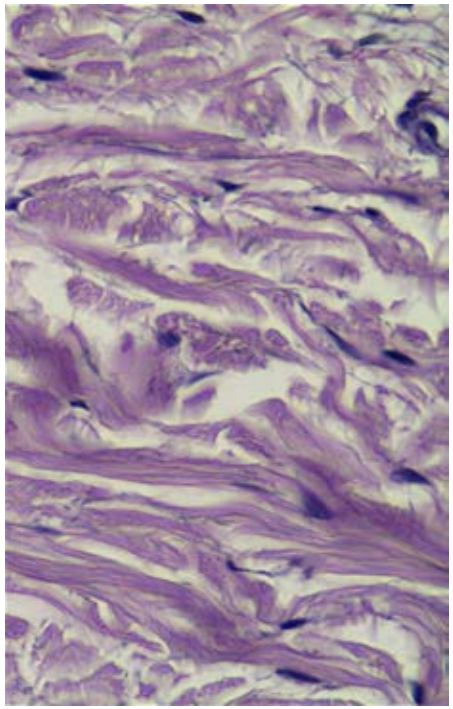


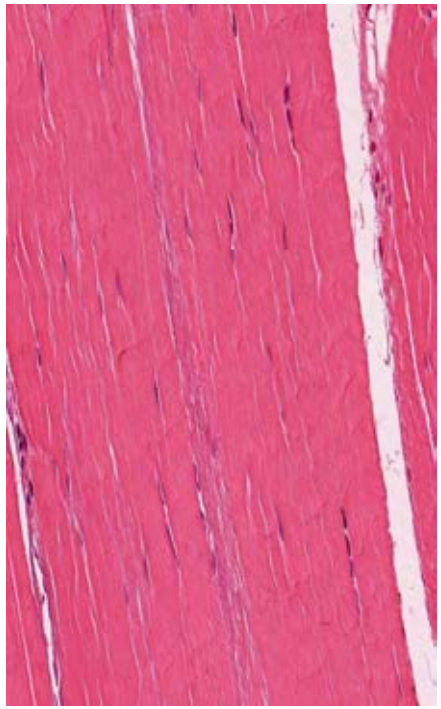
All tissues of the internal environment have several features :

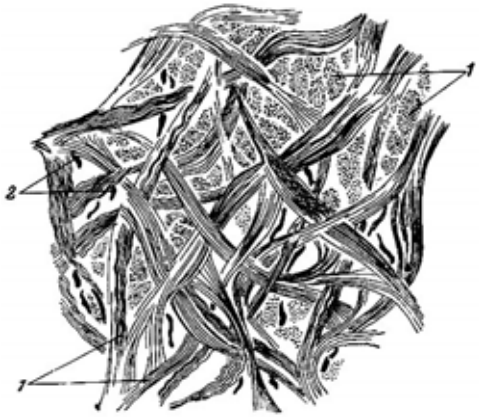
-origin from mesenchyme,
-abundant extracellular matrix
-separated arrangement of resident cells
-lack of permanent cell junctions

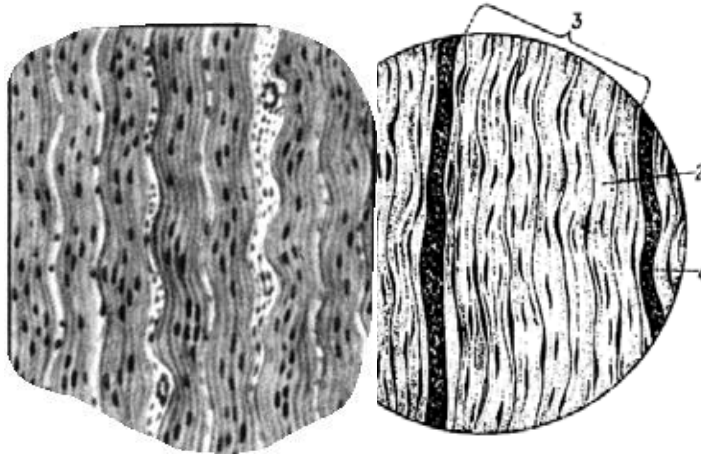
PROPER (FIBROUS) CONNECTIVE TISSUES



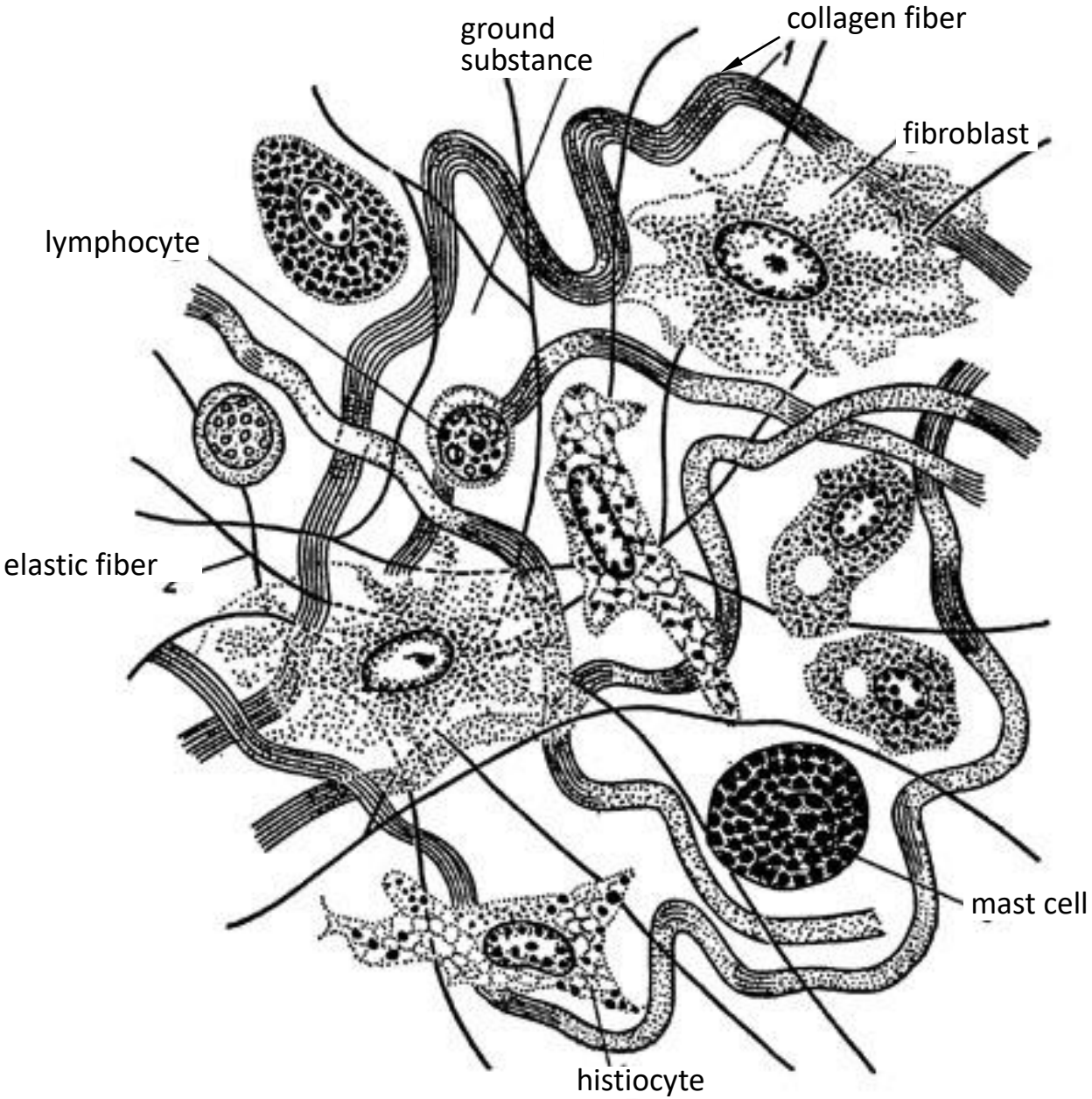




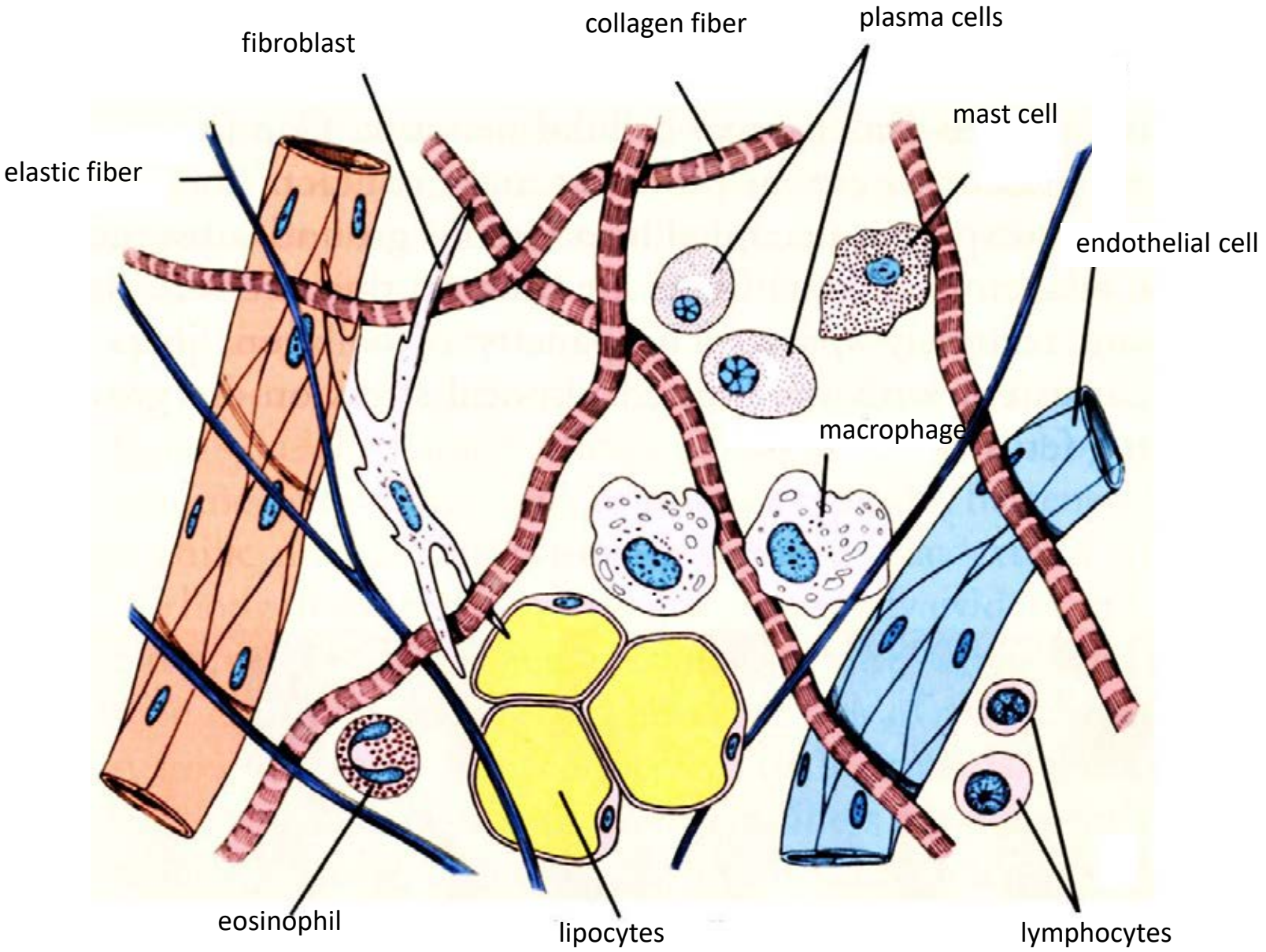




LOOSE CONNECTIVE TISSUE

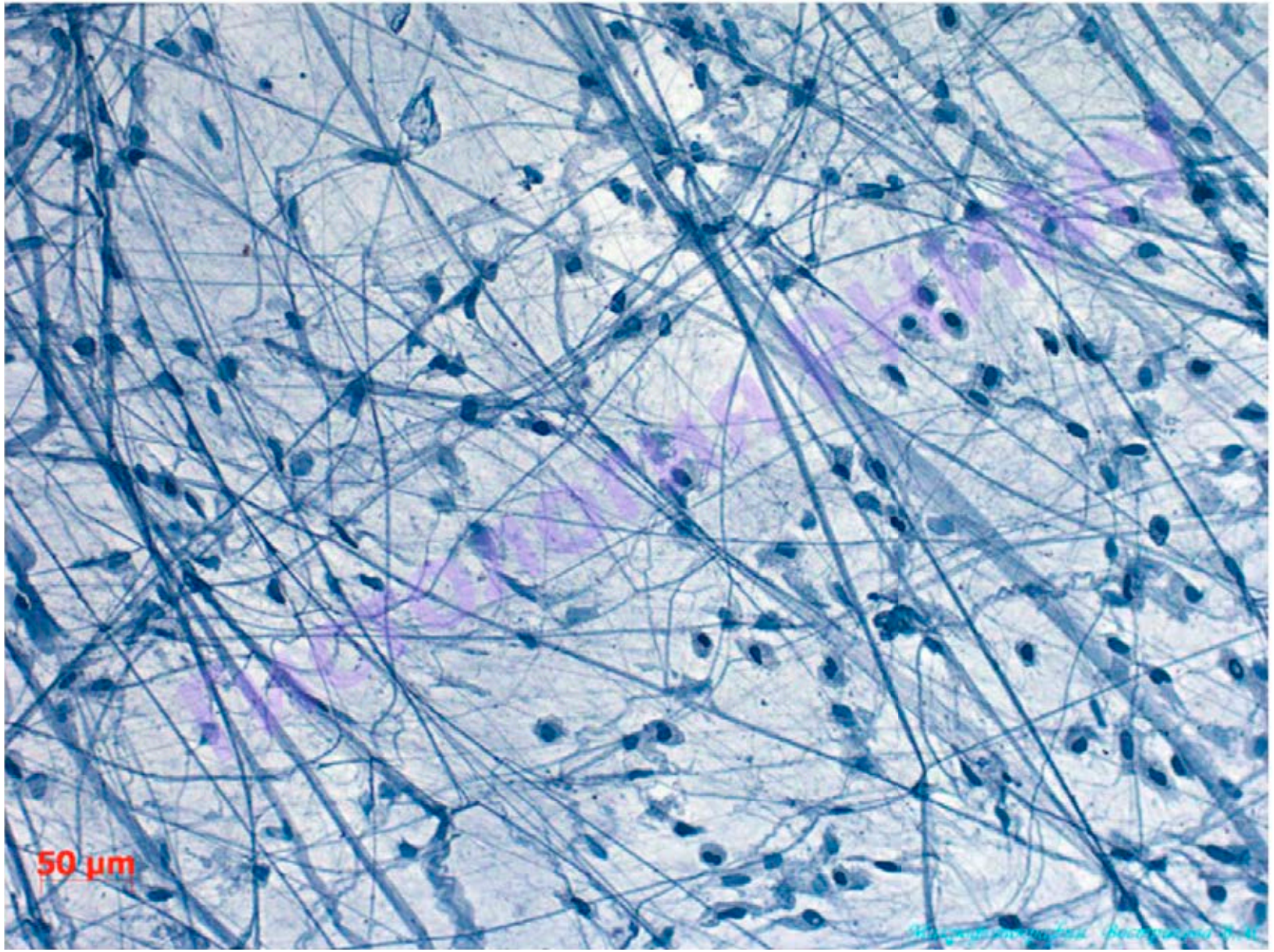


LOOSE CONNECTIVE TISSUE



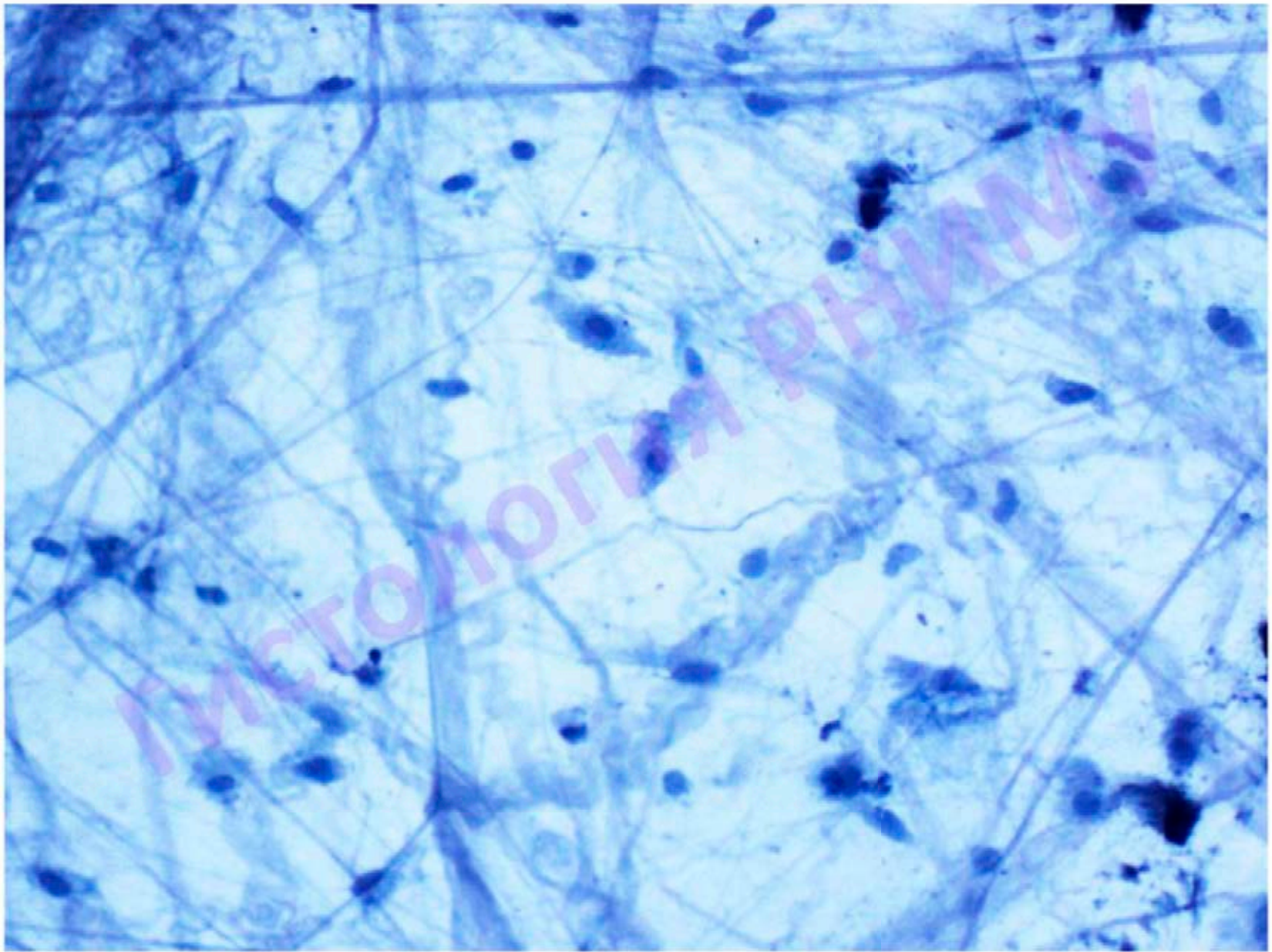
Slide №55 “Loose connective tissue (whole mount)”

Staining: iron hematoxylin



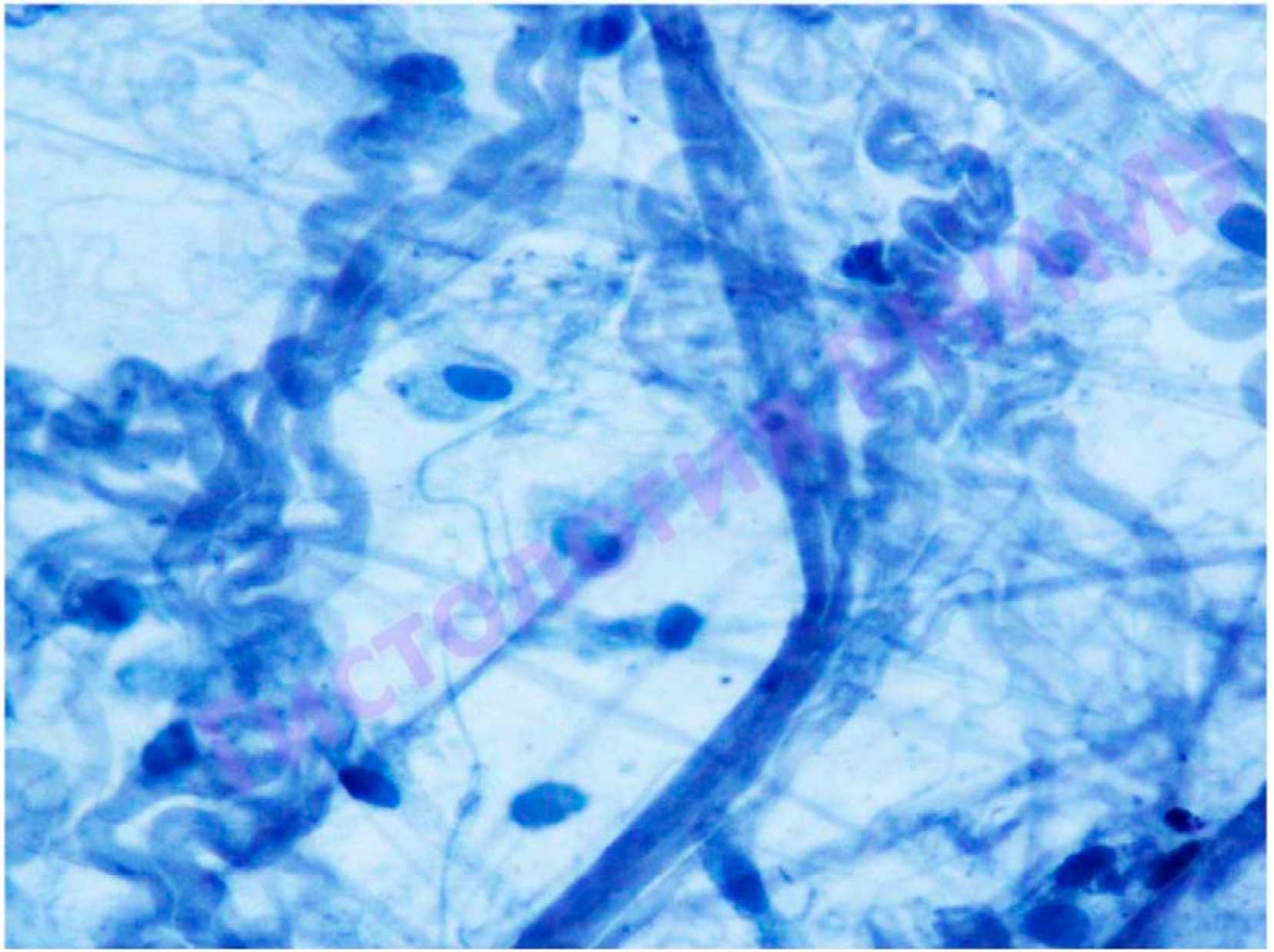
Slide №55 “Loose connective tissue (whole mount)”

Staining: iron hematoxylin

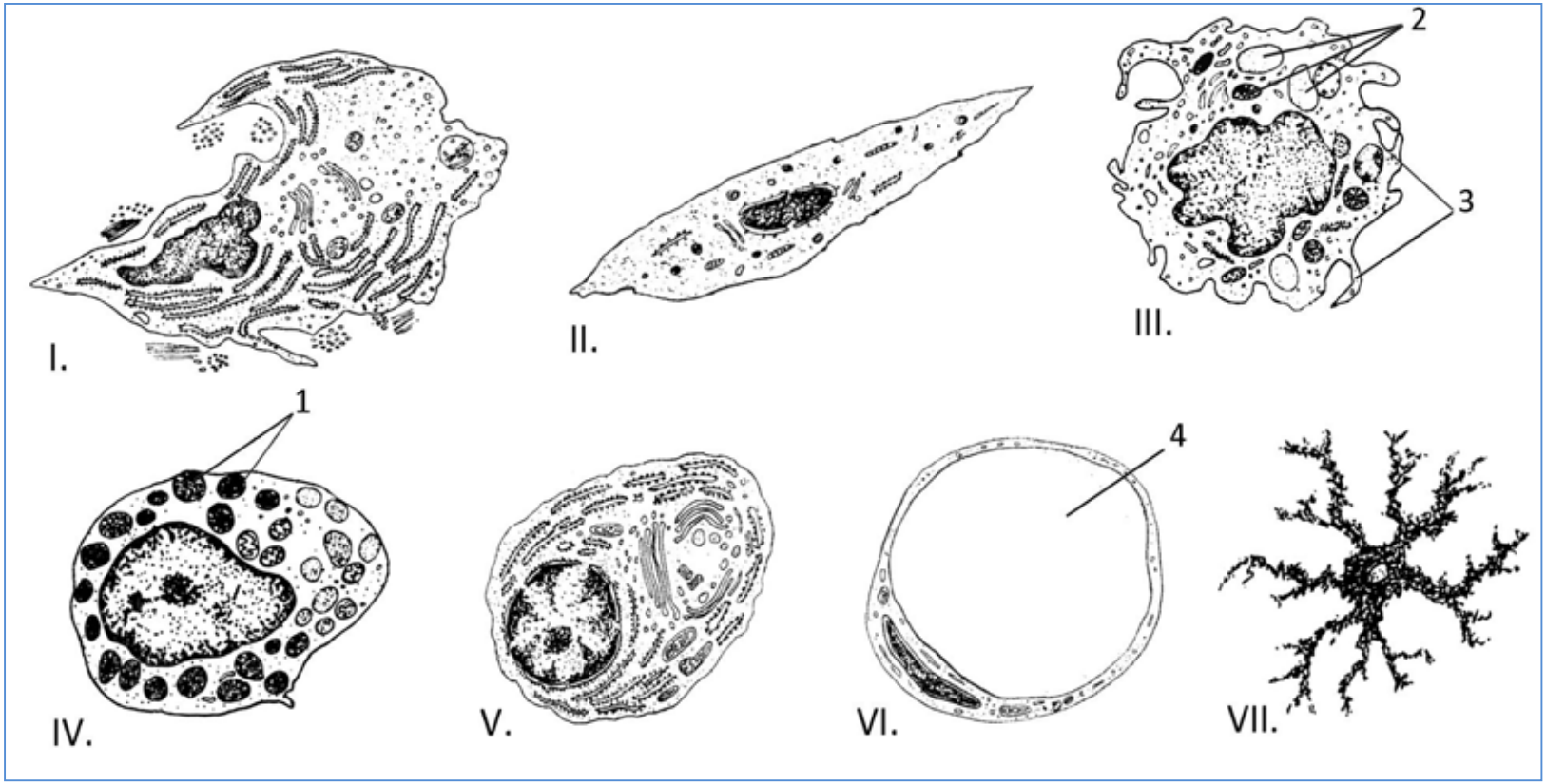


Slide №55 “Loose connective tissue (whole mount)”

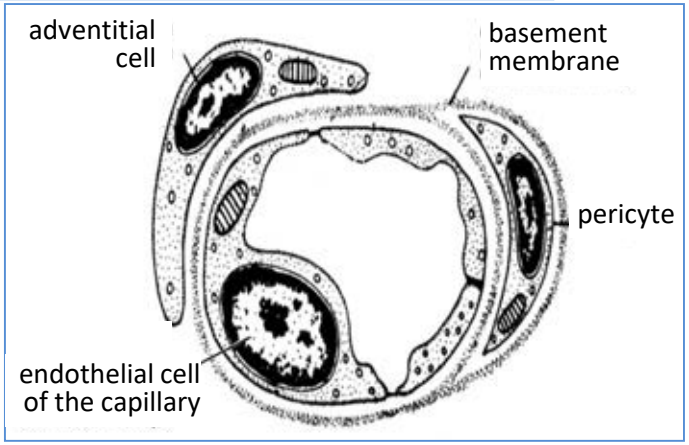
Staining: iron hematoxylin



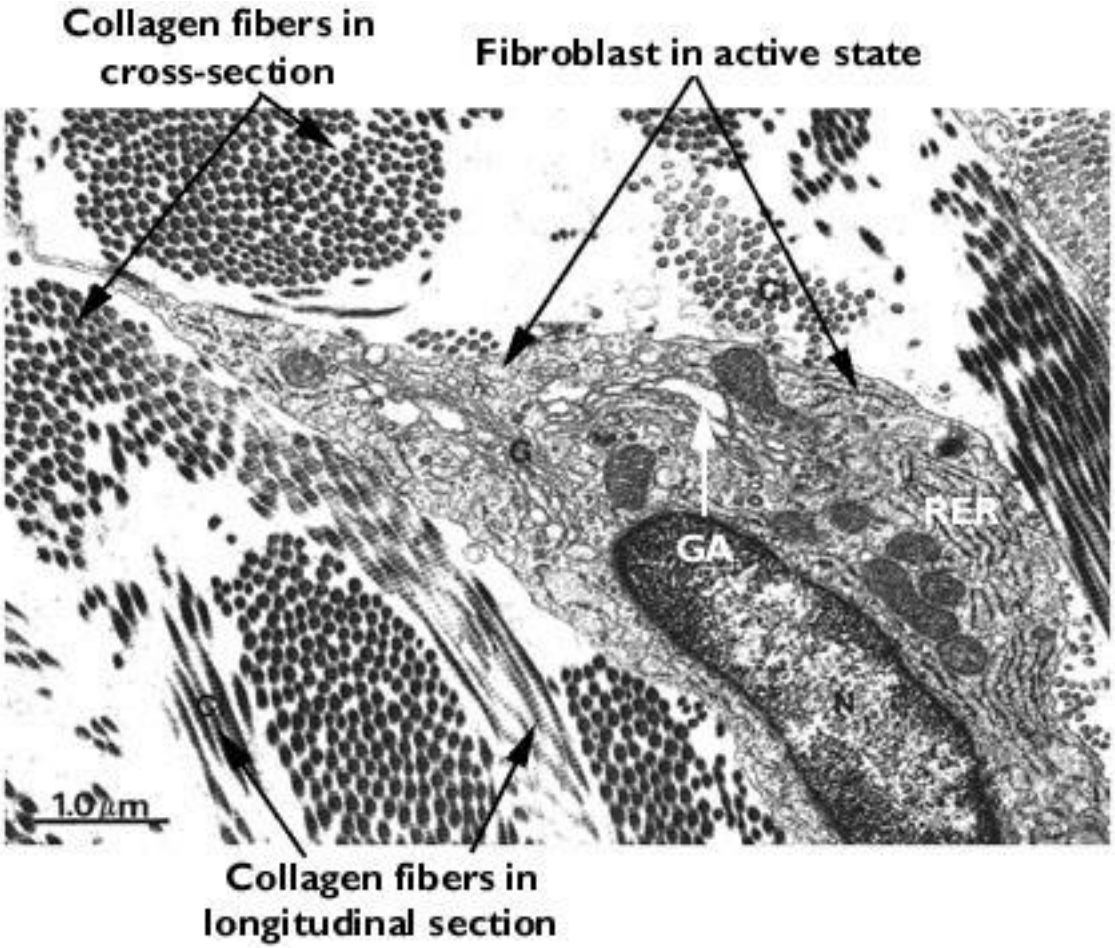
CELLS OF THE LOOSE CONNECTIVE TISSUE



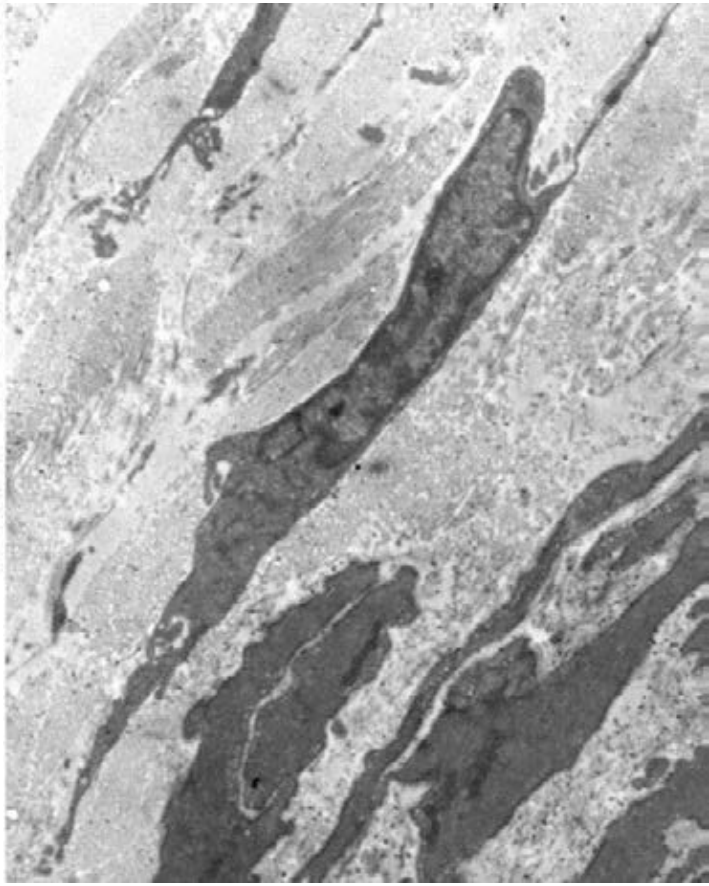
Cells of the loose fibrous connective tissue:
I- fibroblast, II- fibrocyte, III- histiocyte, IV- mast cell, V- plasma cell, VI- adipocyte, VII- pigment cell.
1- specific granules, 2- lysosomes, 3- lamellopodia, 4- lipid droplet.



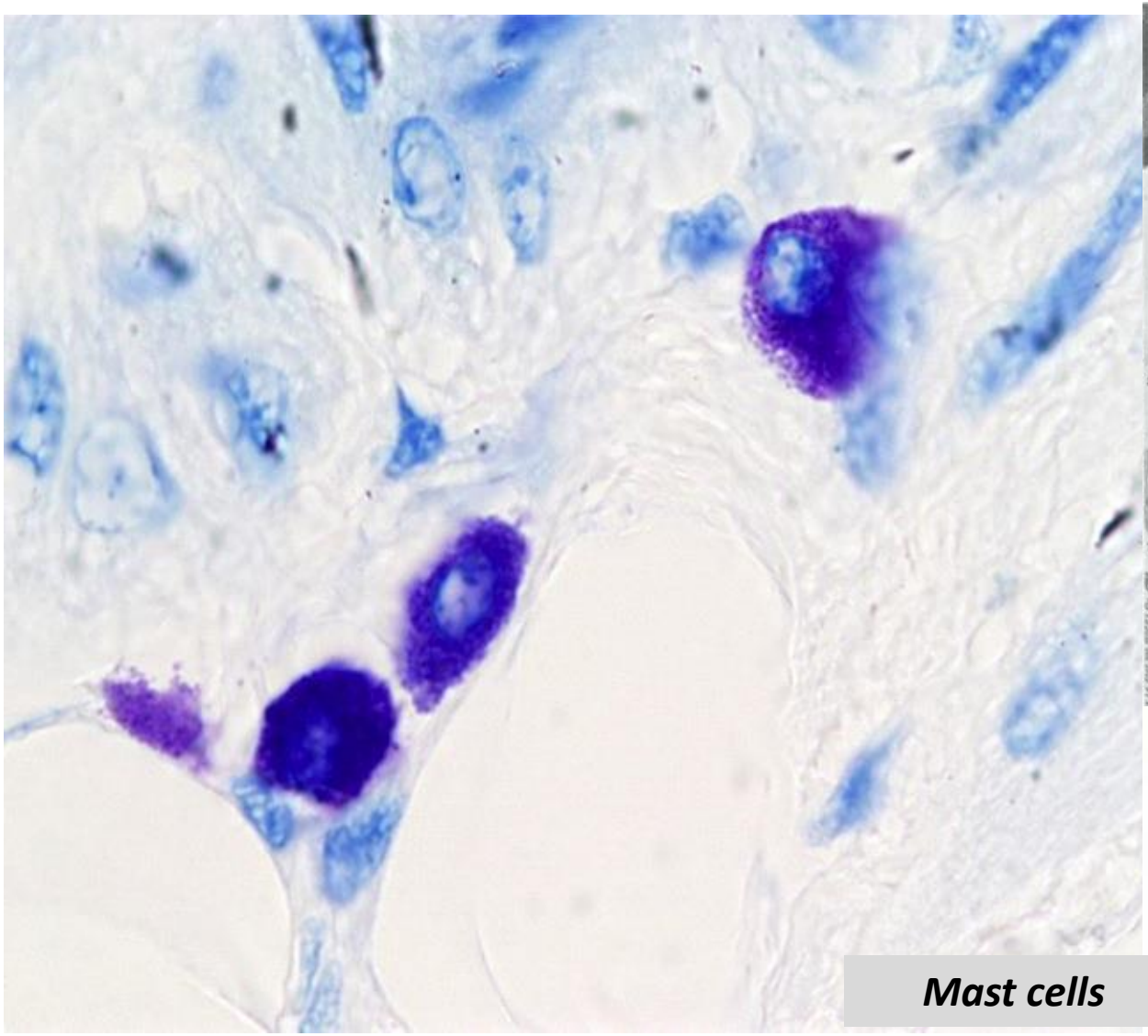
FIBROBLAST, FIBROCYTE

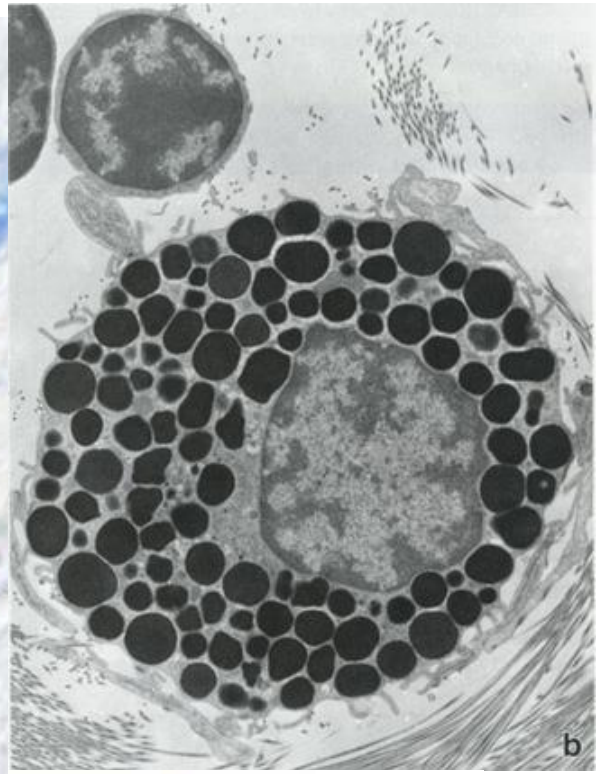


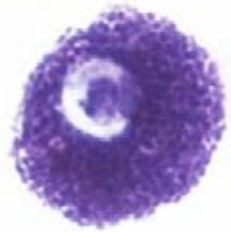
Fibroblasts



MAST CELL

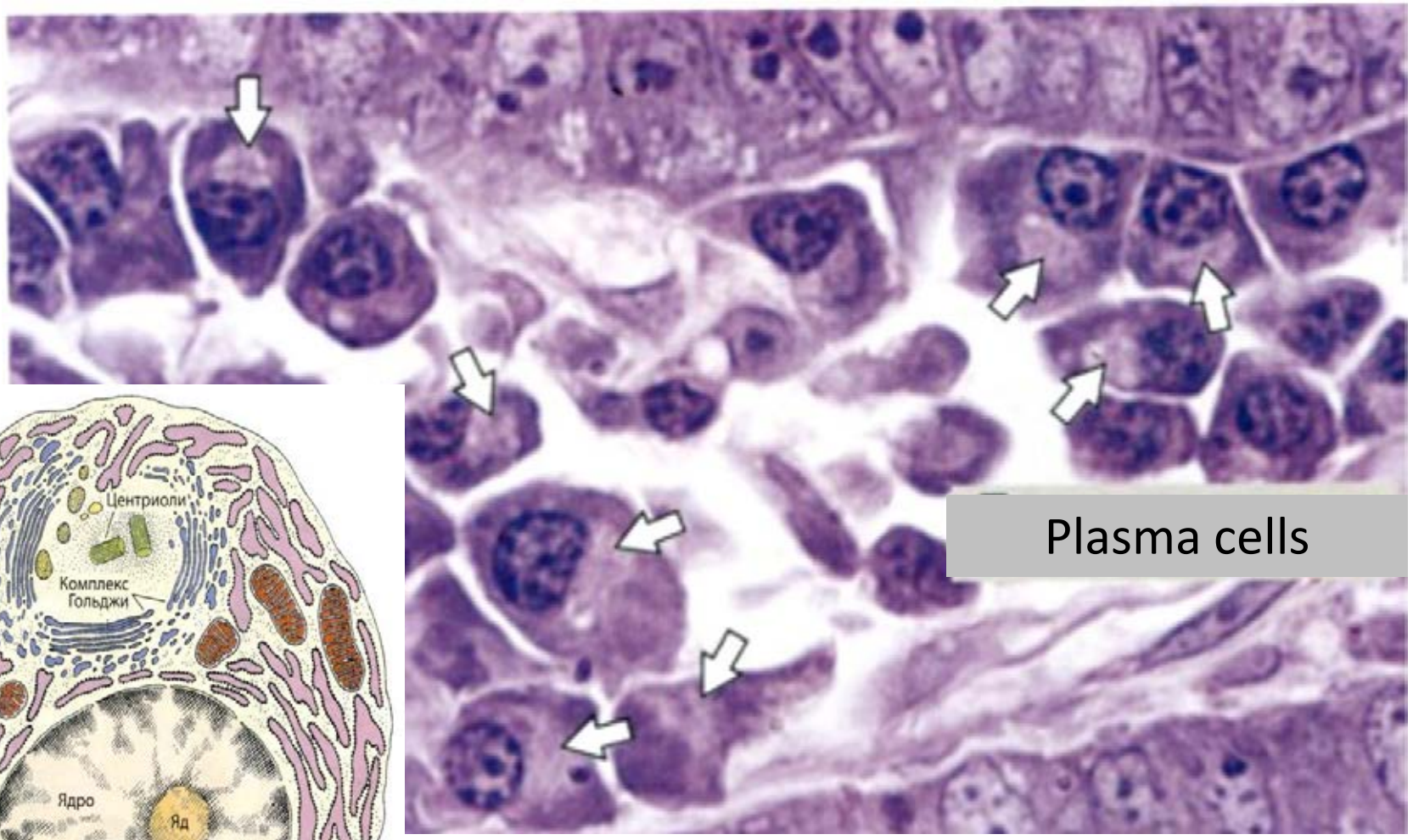




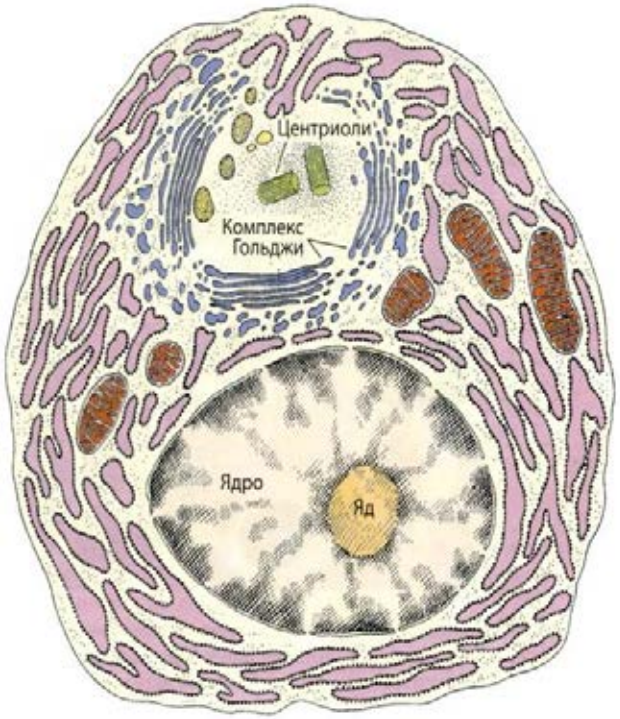


Mast cells

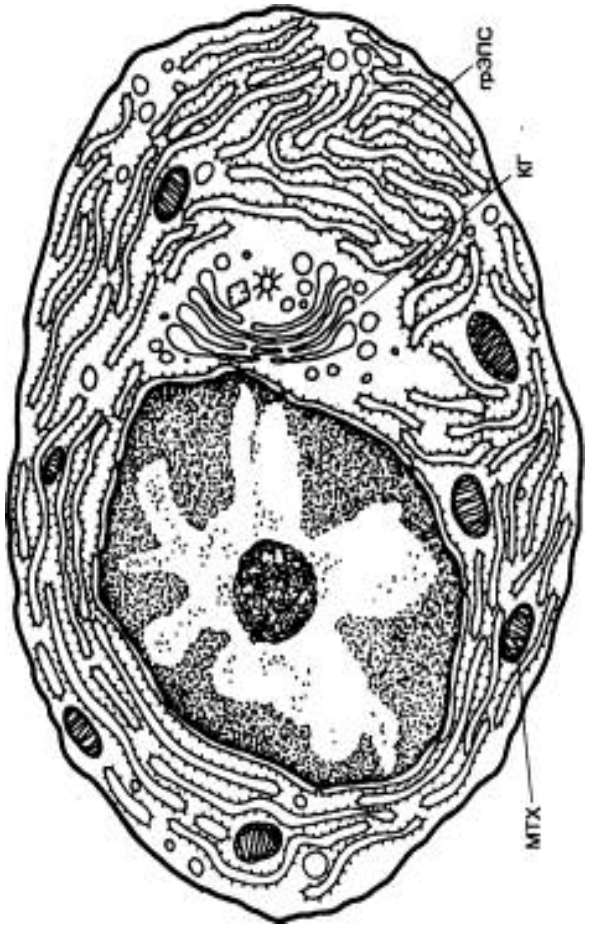
PLASMA CELL



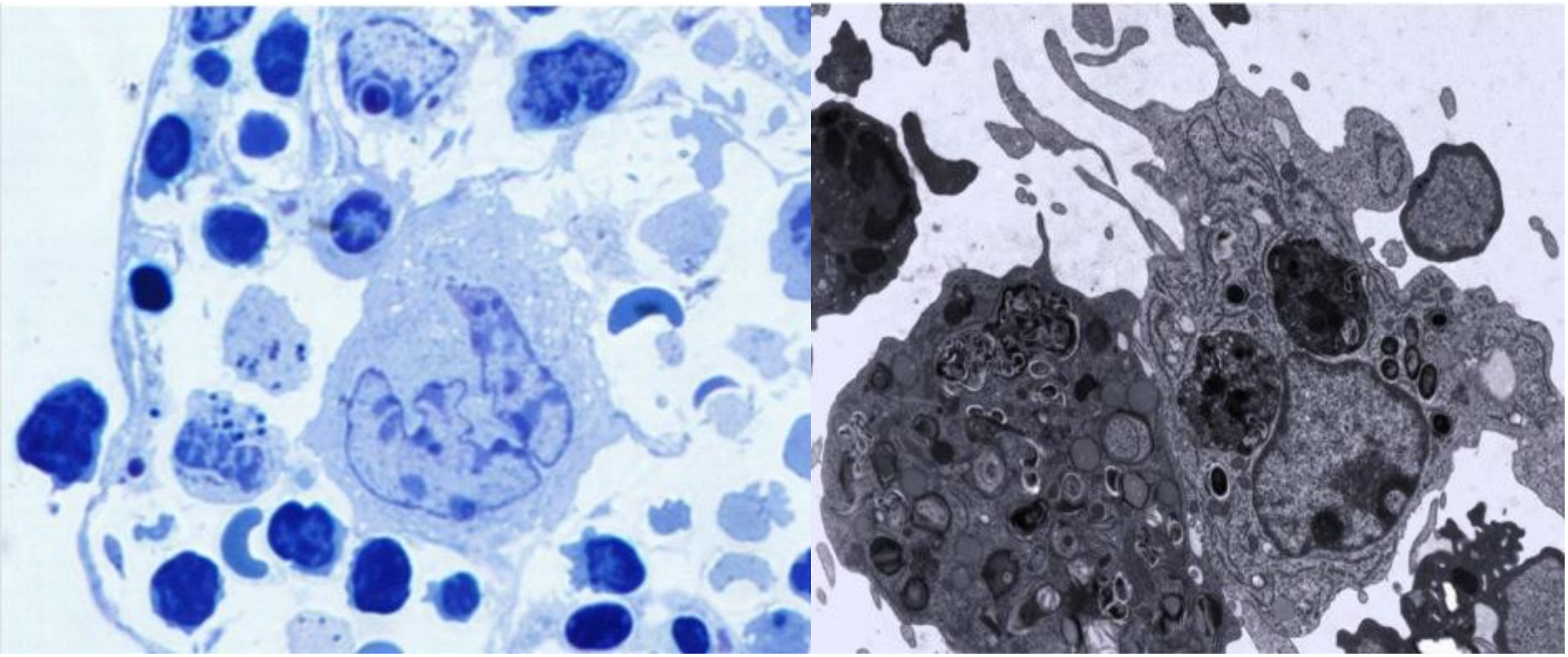
Plasma cells



PLASMA CELL

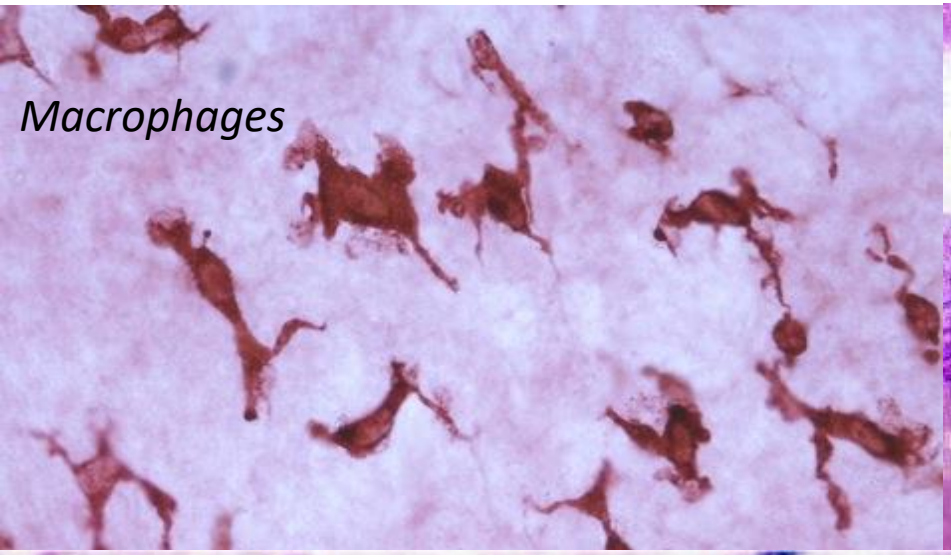


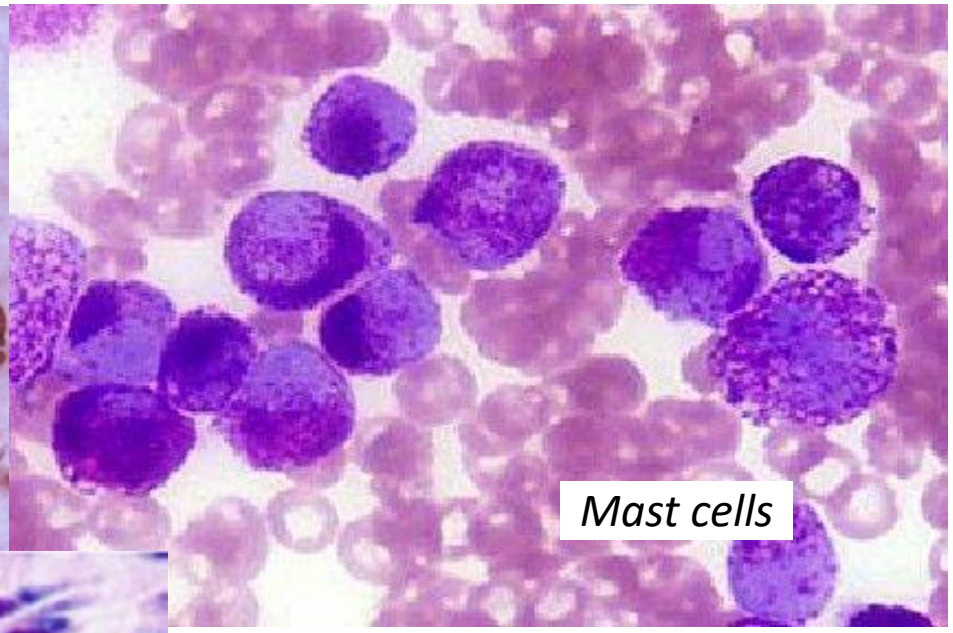
MACROPHAGE

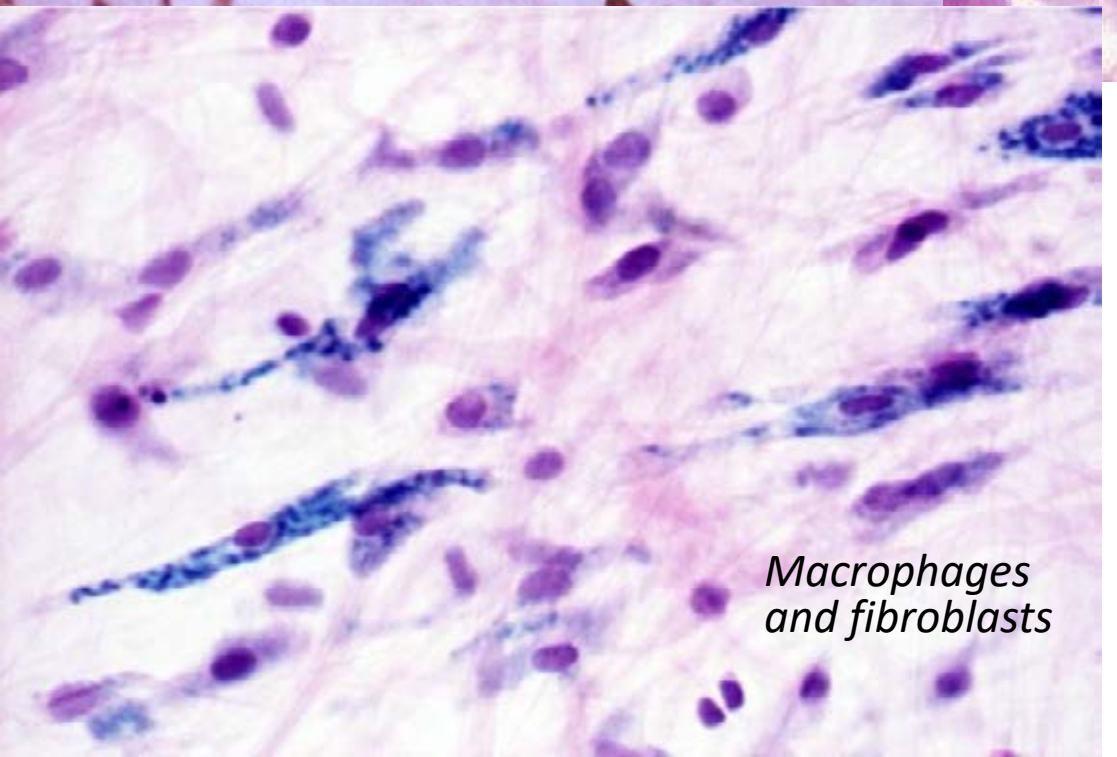


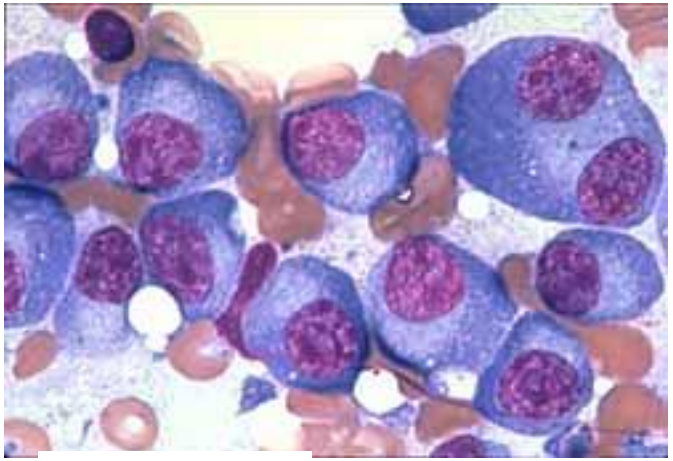
Macrophage

CELLS OF THE LOOSE CONNECTIVE TISSUE



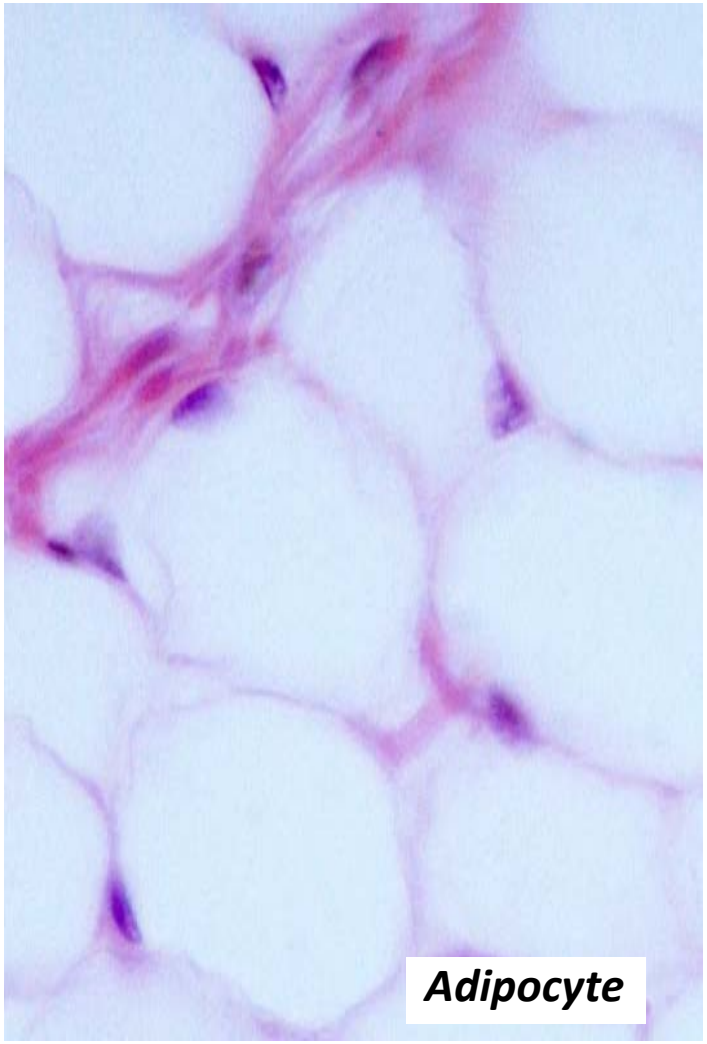






Plasma cells

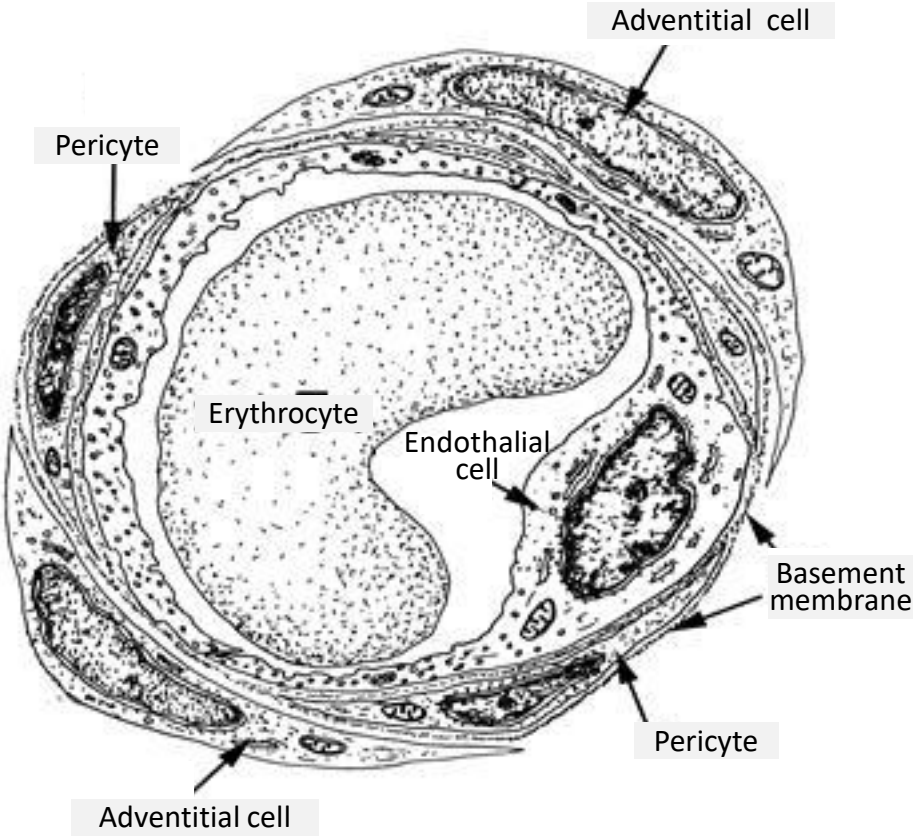
ADIPOCYTE,PIGMENT CELL

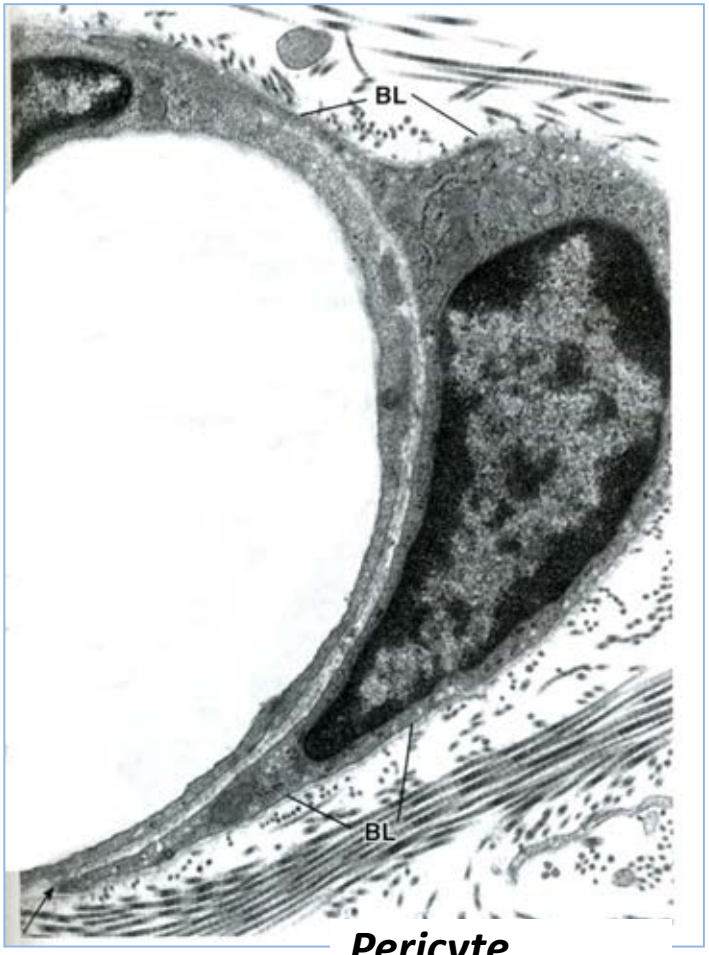


Adipocyte

Pigment cell (melanocyte)

CELLS OF BLOOD VESSELS

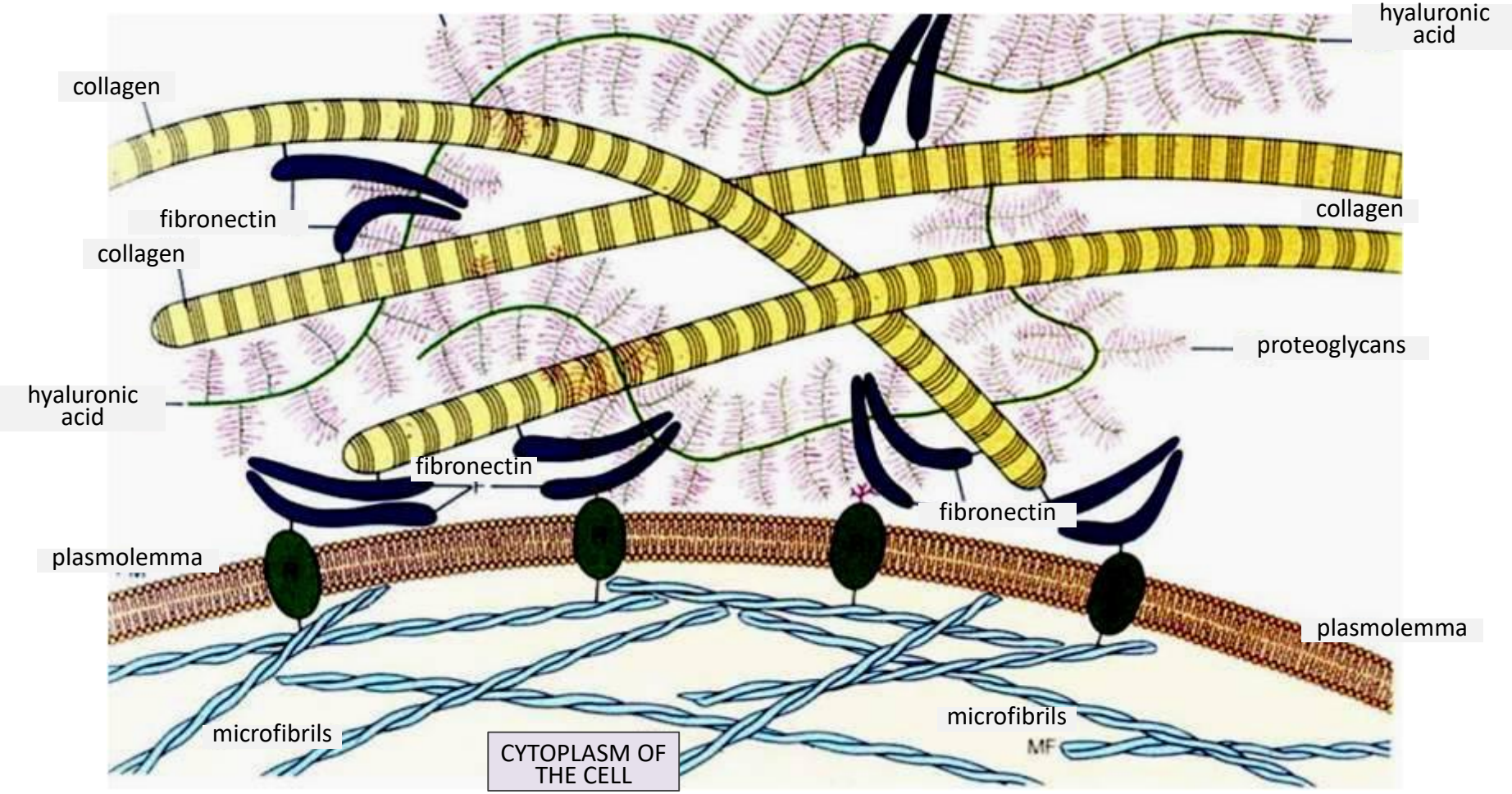




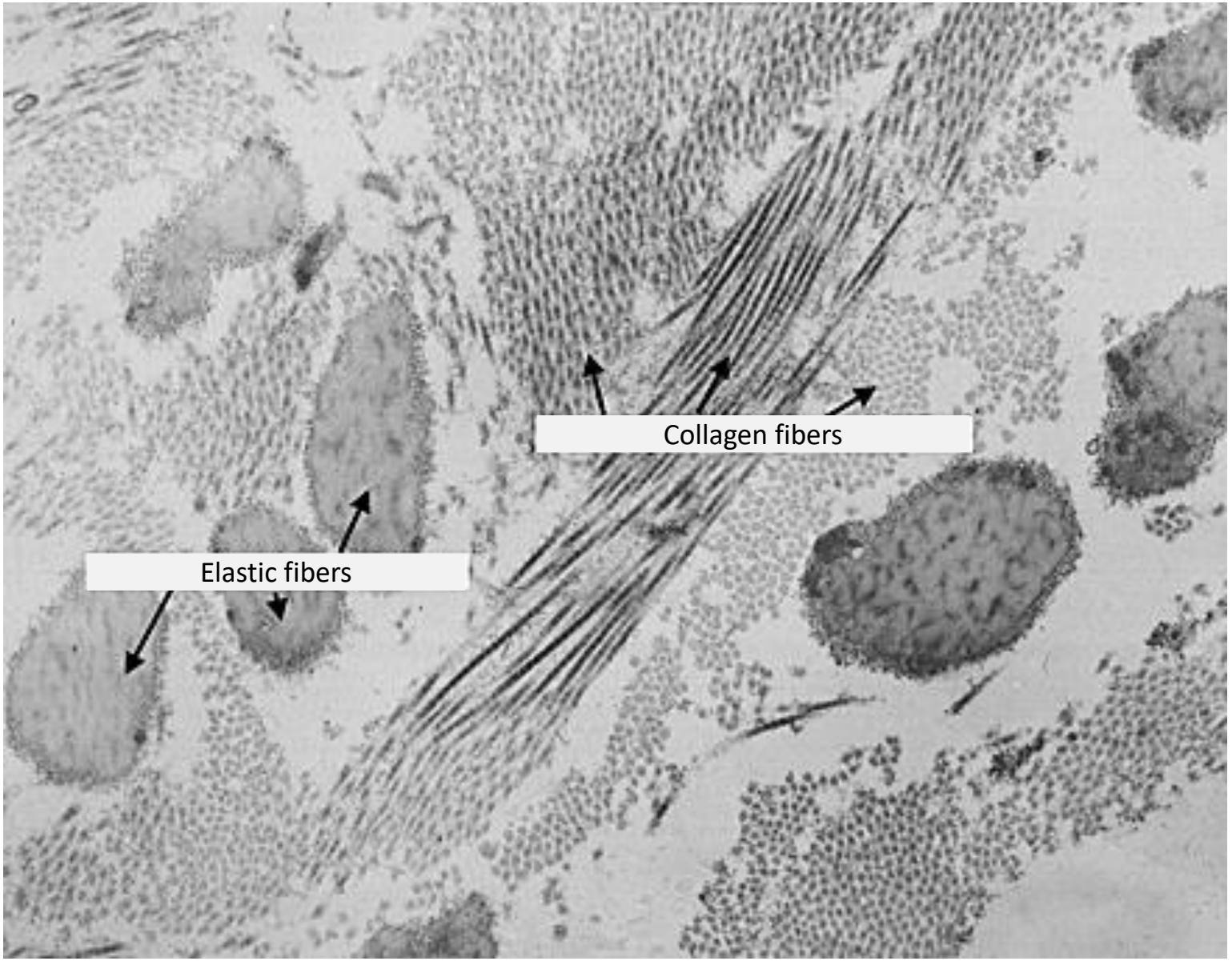
Pericyte
Endothelial cell

GROUND SUBSTANCE :
- Proteoglycans (proteins + glycosaminoglycans)
- Glycoproteins (adhesive proteins)
- FIBERS:
- Collagen
- Elastic
- Reticular

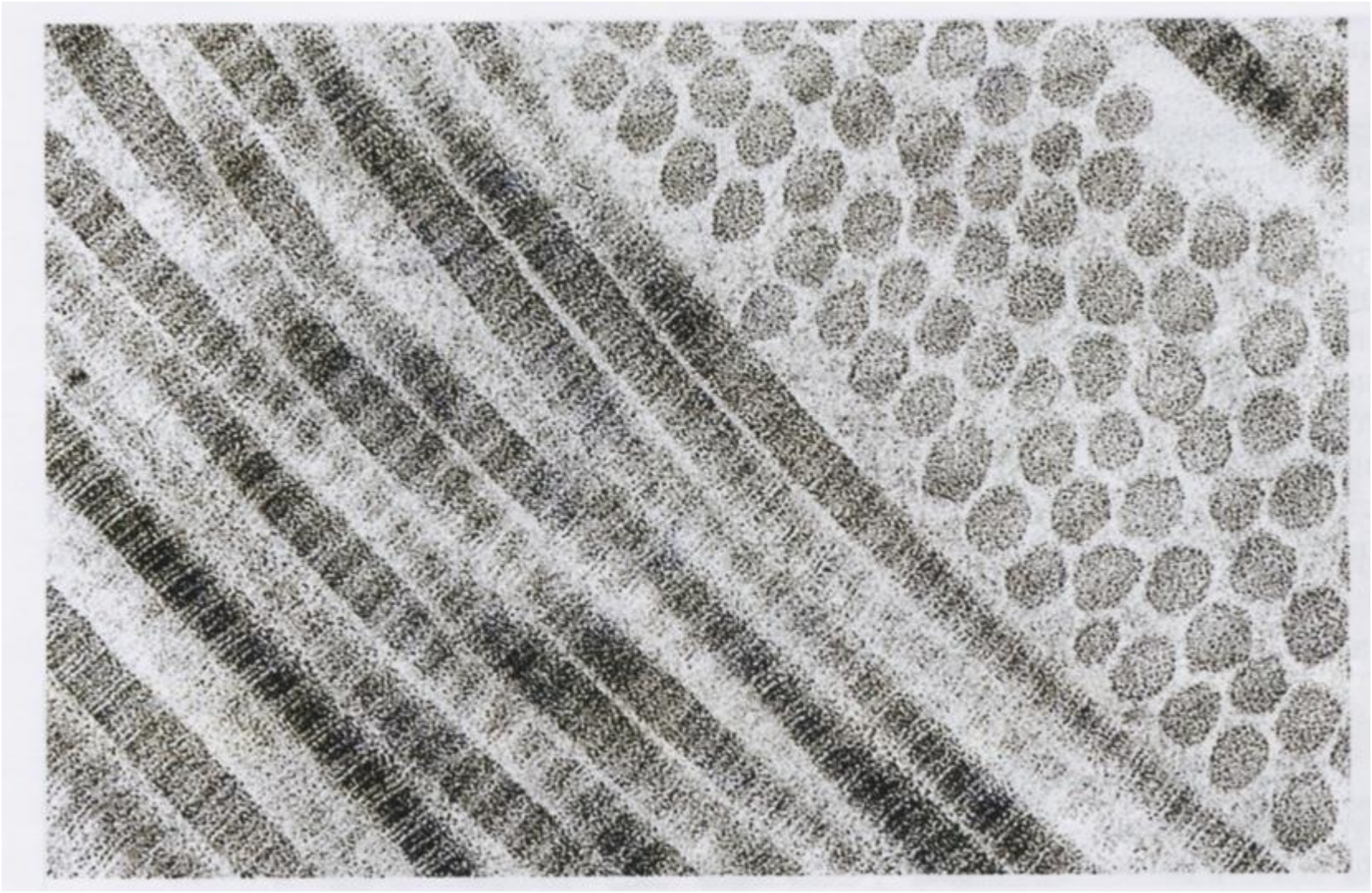
EXTRACELLULAR MATRIX OF THE CONNECTIVE TISSUE



EXTRACELLULAR MATRIX OF THE CONNECTIVE TISSUE

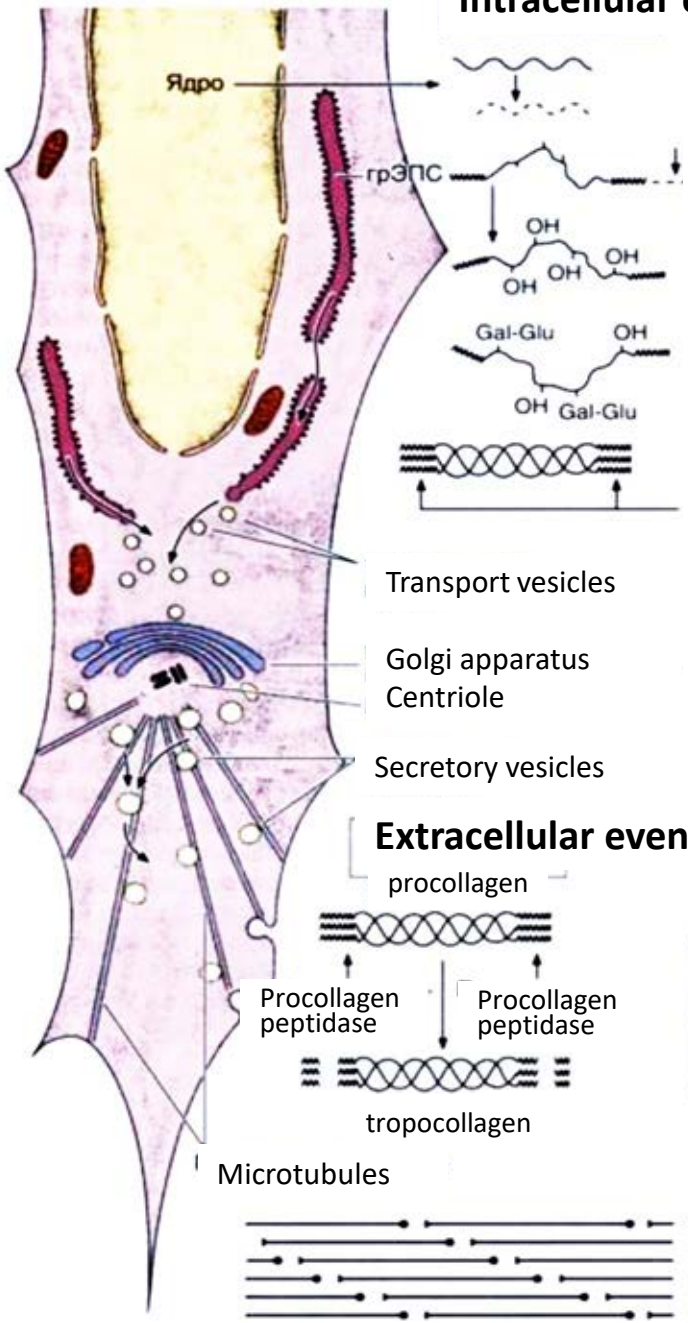


COLLAGEN FIBERS



PRODUCTION OF COLLAGEN

Intracellular events



In rER:
- Uptake of amino acids by endocytosis
- Formation of mRNA
- Synthesis of α-chains with registration peptides
- Hydroxylation of proline and lysine resudes
- Glycosylation of specific hydroxylysyl resudes
-Formation of procollagen triple helix molecules

In Golgi:
- Packaging of the procollagen into secretory vesicles
- Movement of vesicles to plasma membrane assisted by microfilaments and microtubules
- Exocytosis of procollagen

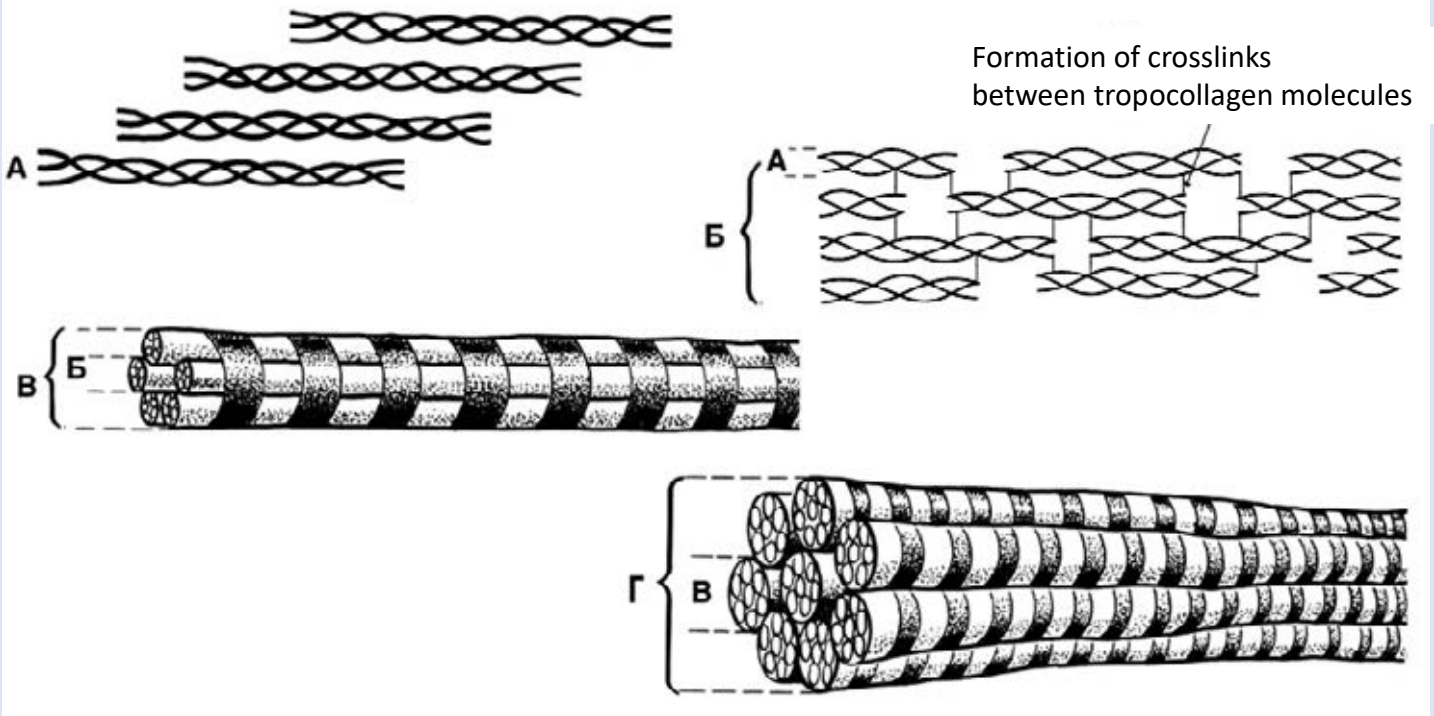
Extracellular events

- Cleavage of registered, nonhelical ends of the procollagen to form tropocollagen
- Polymerization of tropocollagen into collagen fibril

Microtubules

- Formation of crosslinks between tropocollagen molecules, using lysyloxidase
- Formation fibrillar structure

STRUCTURE OF A COLLAGEN FIBERS



Structure of a collagen fiber

А- tropocollagen molecule composed of three polypeptides,
Б- collagen microfibril, В- collagen fibril, Г- collagen fiber

TYPES OF COLLAGEN FIBERS

Types of collagen differ in α-chains

I – skin, bone, tendon, cornea (the most prevalent kind of collagen)

II – cartilage, embryonic cornea

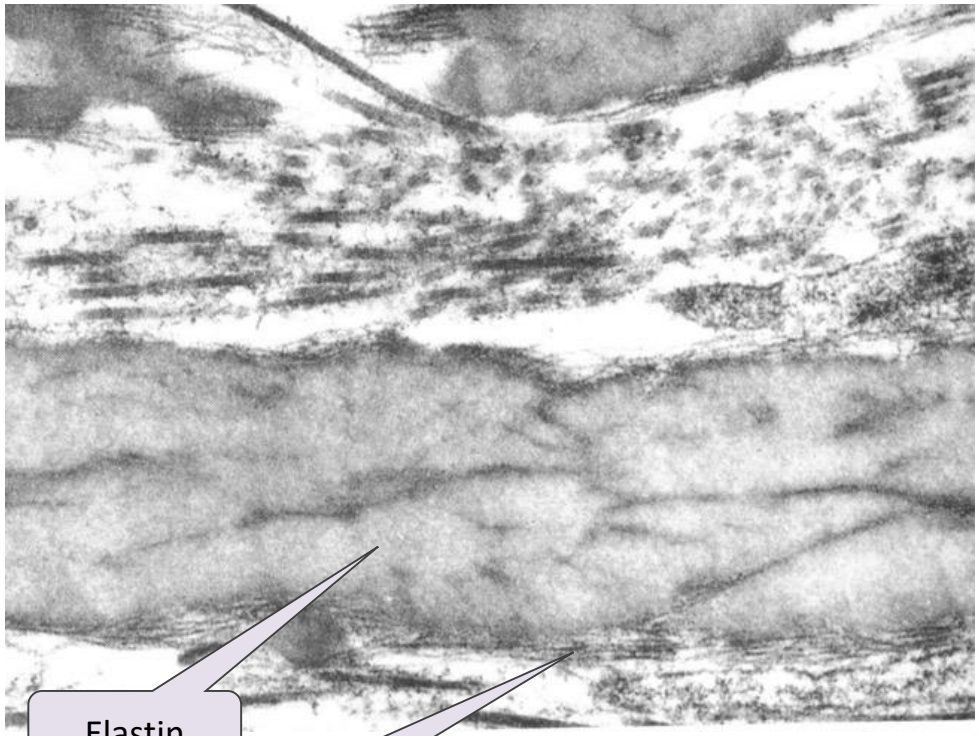
III – reticular fibers, LCT, blood vessel wall, skin dermis

IV – basement membrane of epithelium

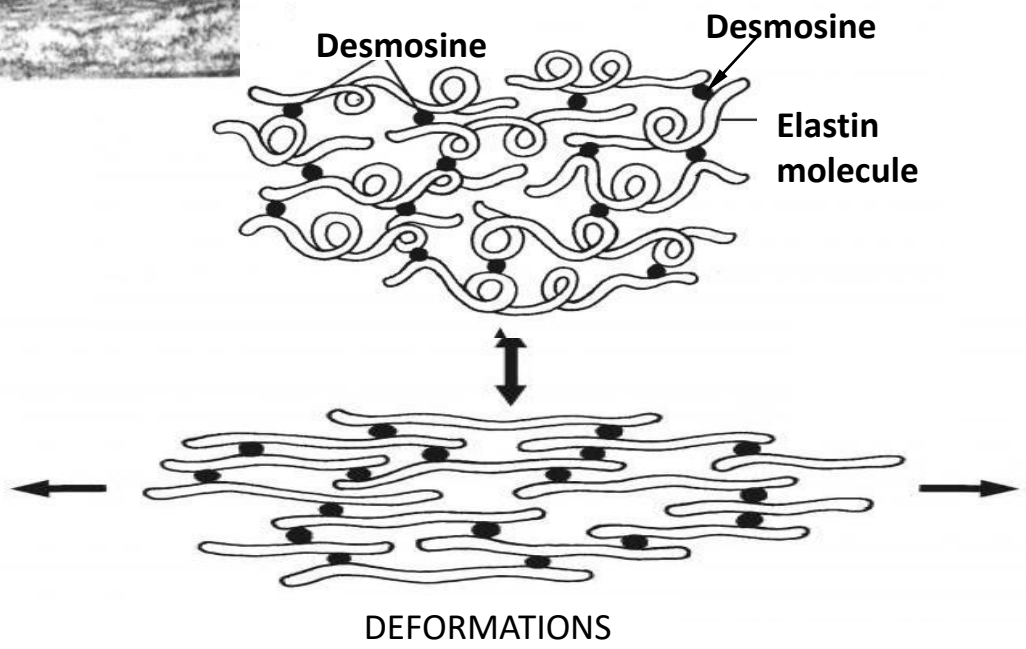
VII – anchoring fibrils in basement membrane

More than 25 different types

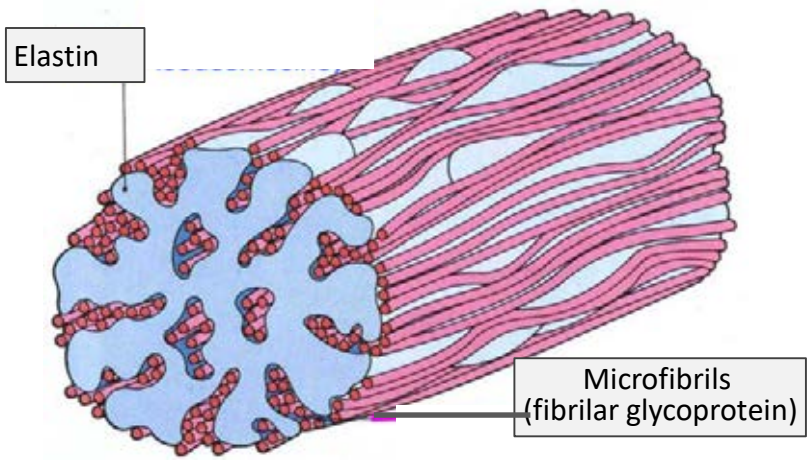
STRUCTURE OF A ELASTIC FIBER

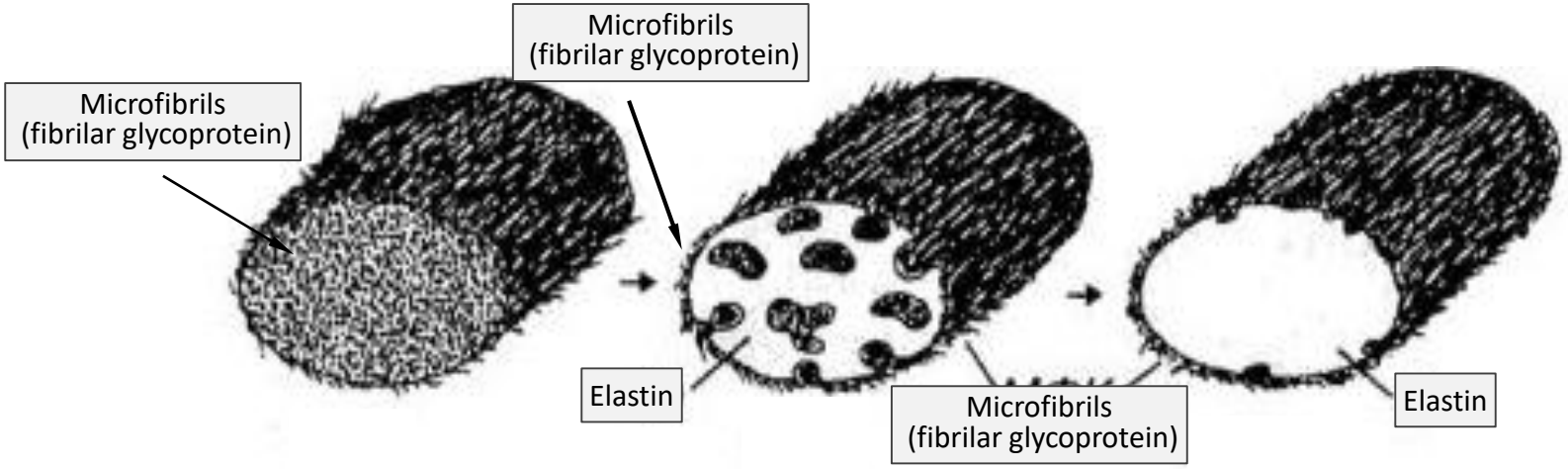


1 to 10 µm



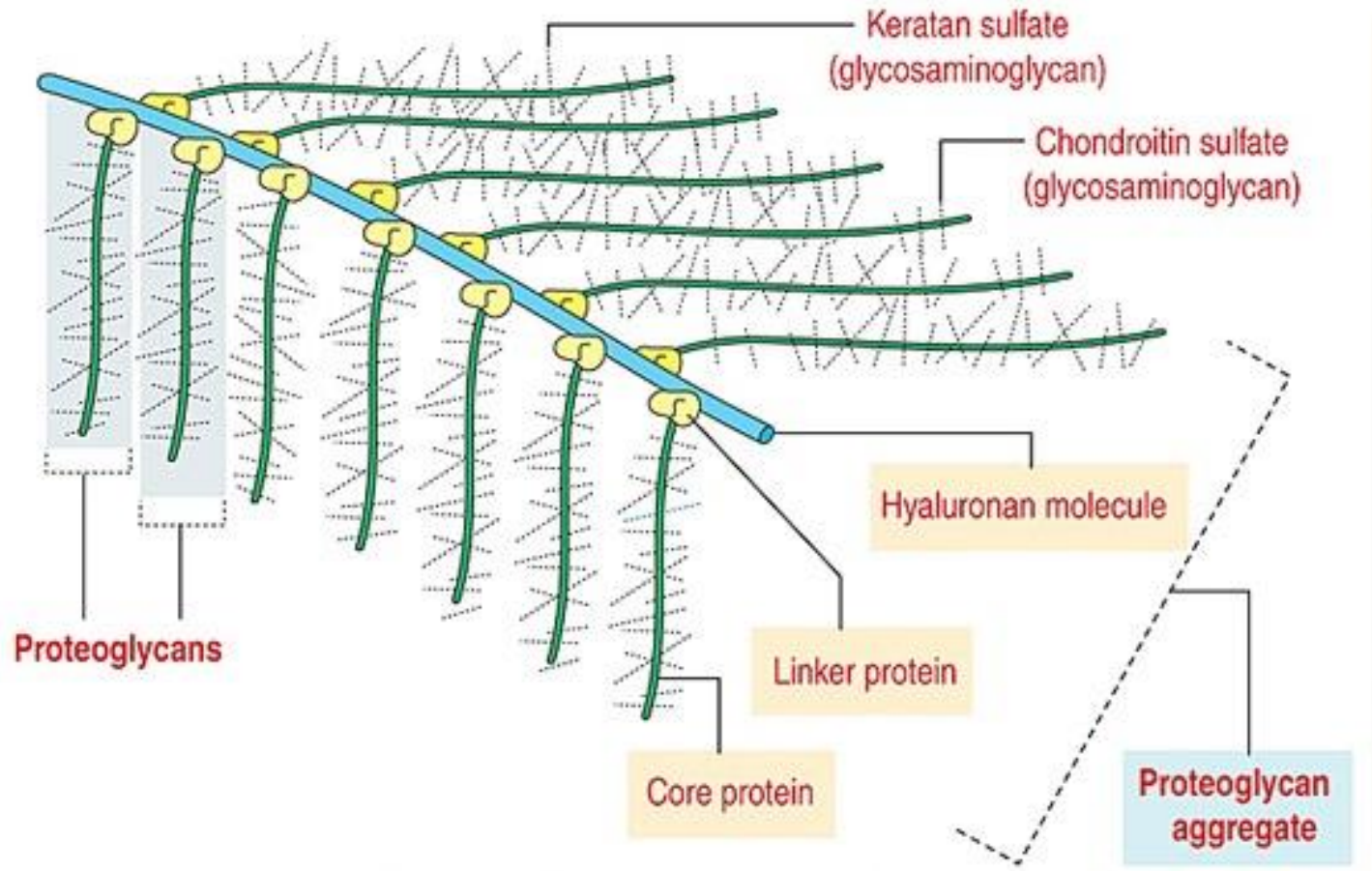
STRUCTURE OF A ELASTIC FIBER



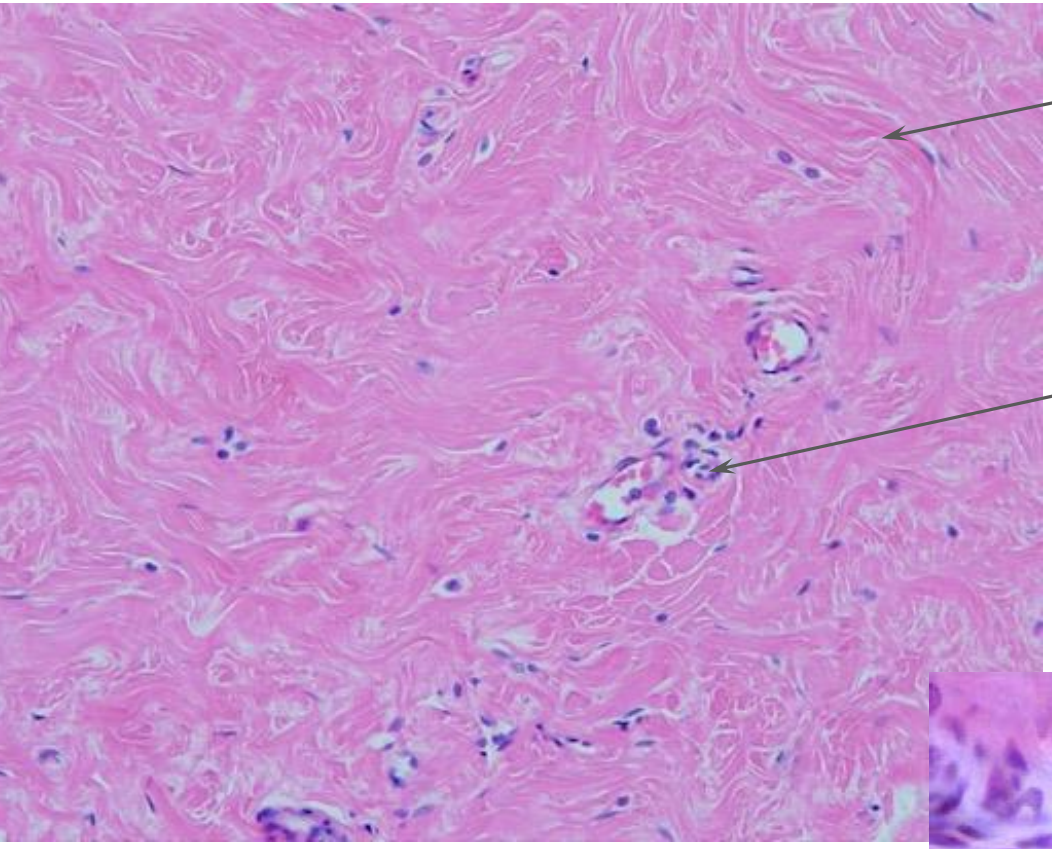


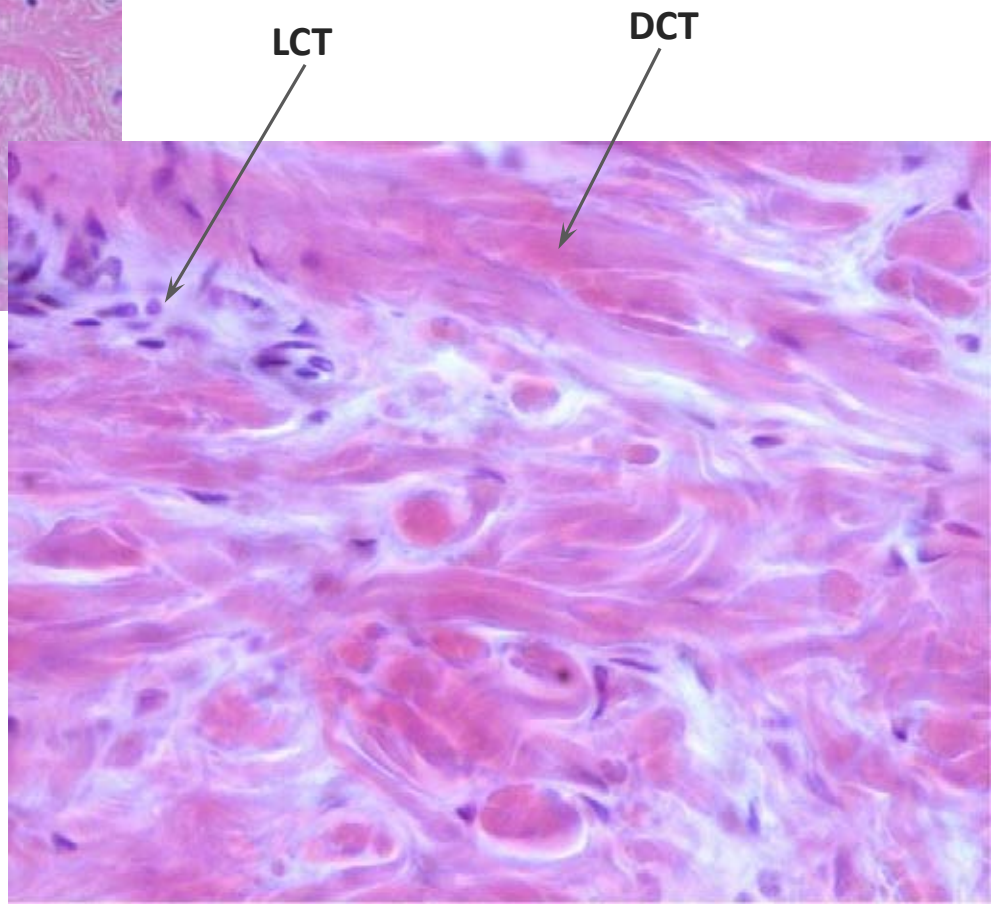
Oxytalan fiber → Elaunin fiber → Mature elastic fiber

GROUND SUBSTANCE (proteoglycan complex)

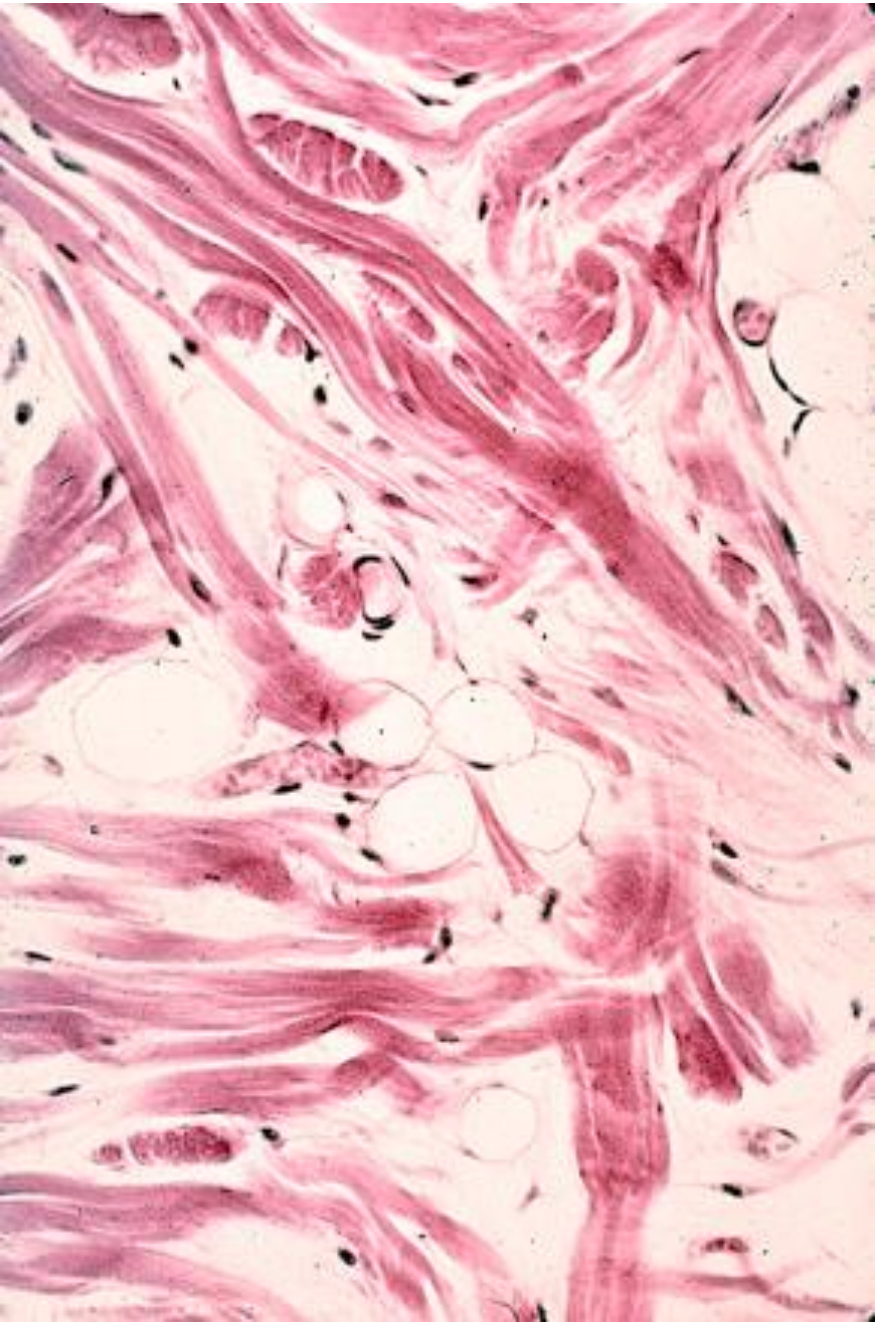


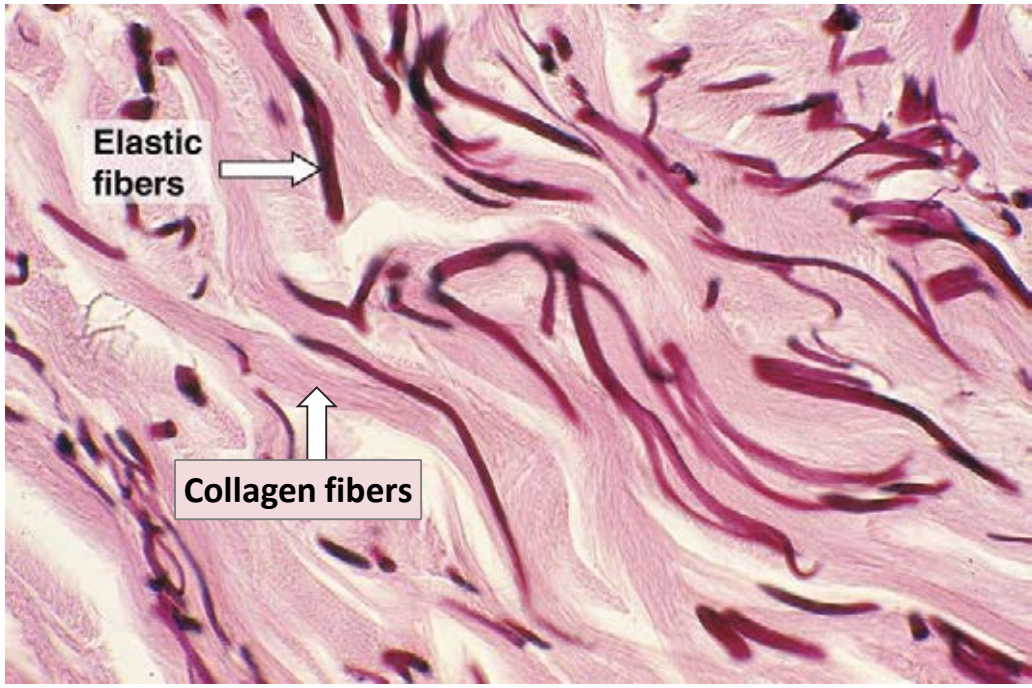
PROPER (FIBROUS) CONNECTIVE TISSUE



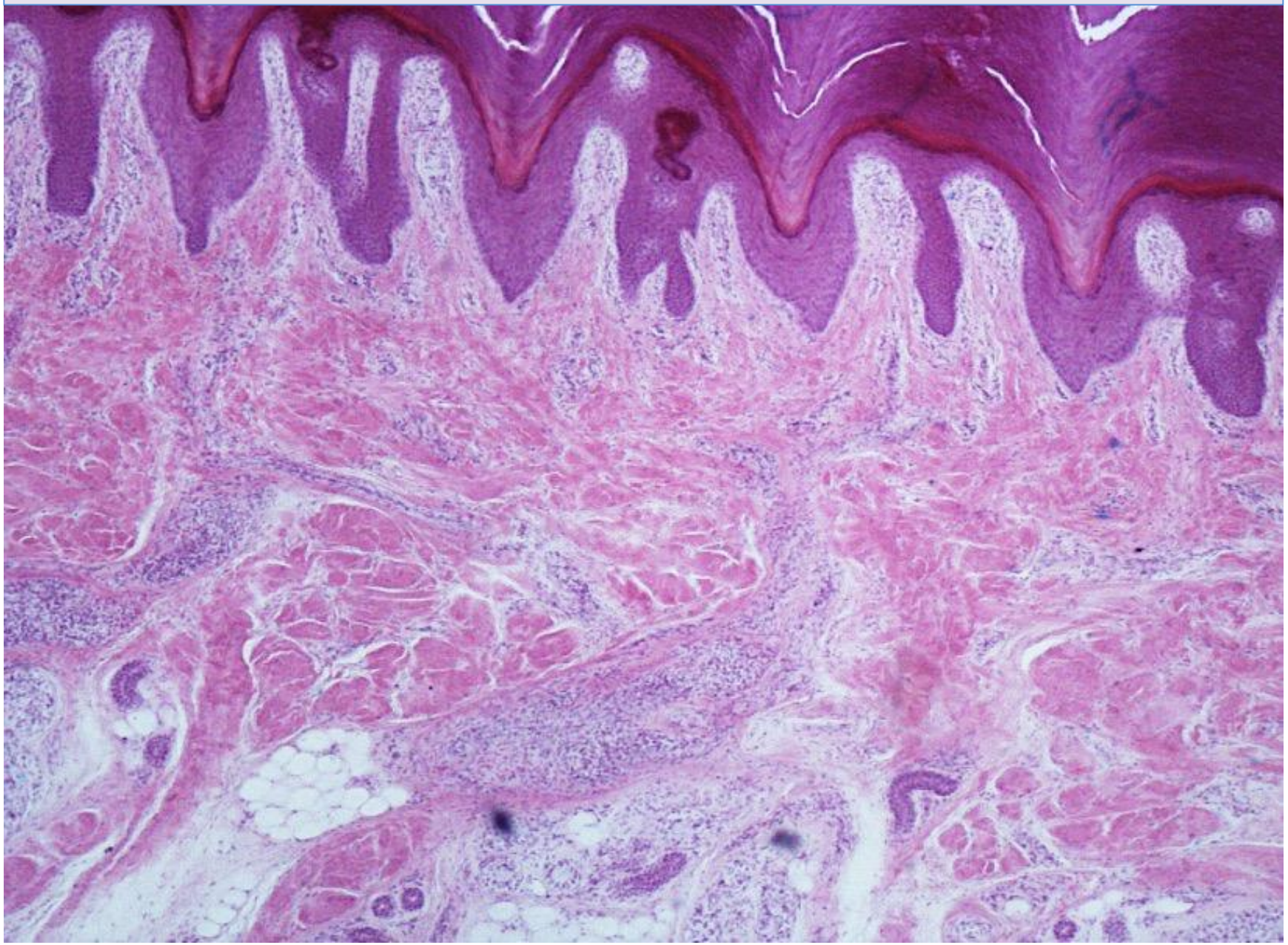


TYPES of DCT FIBERS

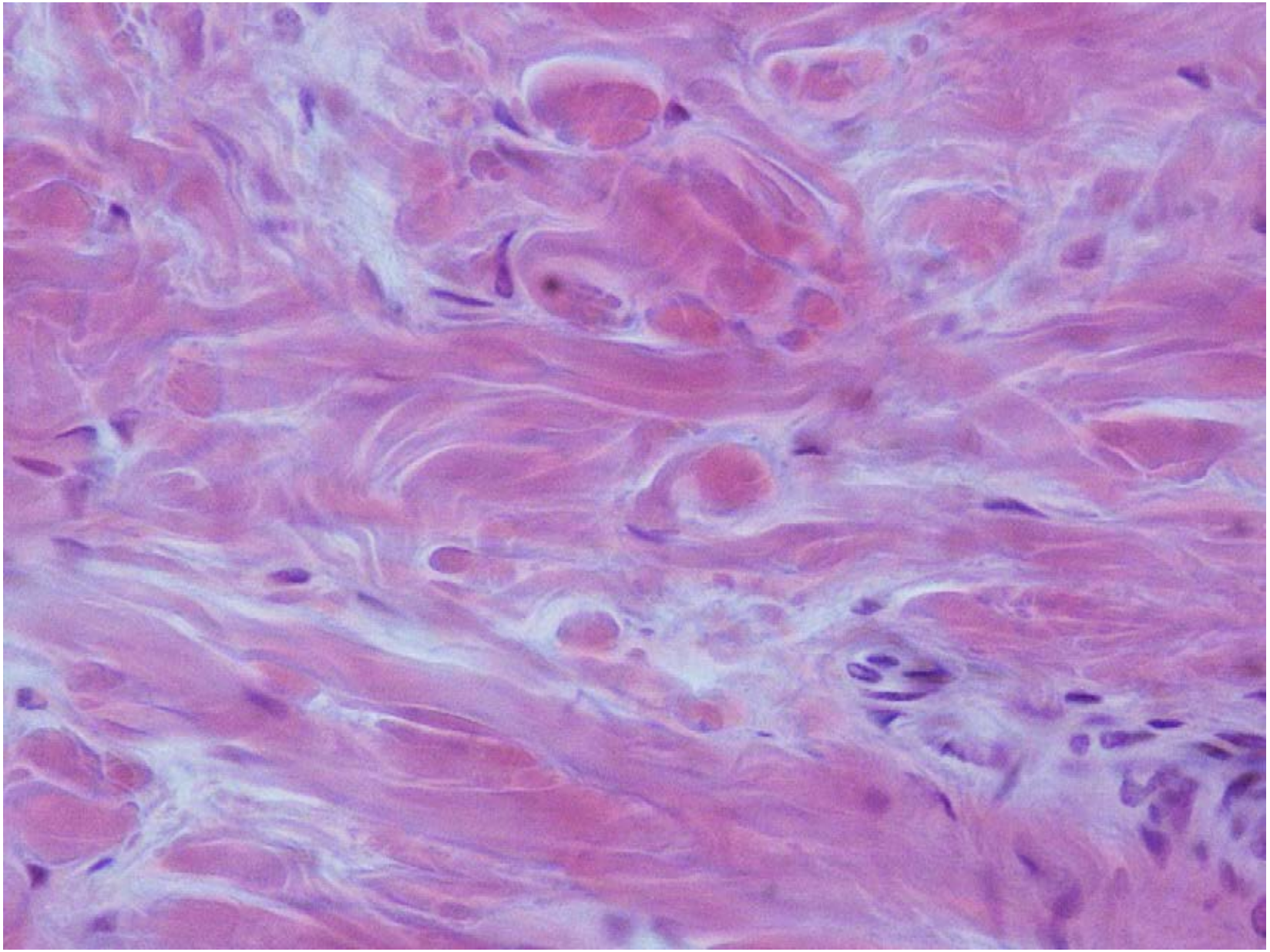




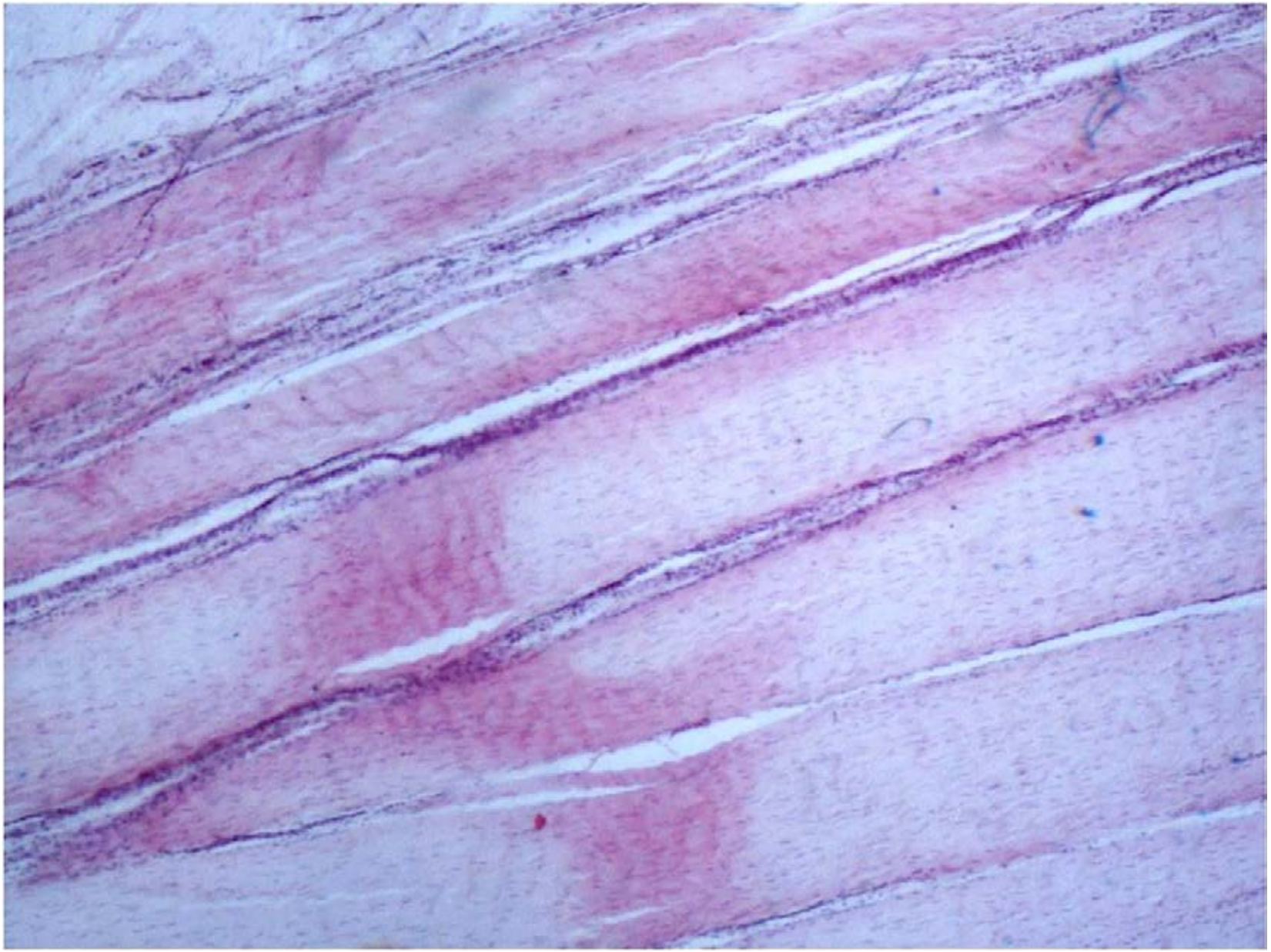
Slides №60, 61 “Dense irregular connective tissue of the dermis, section of the thick skin”
Staining: H&E



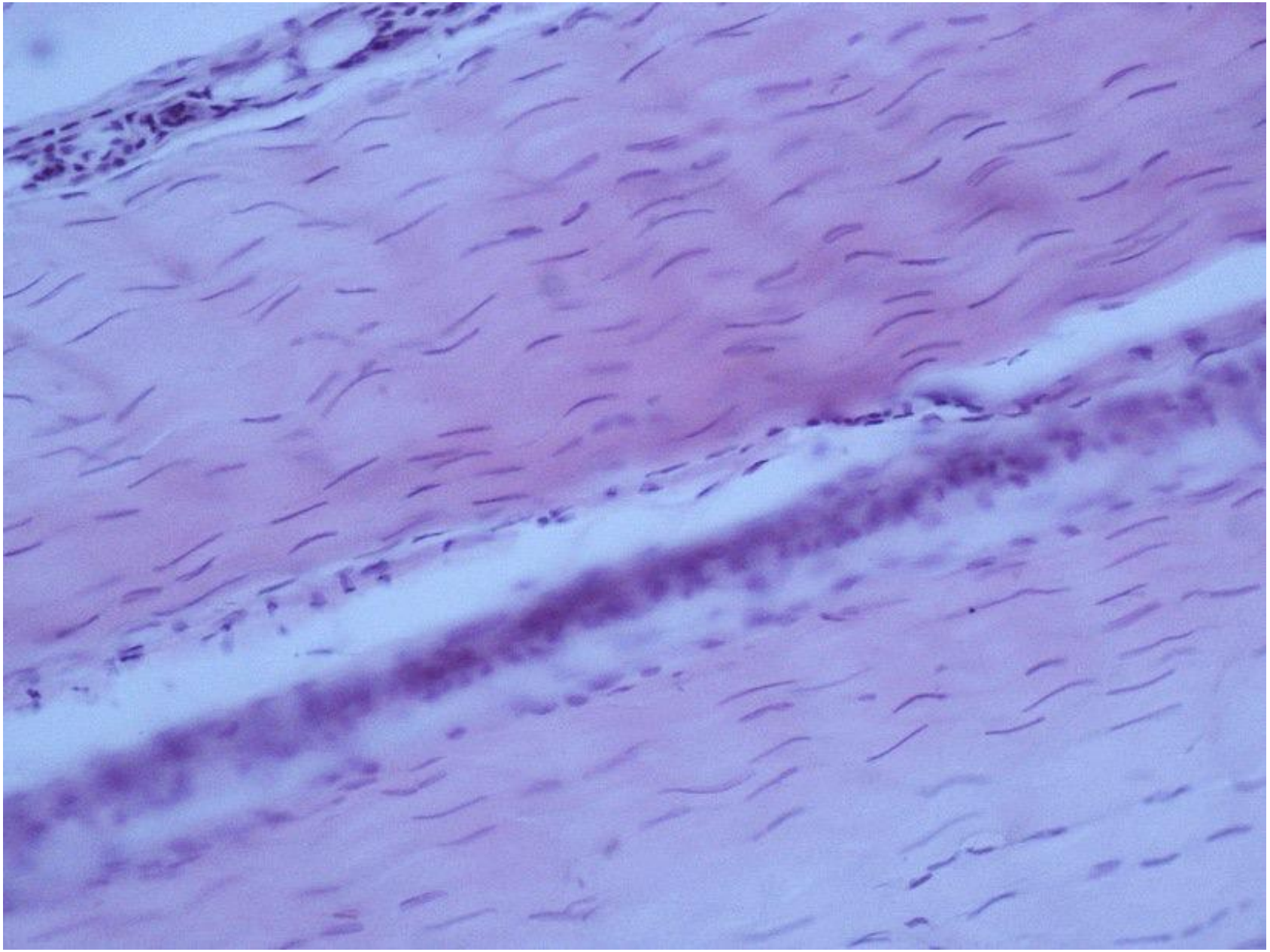
Slides №60, 61 “Dense irregular connective tissue of the dermis, section of the thick skin”
Staining: H&E



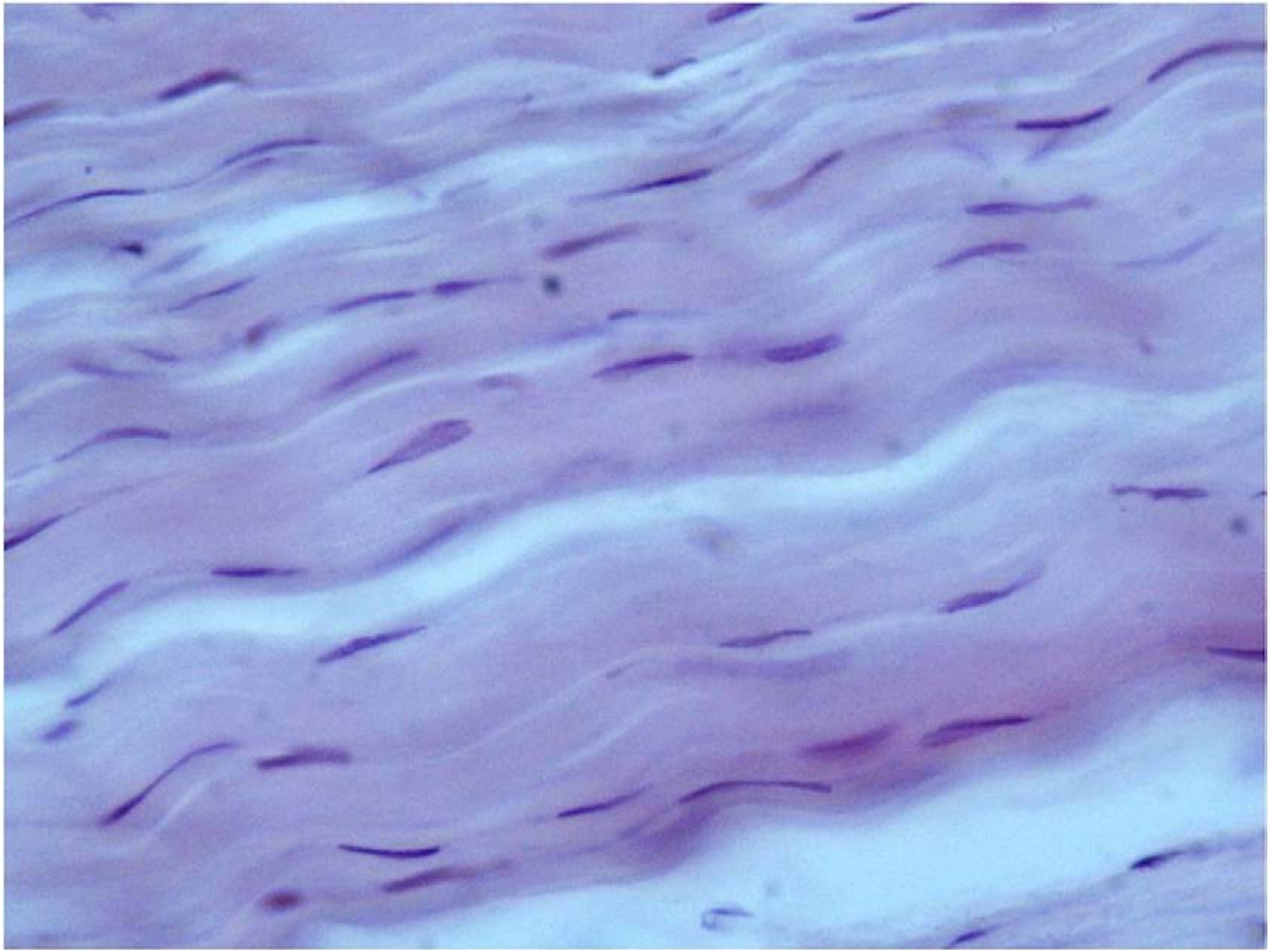
Slide №62 “Dense regular connective tissue of a tendon, longitudinal section”
Staining: H&E



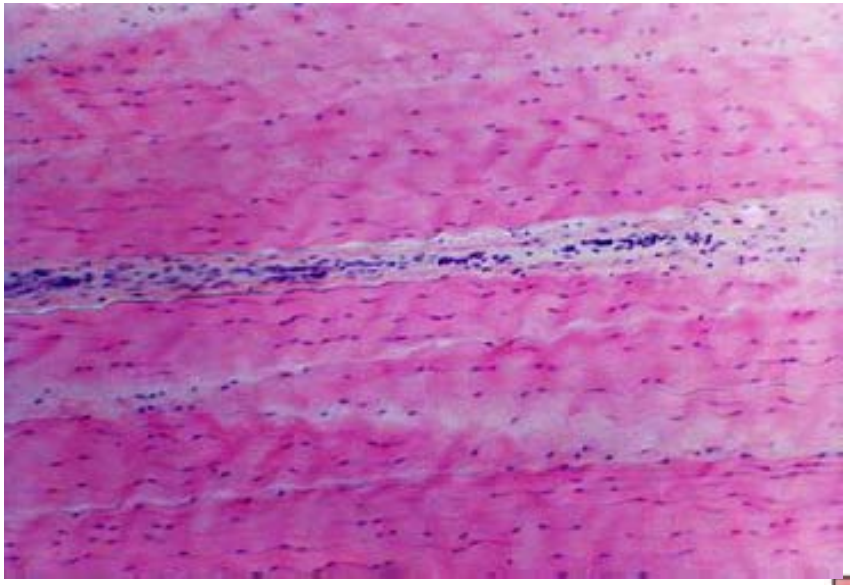
Slide №62 “Dense regular connective tissue of a tendon, longitudinal section”
Staining: H&E

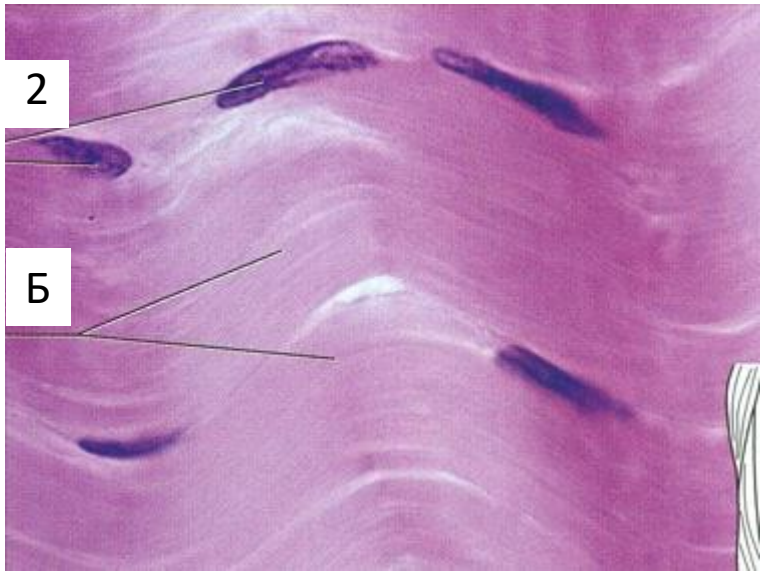


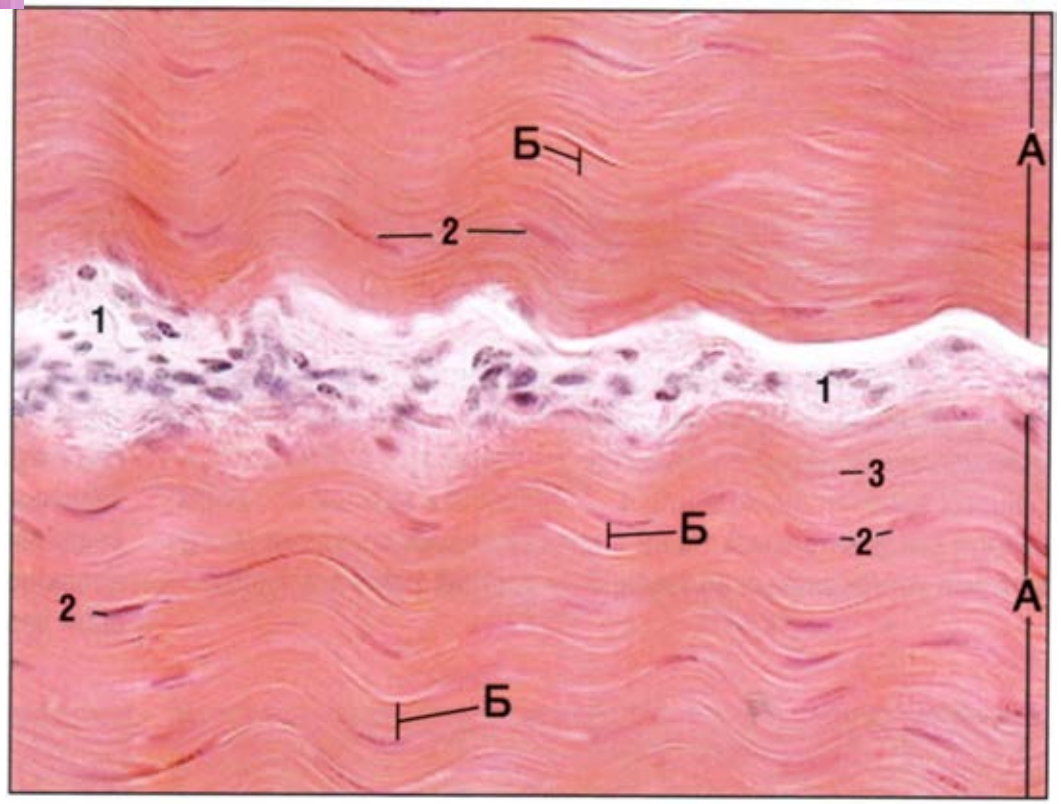
Slide №62 “Dense regular connective tissue of a tendon, longitudinal section”
Staining: H&E



DENSE REGULAR CONNECTIVE TISSUE. TENDON, LONGITUDINAL SECTION





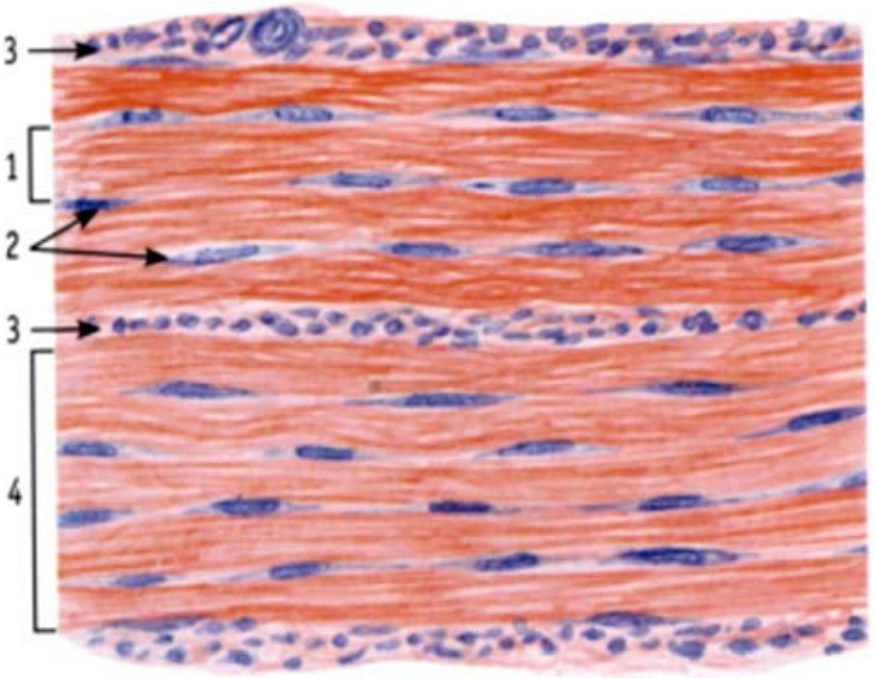


А- bundle of the second order;
Б- bundles of the first order;
1- endotendinium;
2- nuclei of fibrocytes;
3- collagen fibers

DENSE REGULAR CONNECTIVE TISSUE. TENDON, LONGITUDINAL SECTION

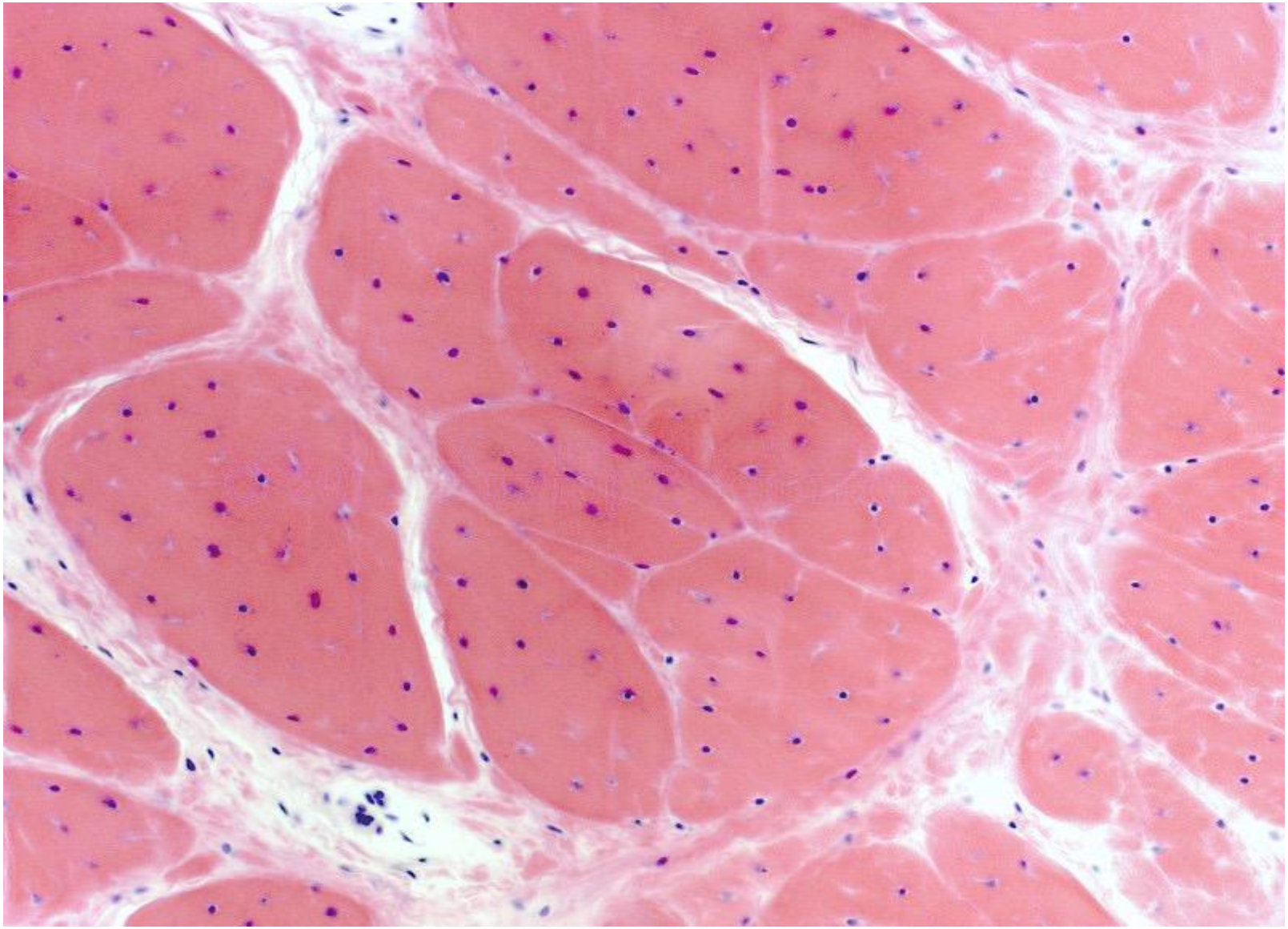
Cross section

Longitudinal section

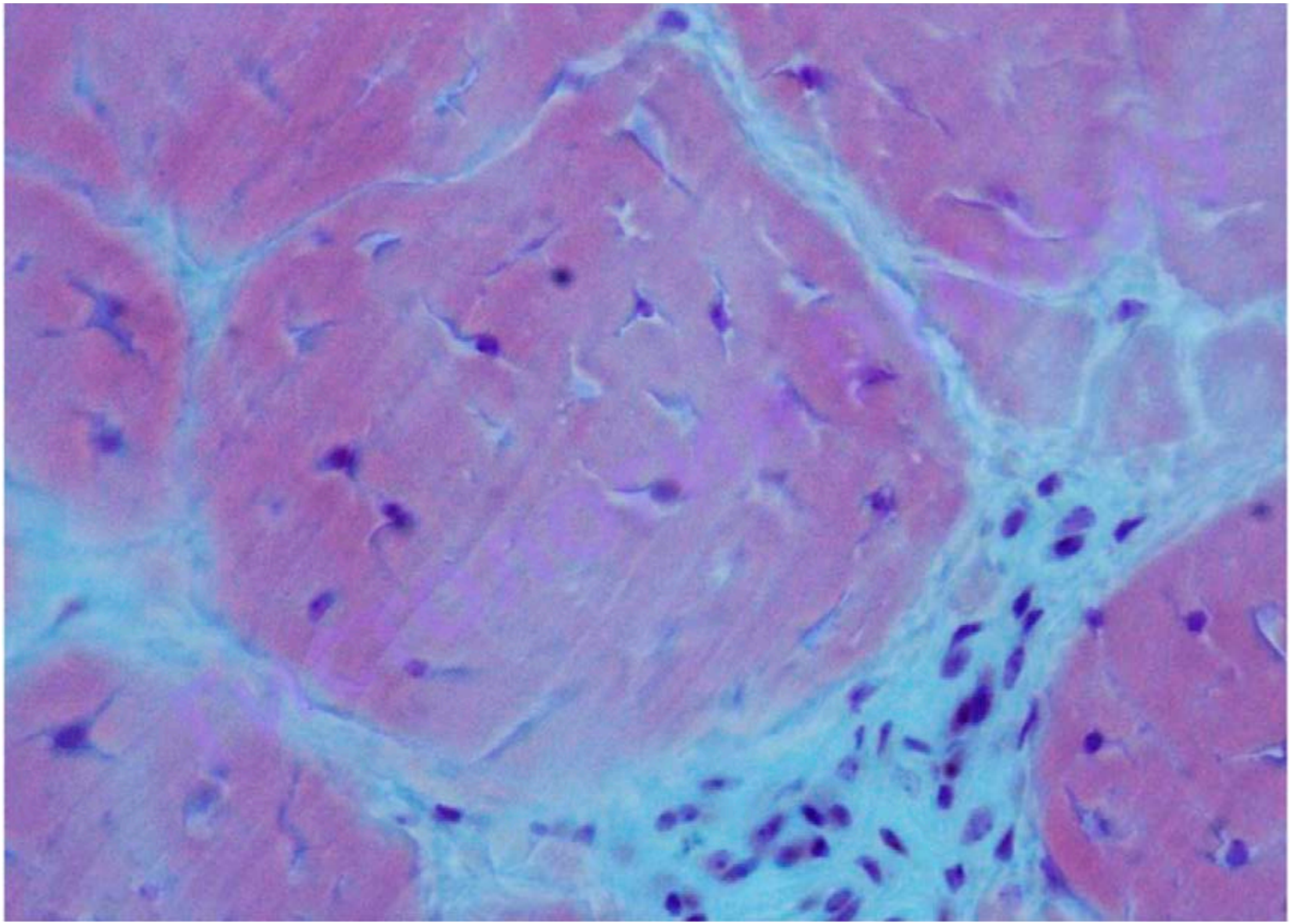


1- bundle of the first order, 2- nuclei of fibrocytes,
3- endotendinium, 4- bundle of the second order,
5- peritendinium, 6-epitendinium

Slide №62a “Dense regular connective tissue of a tendon, cross section”
Staining: H&E

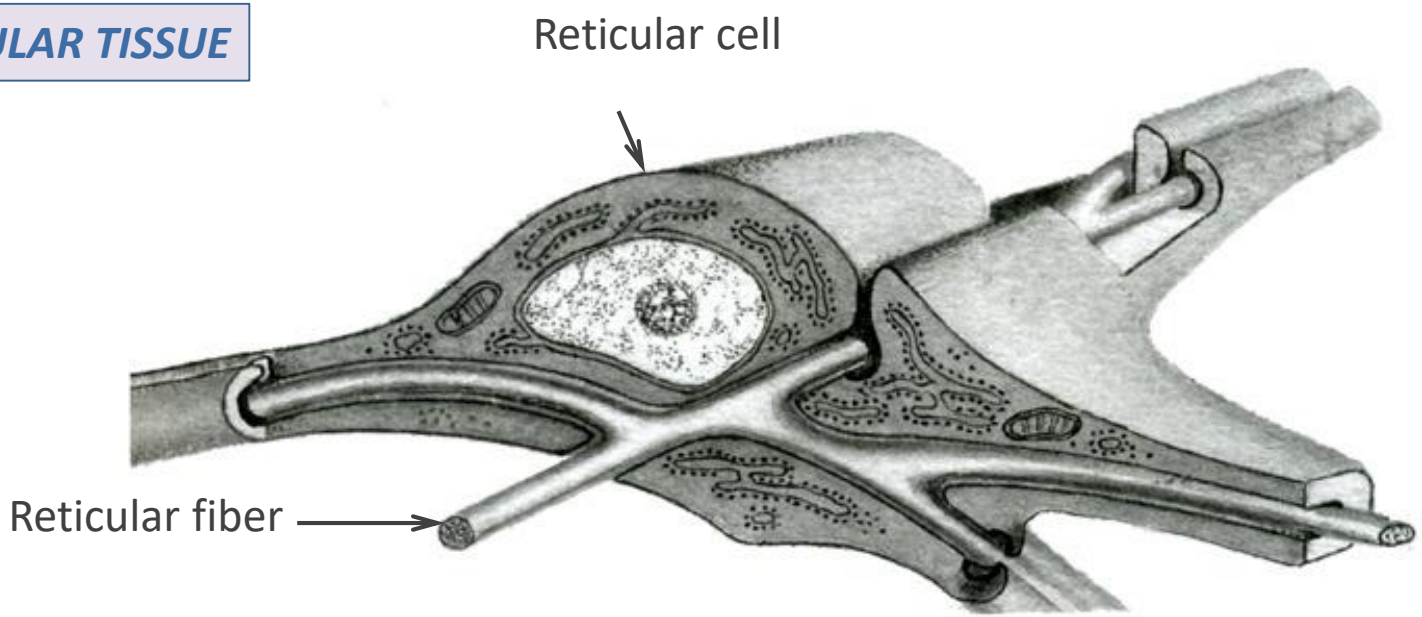


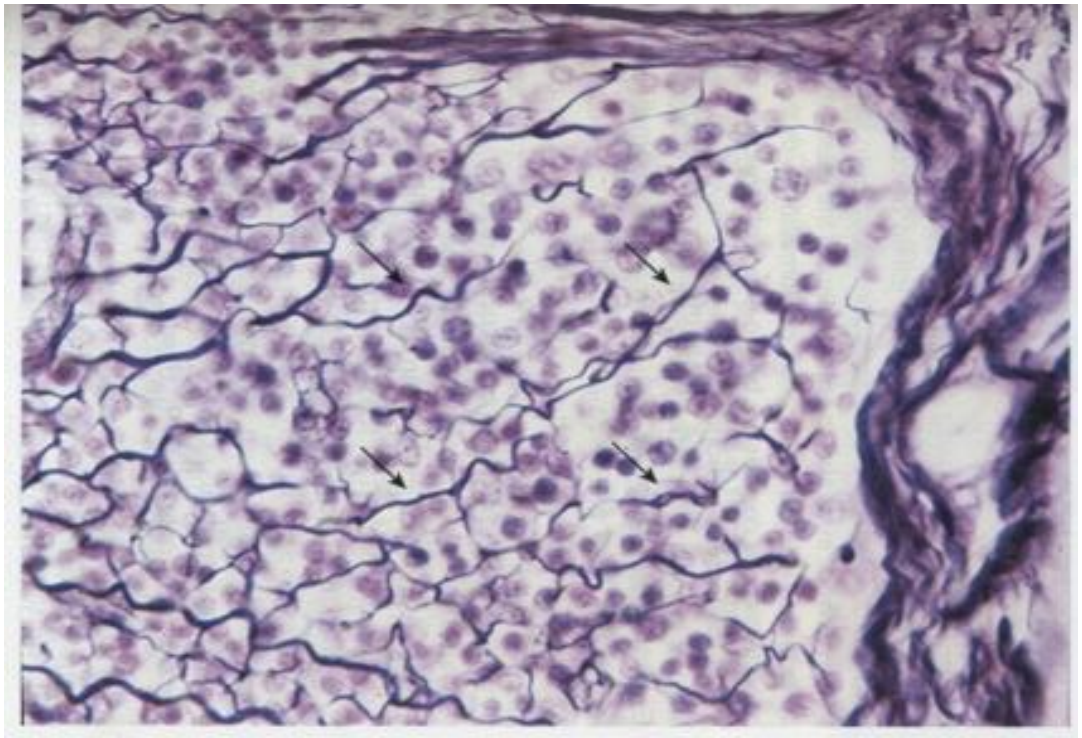
Slide №62a “Dense regular connective tissue of a tendon, cross section”
Staining: H&E



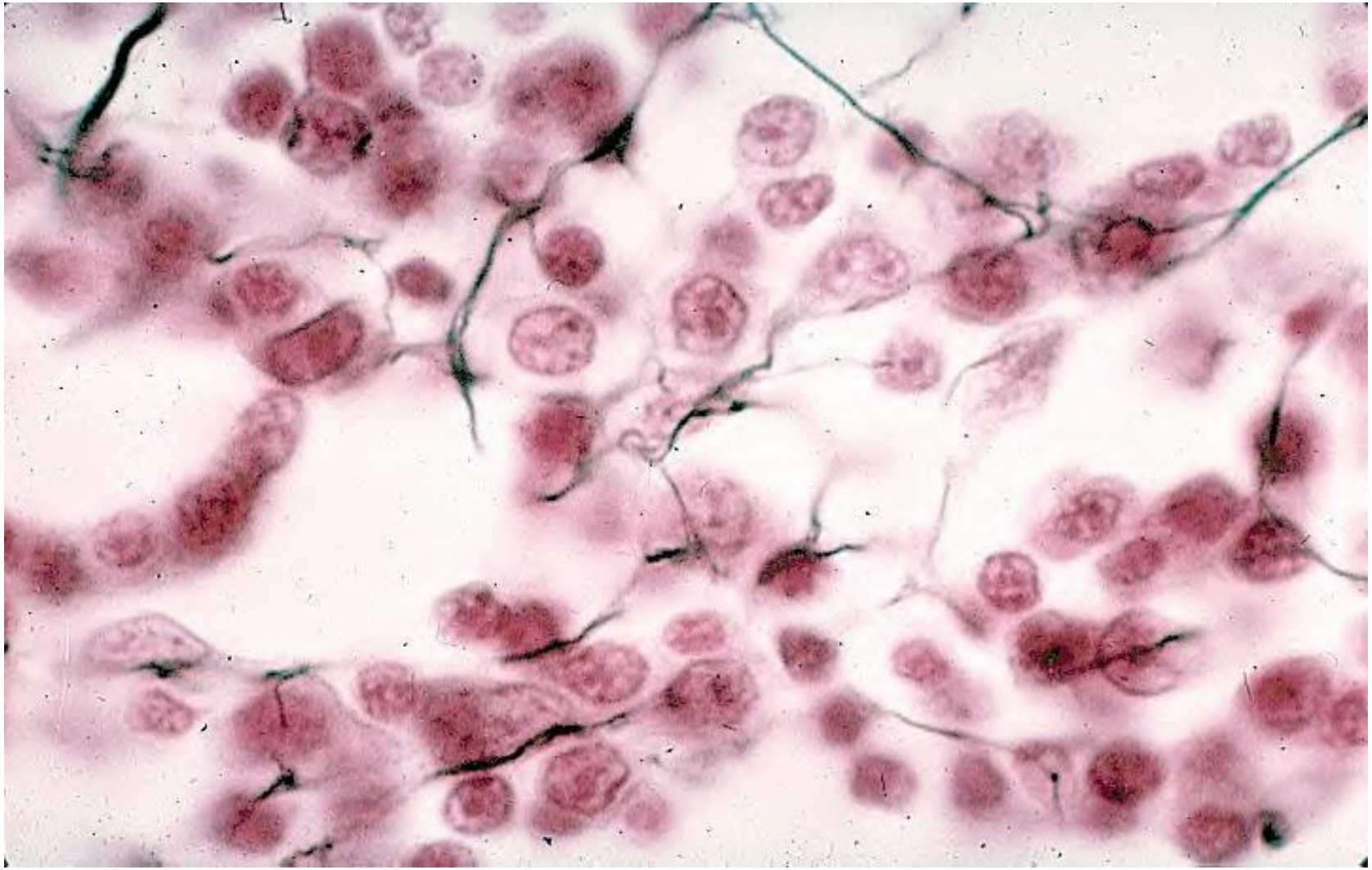
RETICULAR TISSUE

RETICULAR TISSUE

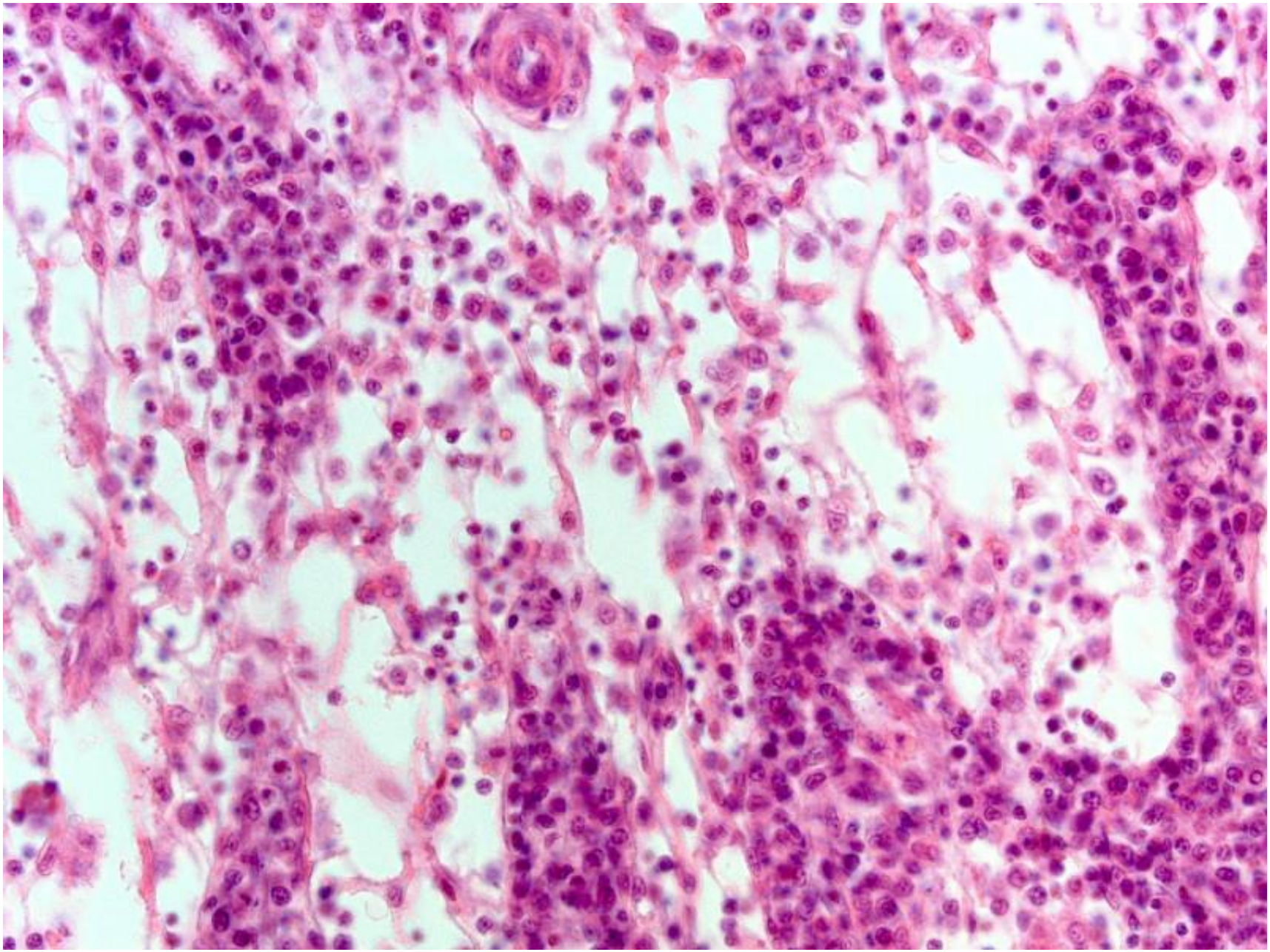




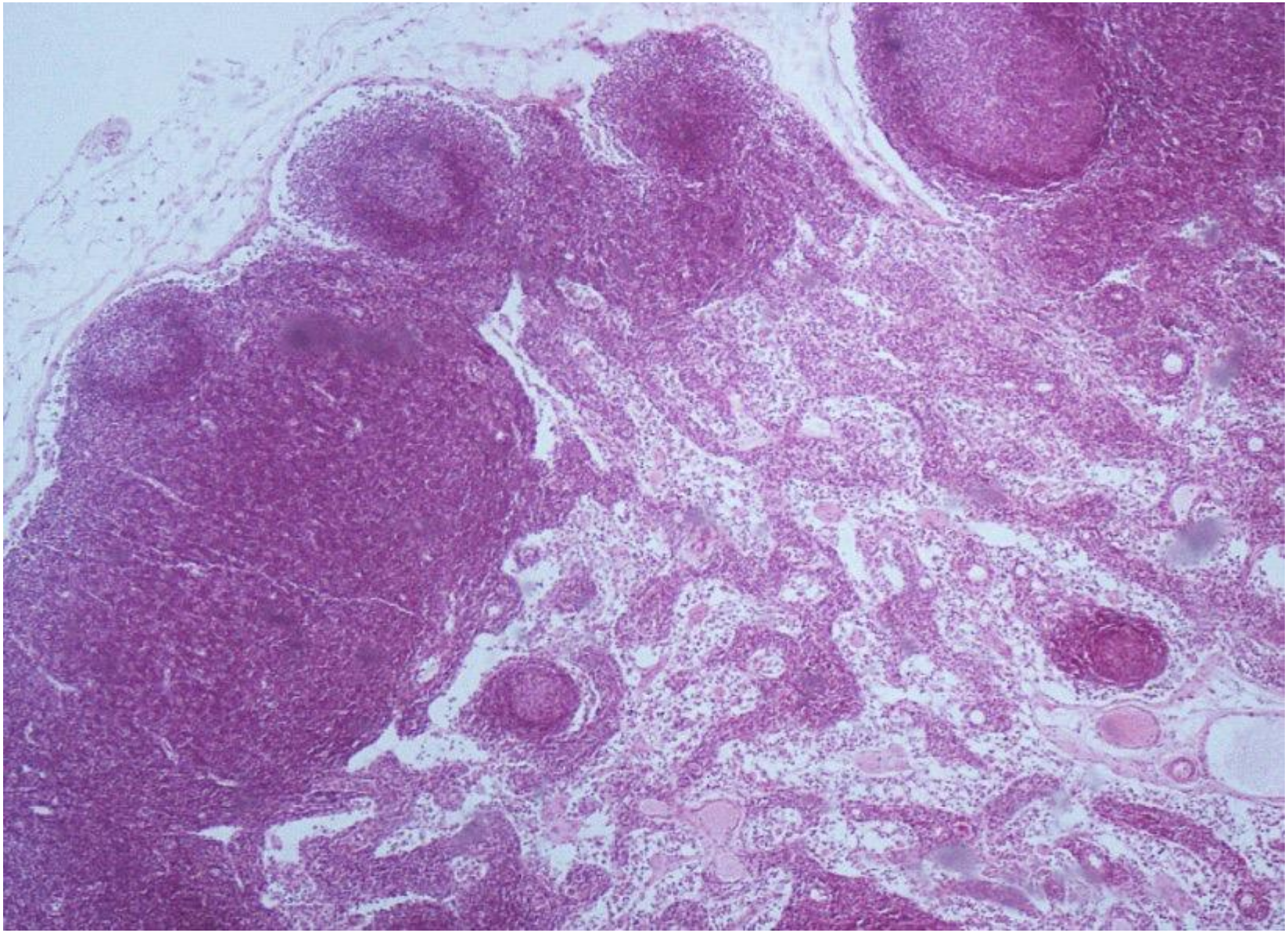
Reticular fibers are displayed with special silver-staining procedures



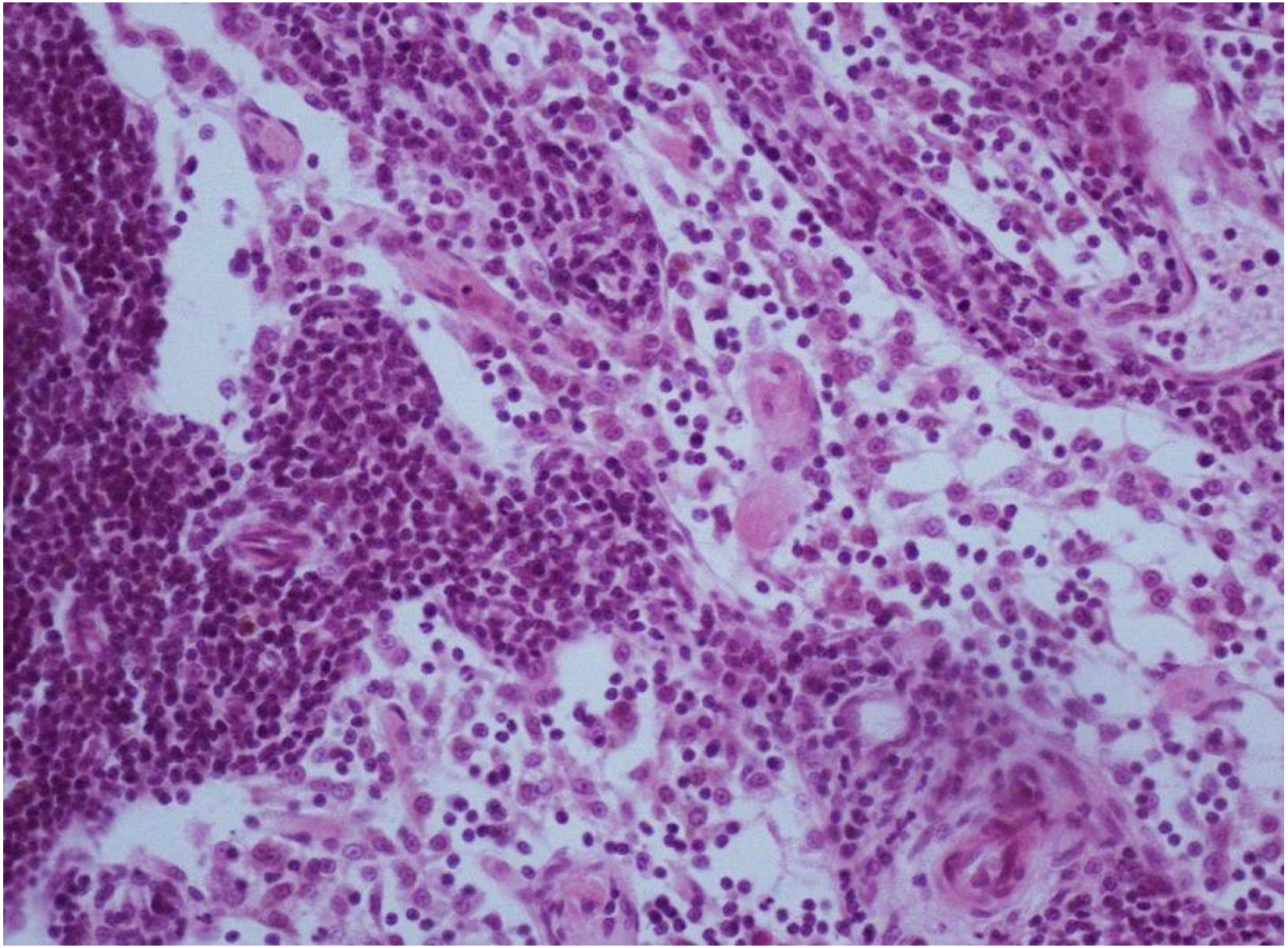
RETICULAR TISSUE



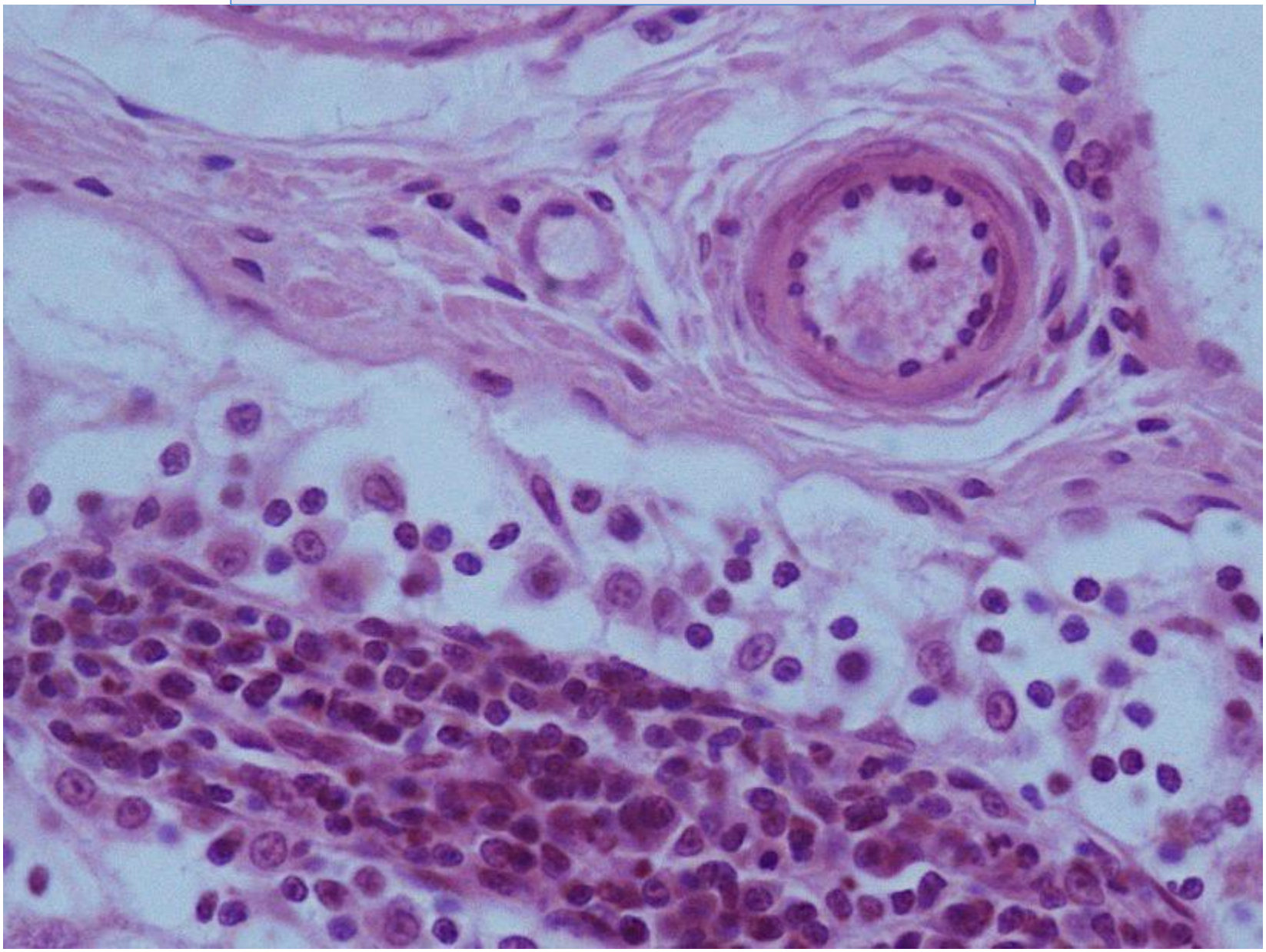
Slide №59 “Reticular tissue, section of a lymph node”
Staining: H&E



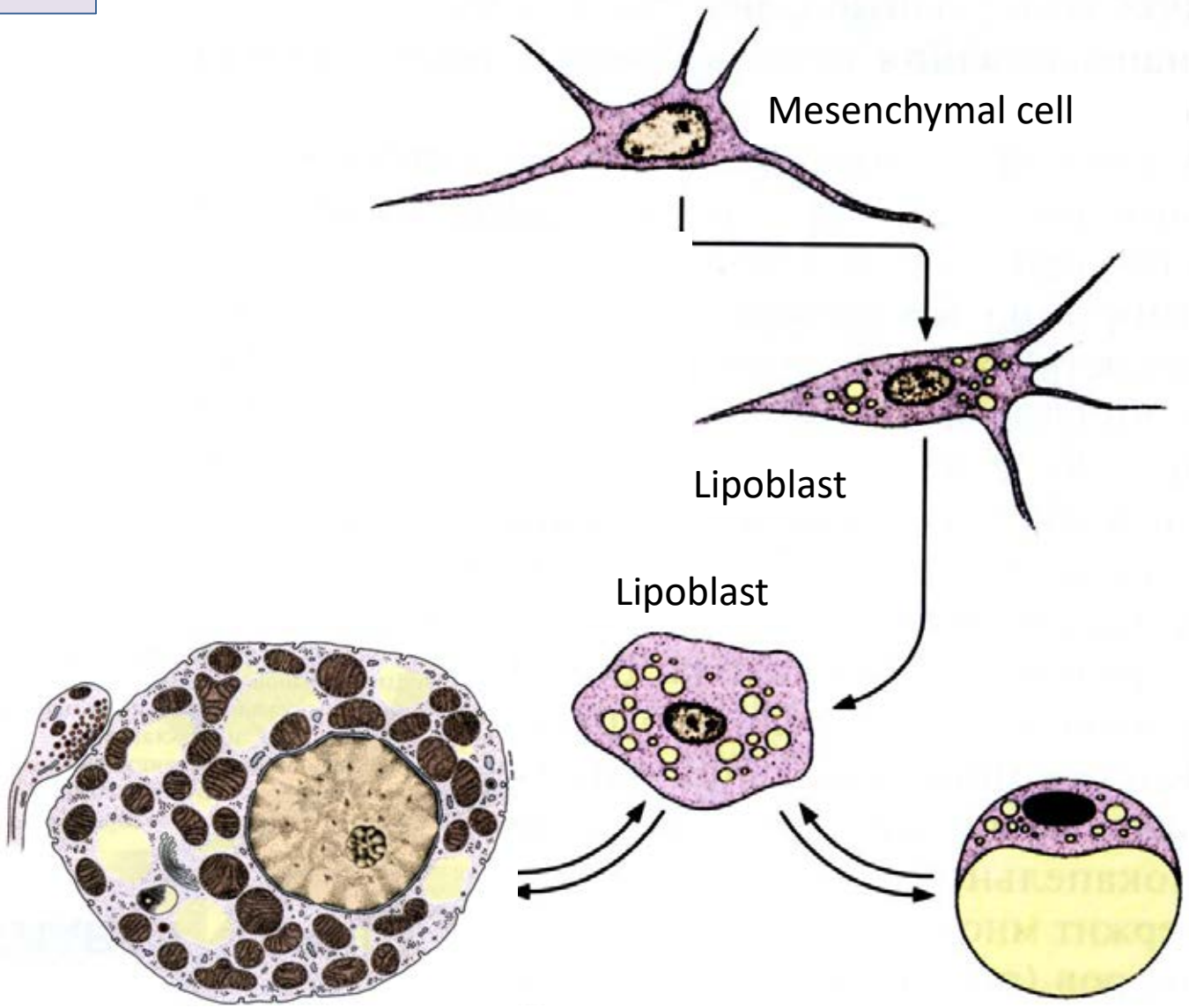
Slide №59 “Reticular tissue, section of a lymph node”
Staining: H&E



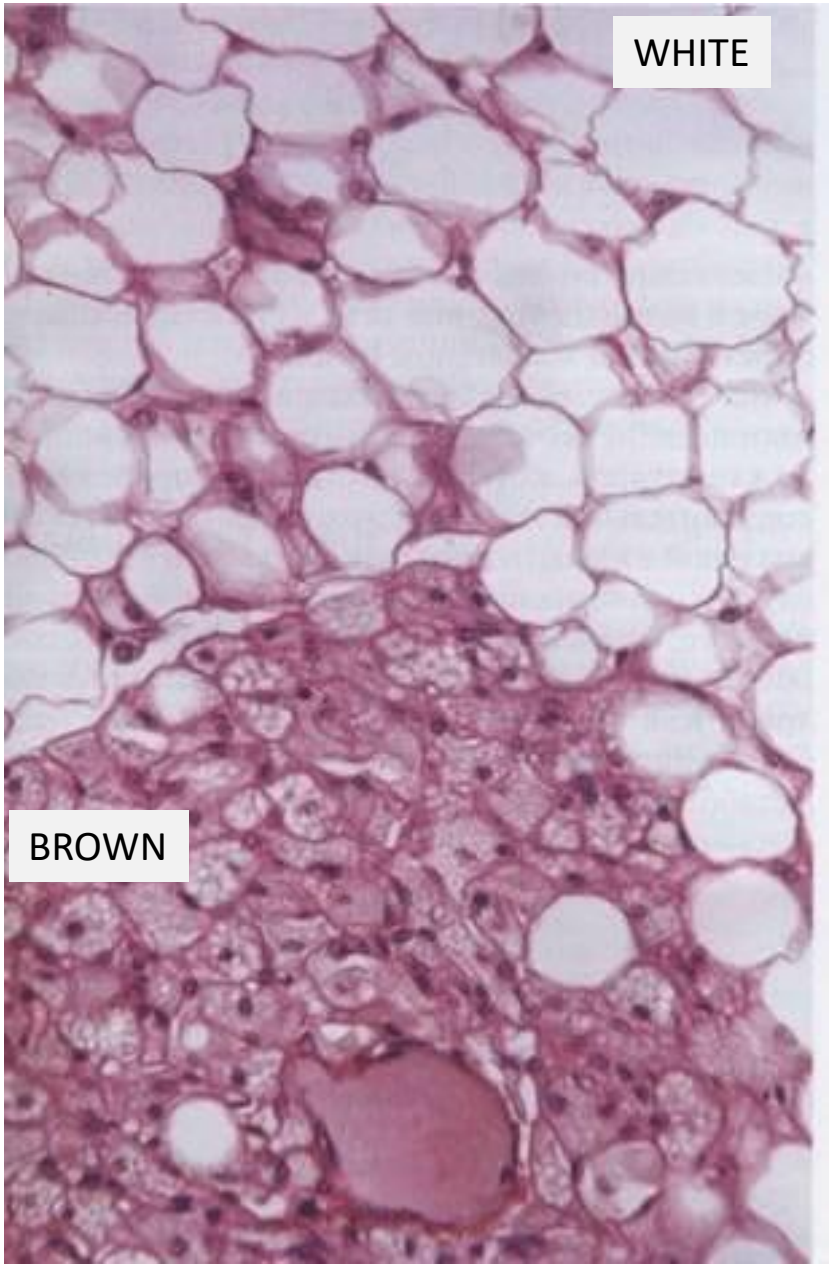
Slide №59 “Reticular tissue, section of a lymph node”
Staining: H&E

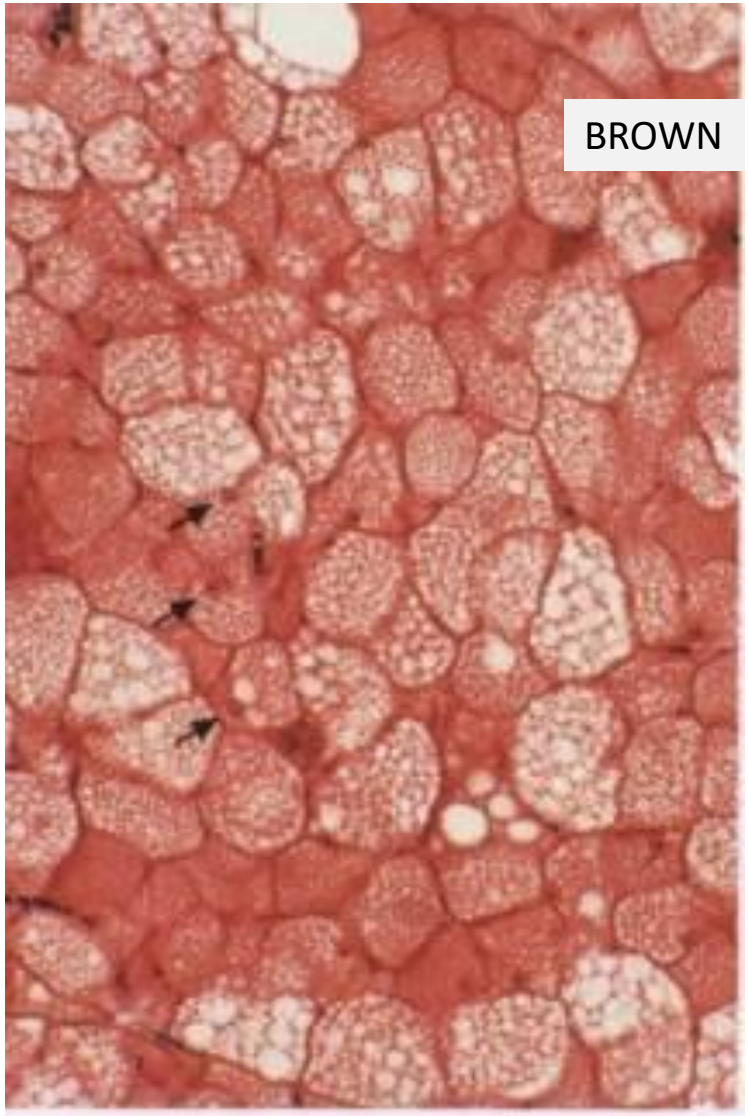


ADIPOSE TISSUE

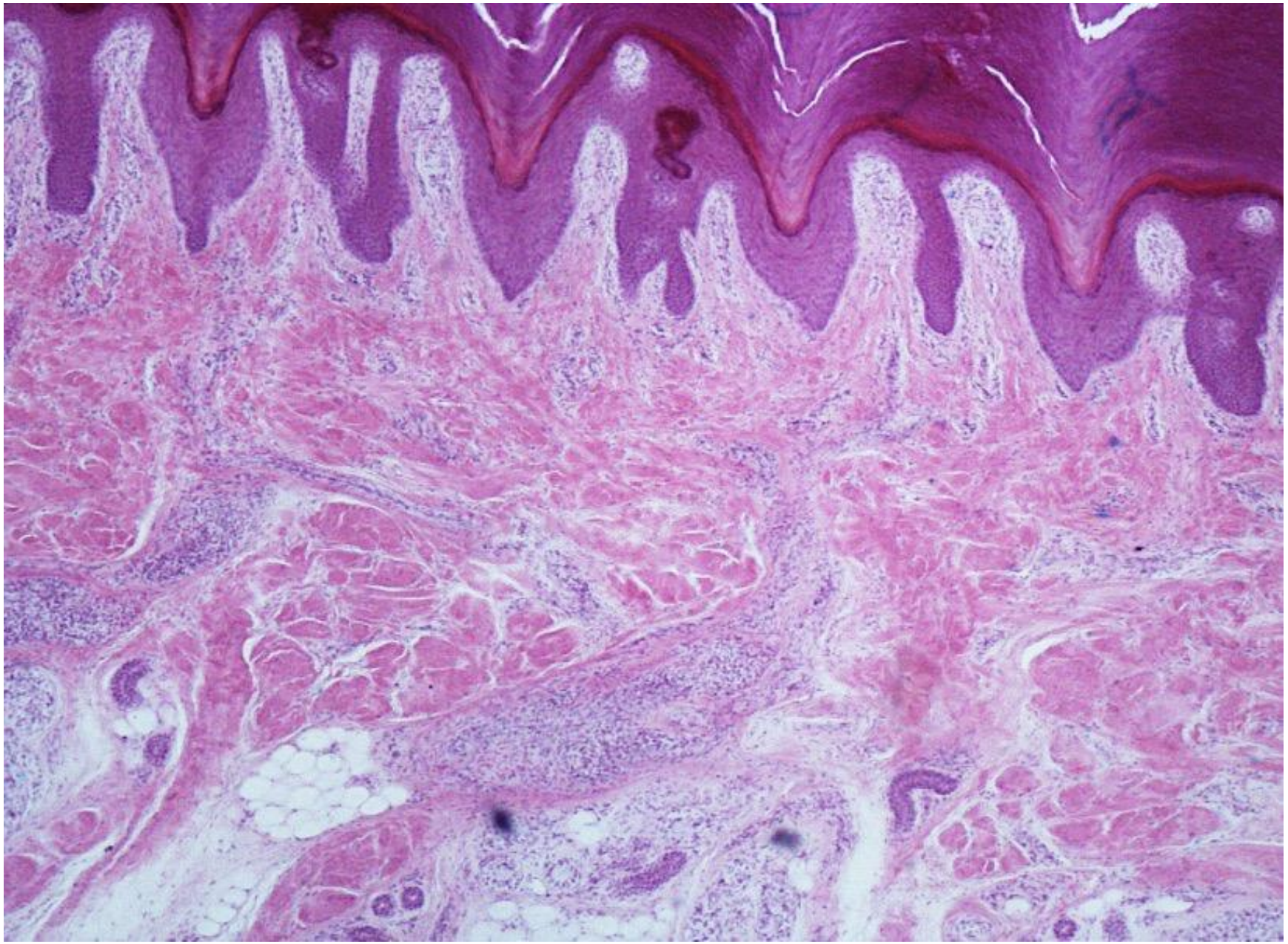


ADIPOSE TISSUE

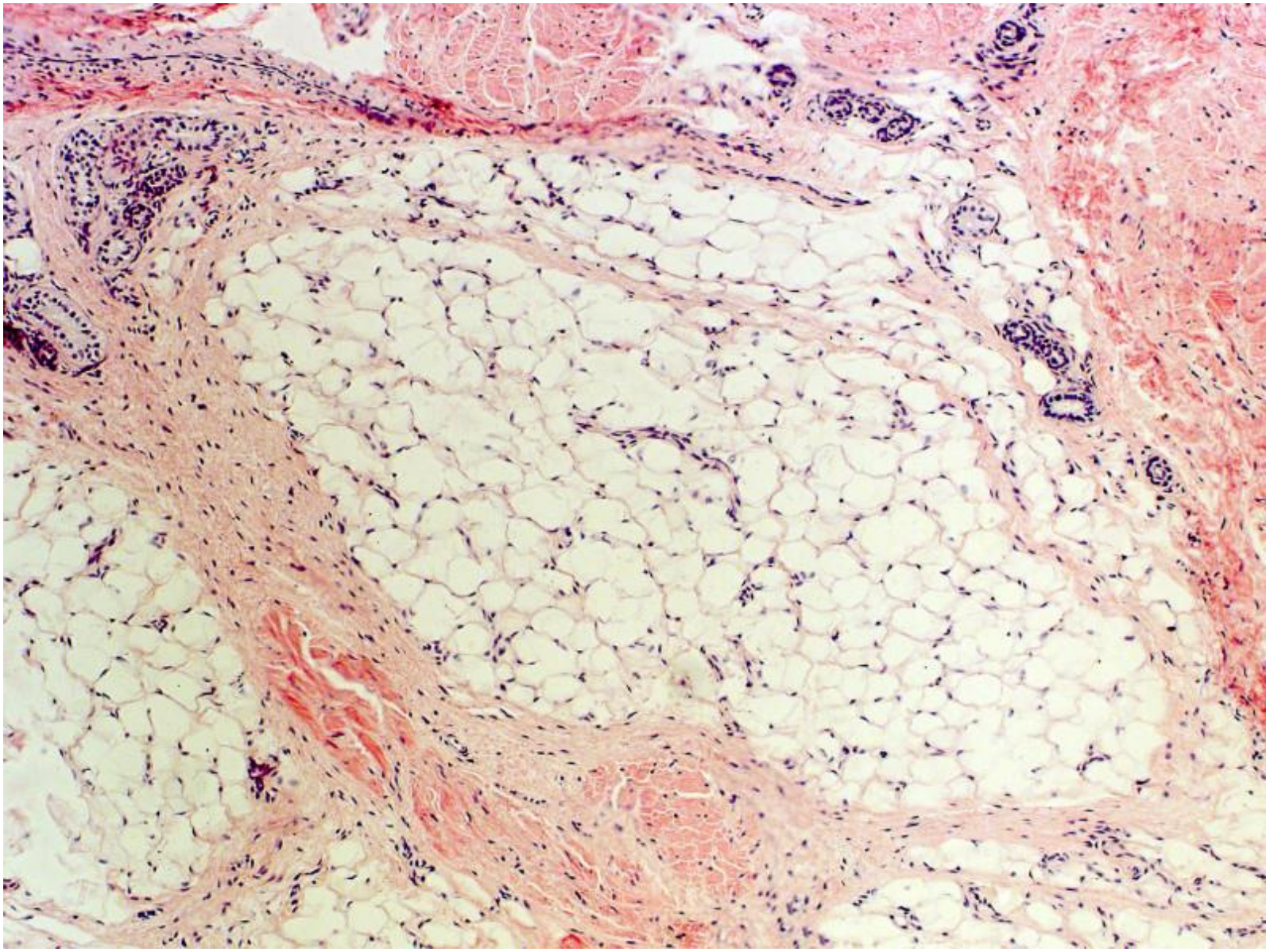




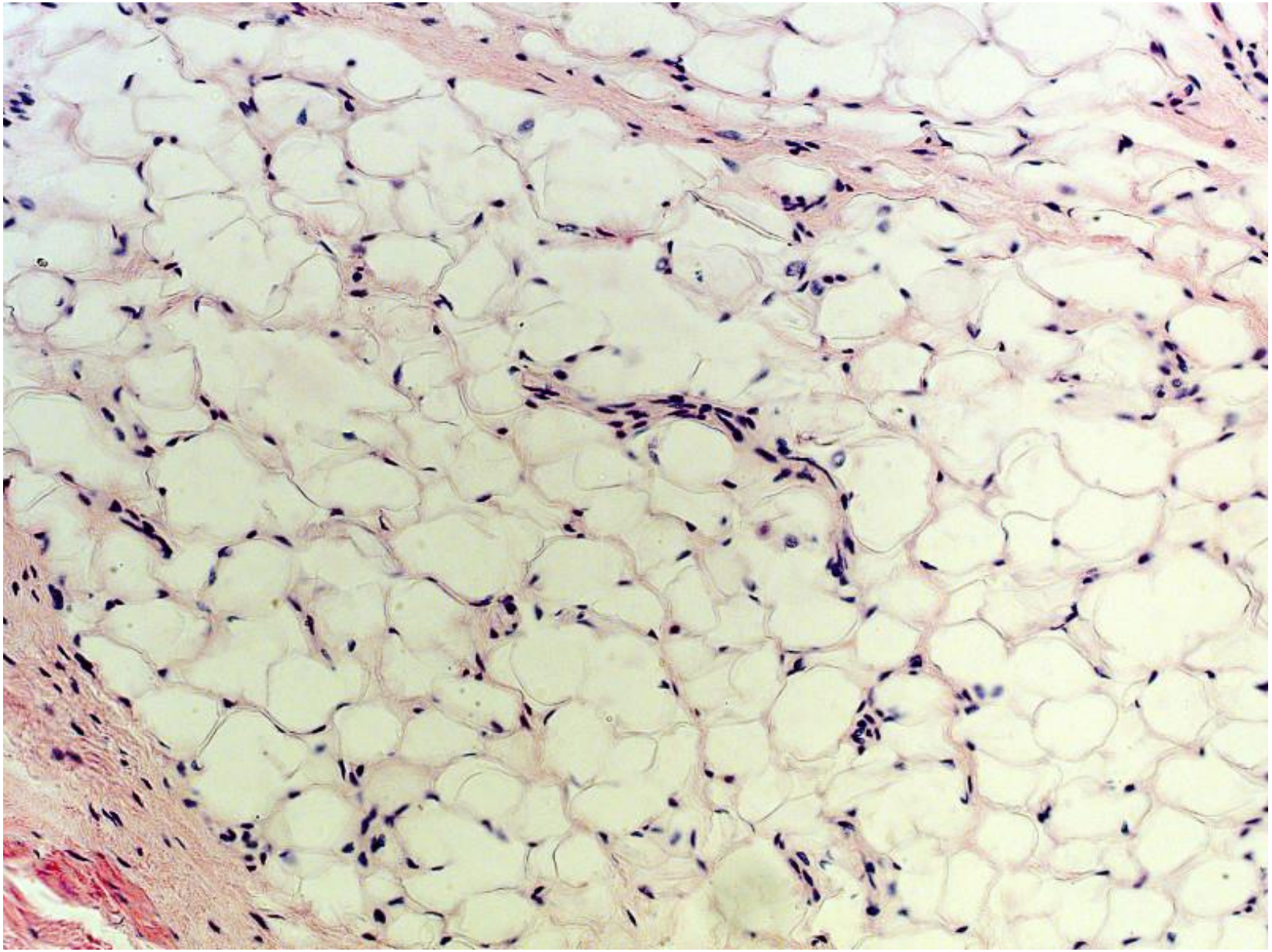
Slides №60, 61 “Section of the thick skin”
Staining: H&E



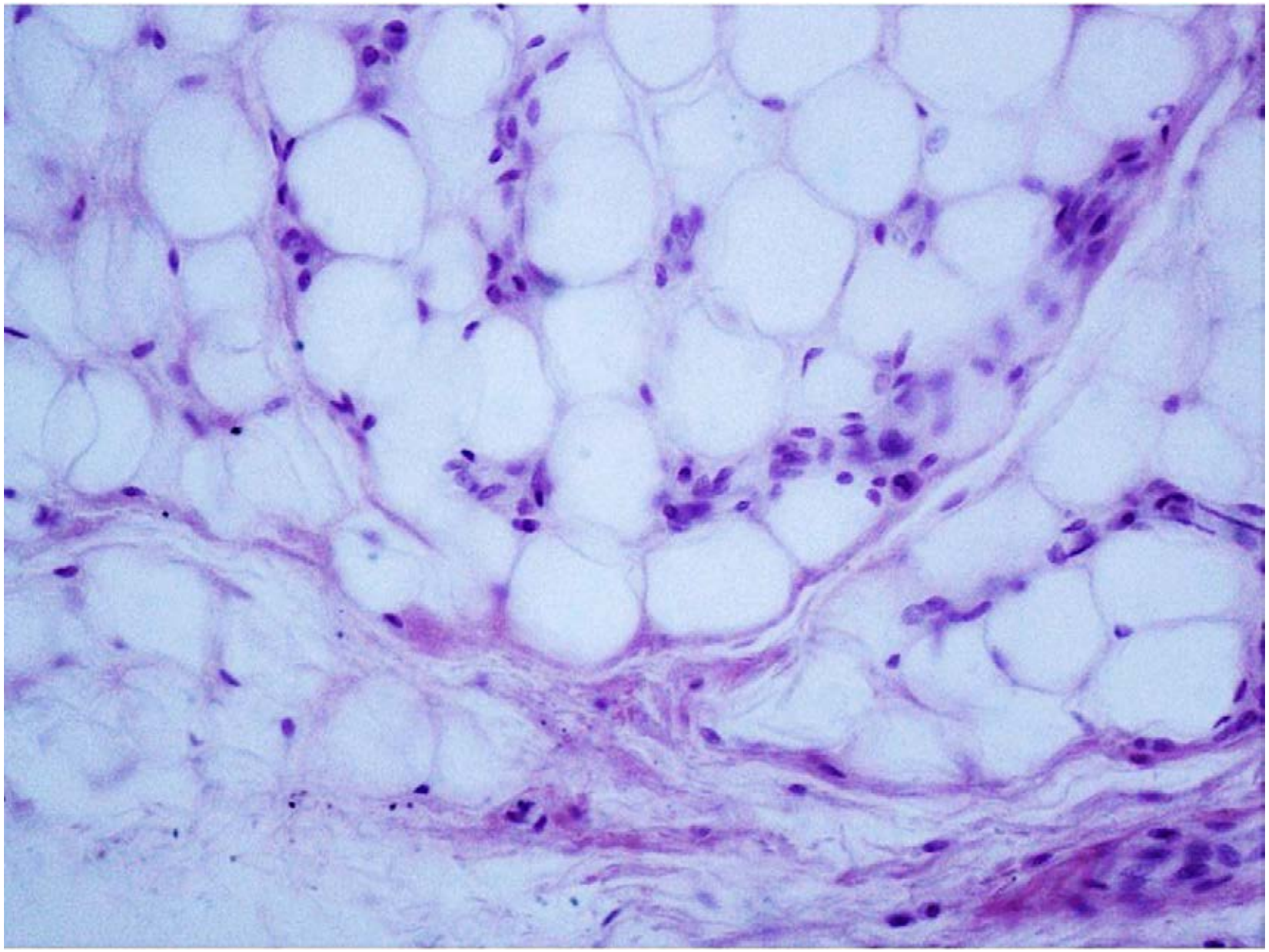
Slides №60, 61 “Section of the thick skin. Adipose tissue”
Staining: H&E



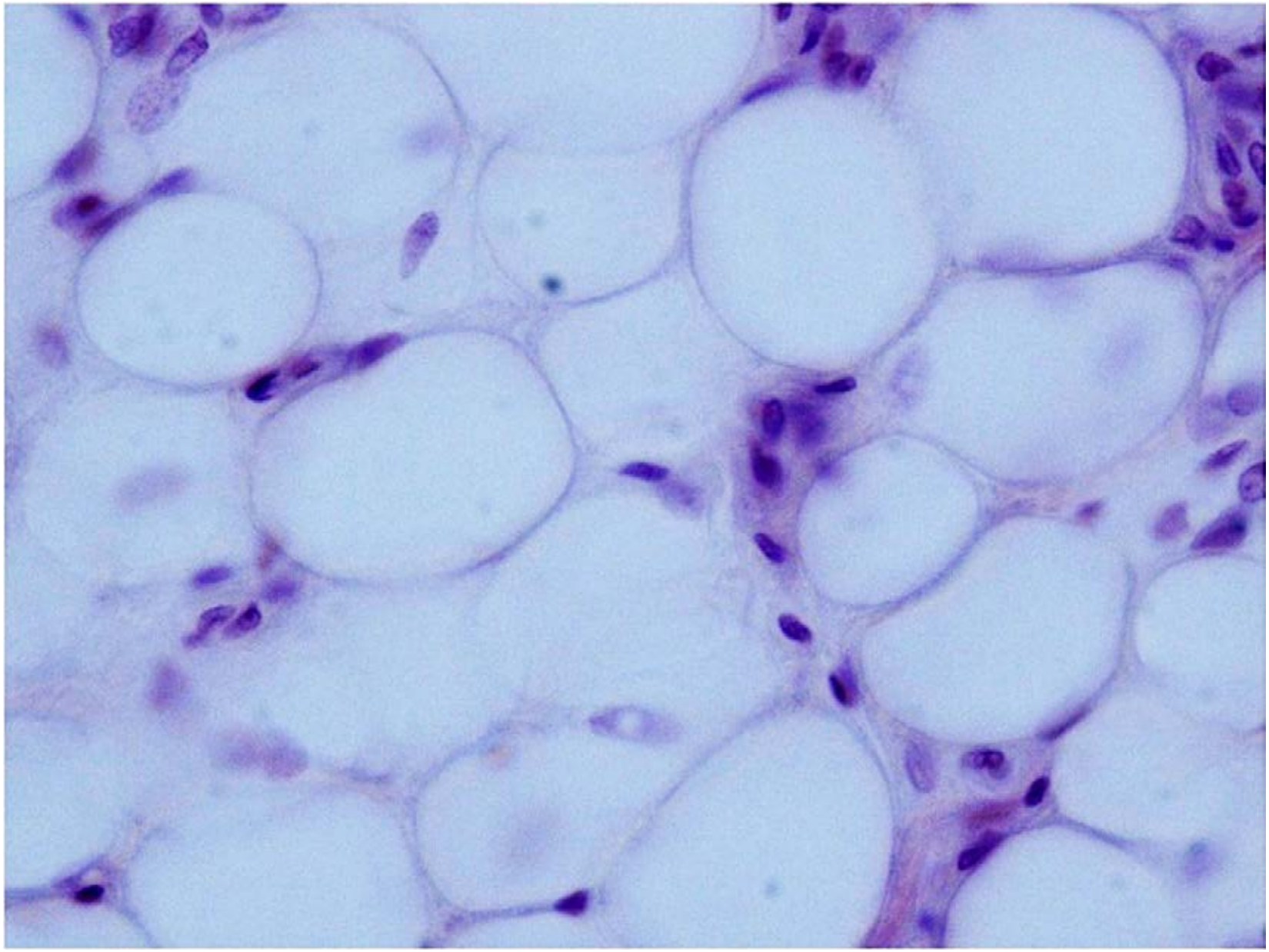
Slides №60, 61 “Section of the thick skin. Adipose tissue”
Staining: H&E



Slides №60, 61 “Section of the thick skin. Adipose tissue”
Staining: H&E

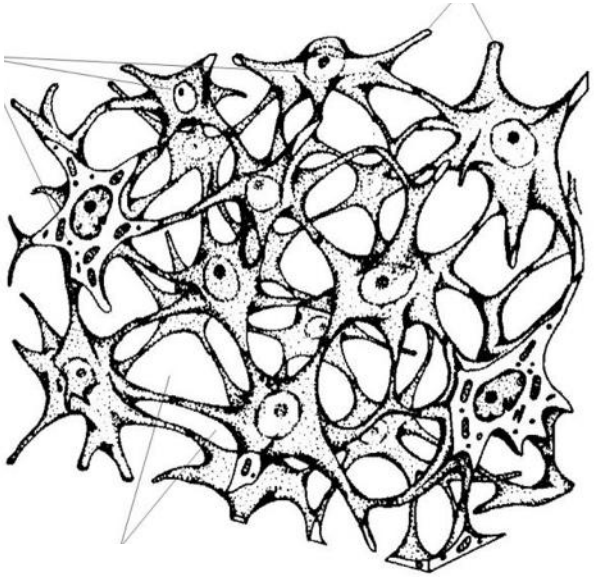


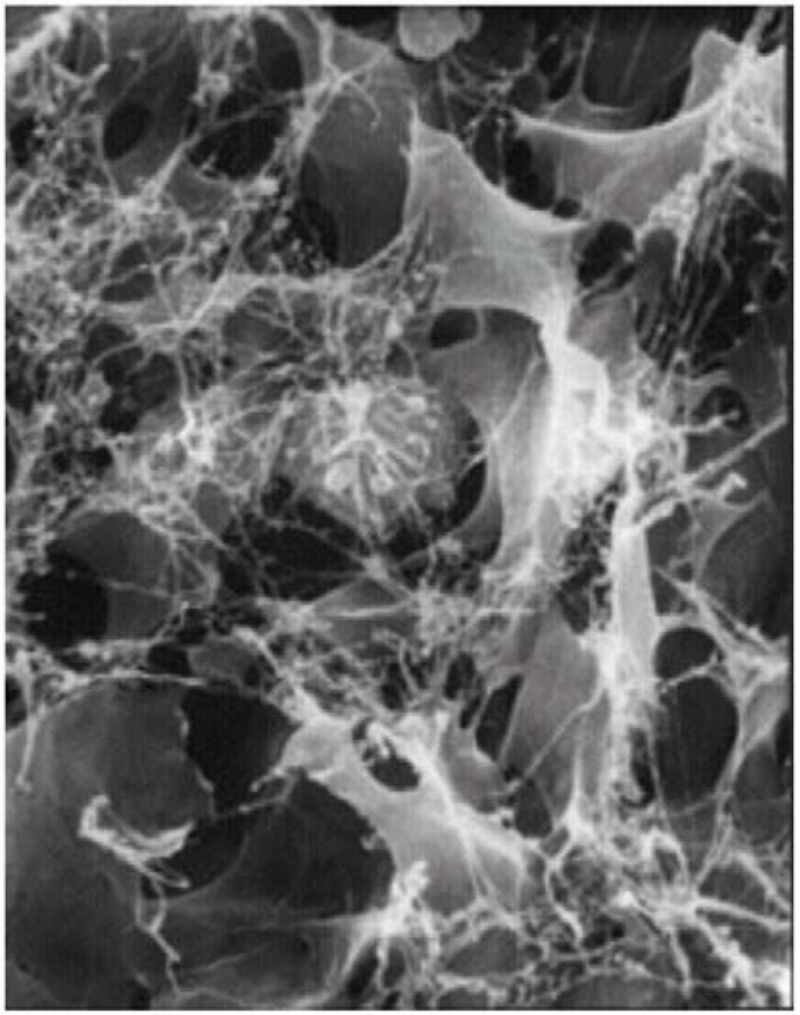
Slides №60, 61 “Section of the thick skin. Adipose tissue”
Staining: H&E



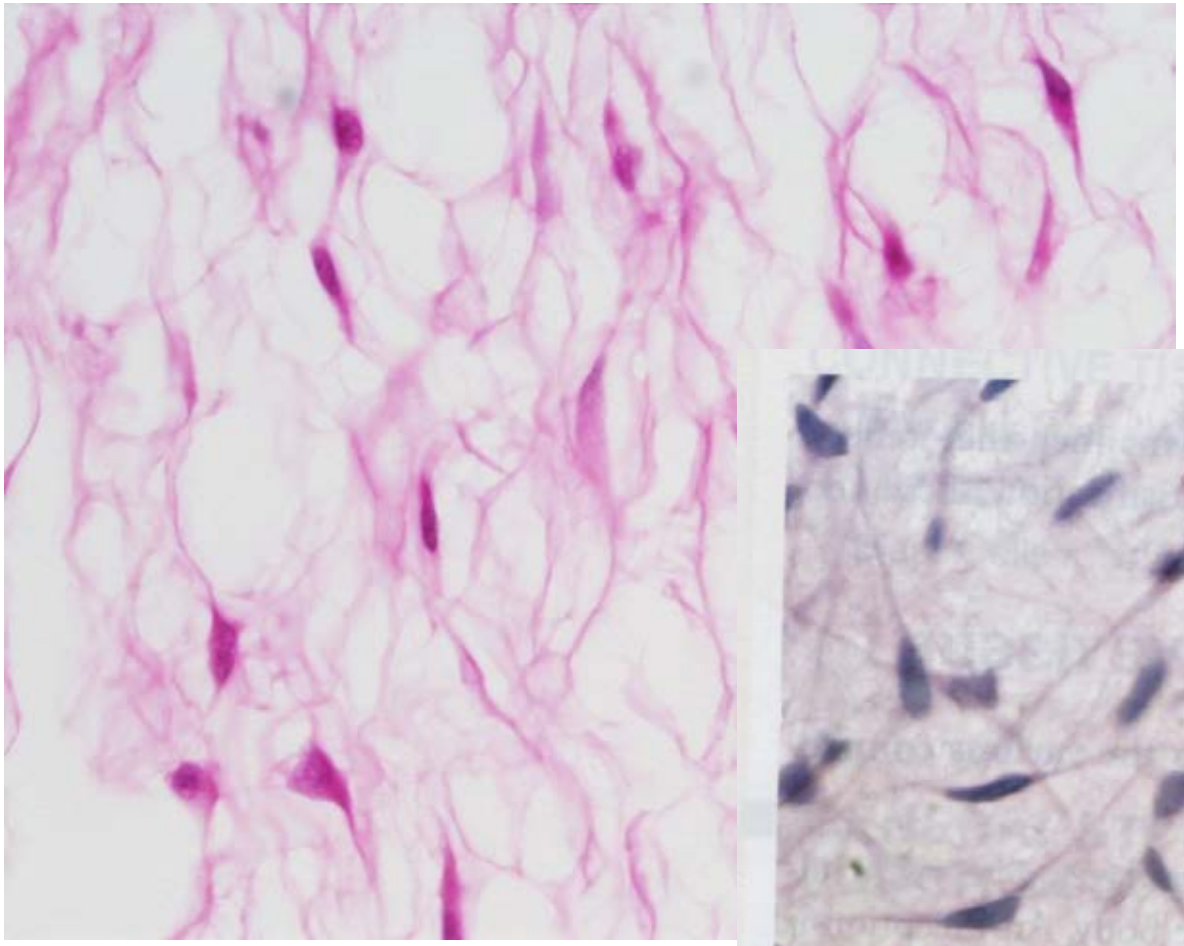
MESENCHYME

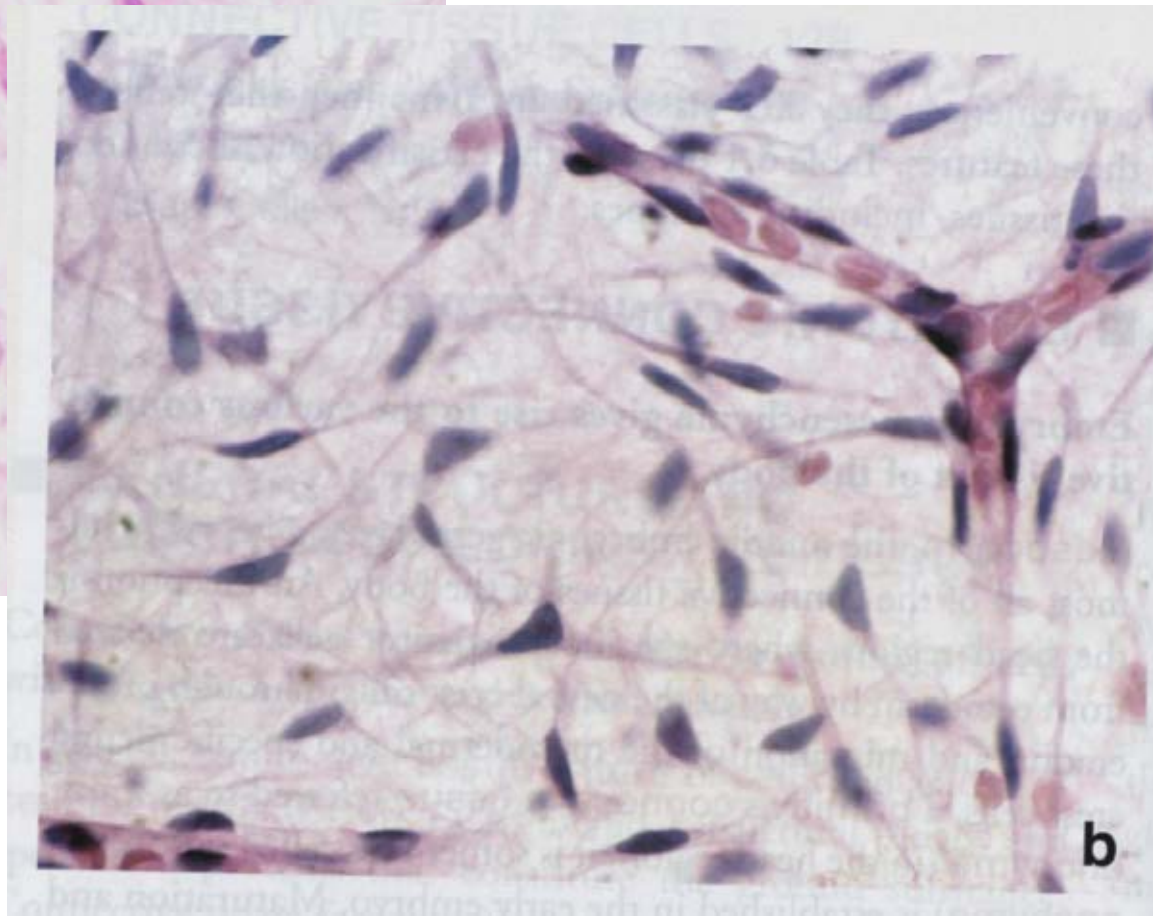
Mesenchymal cells

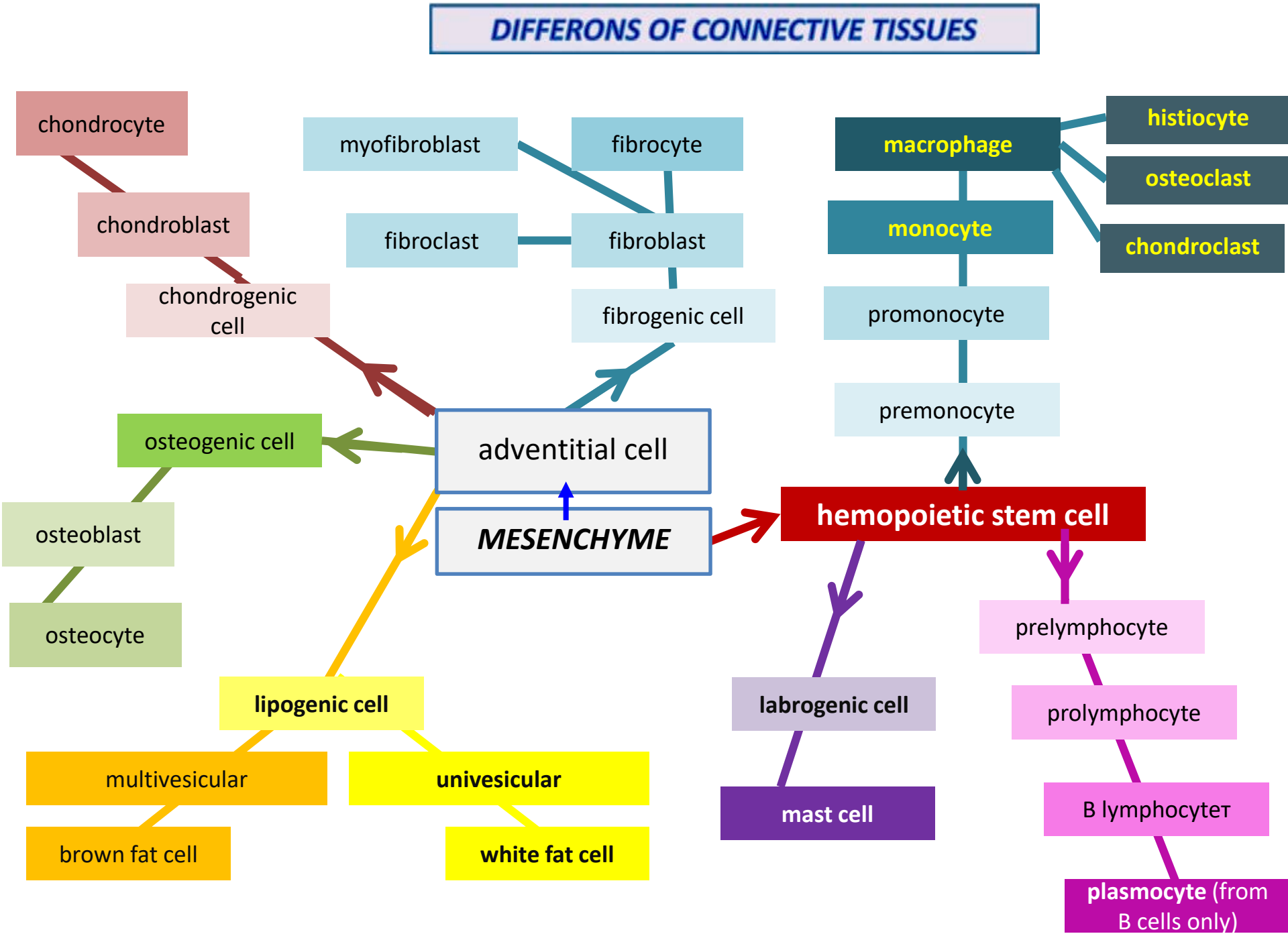




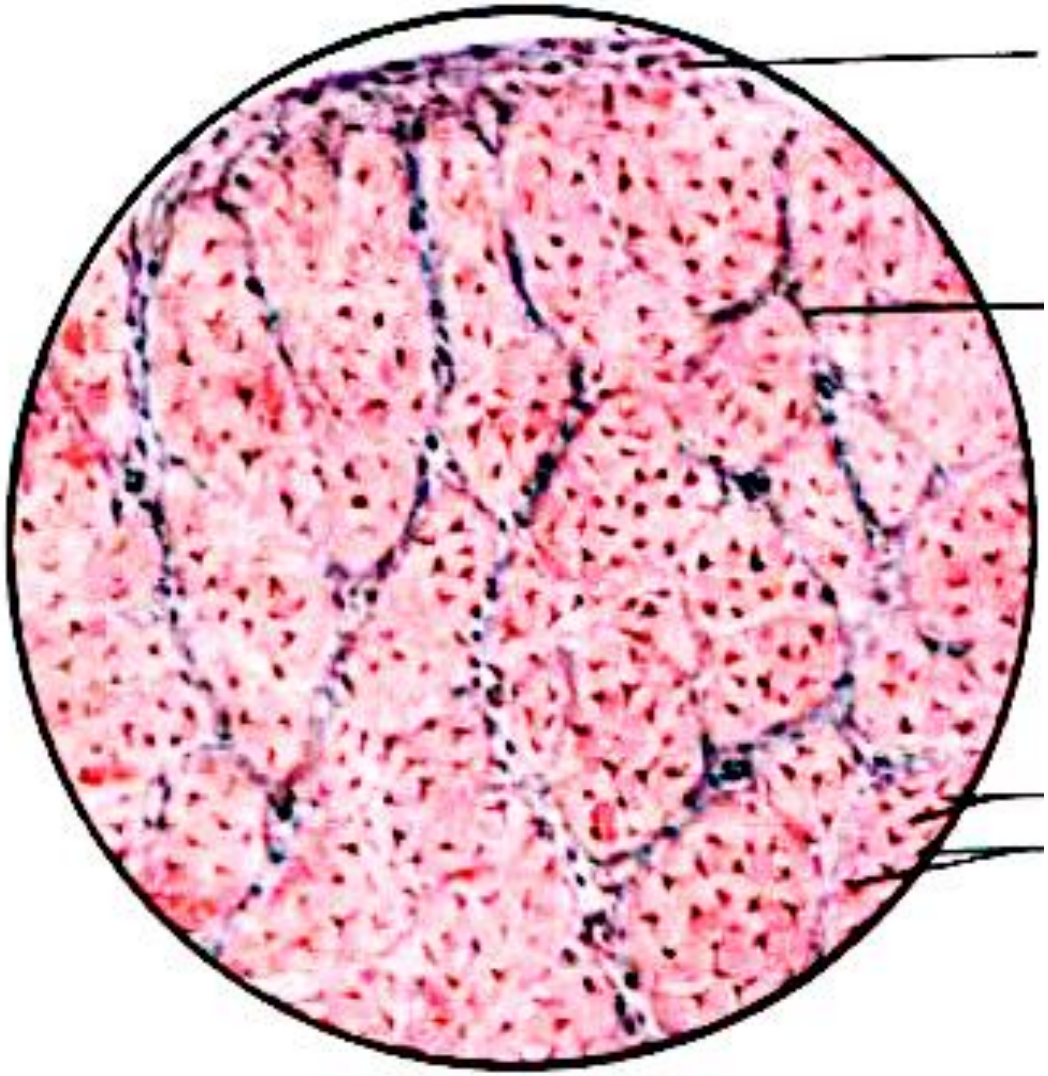
MUCOUS TISSUE

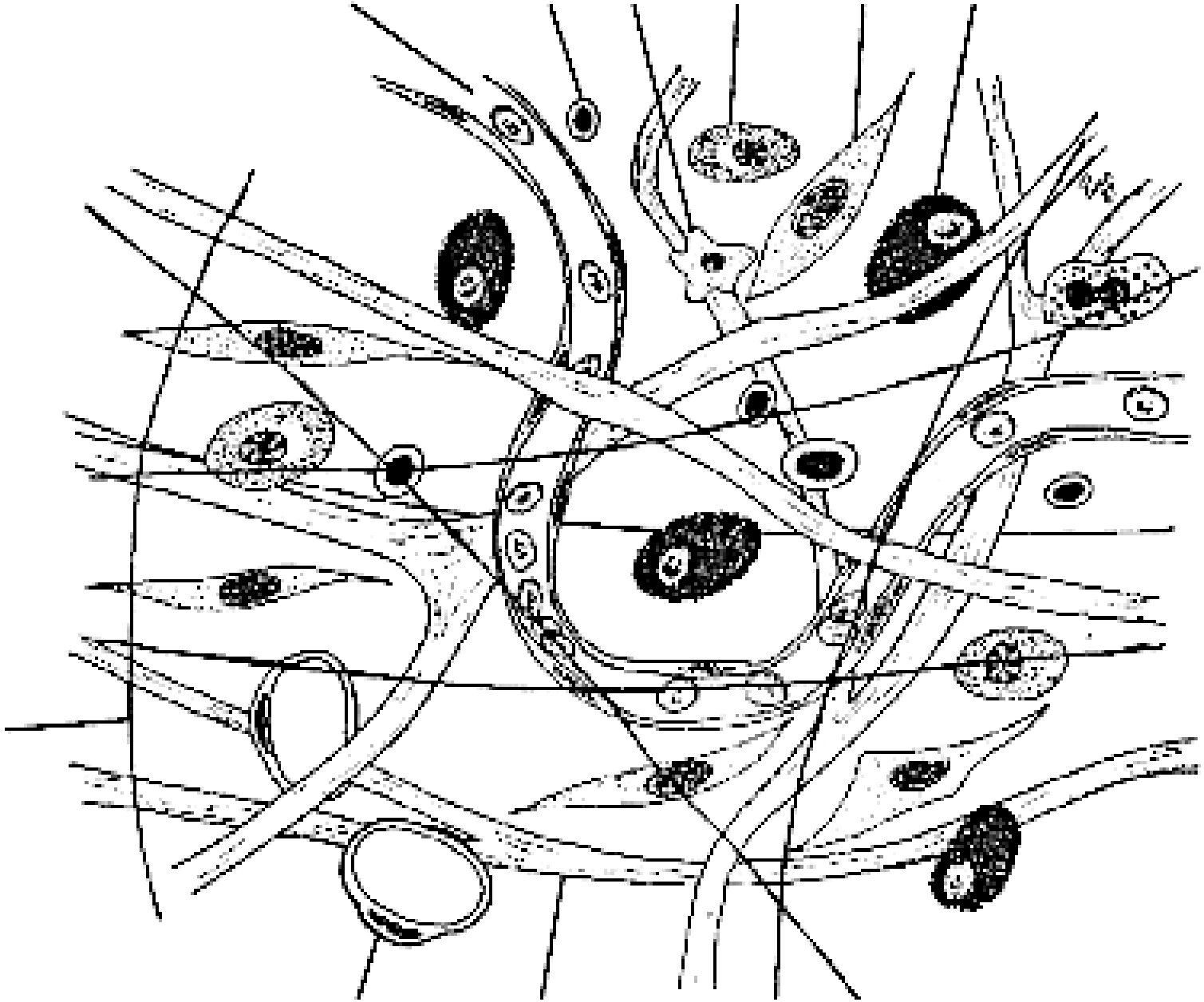


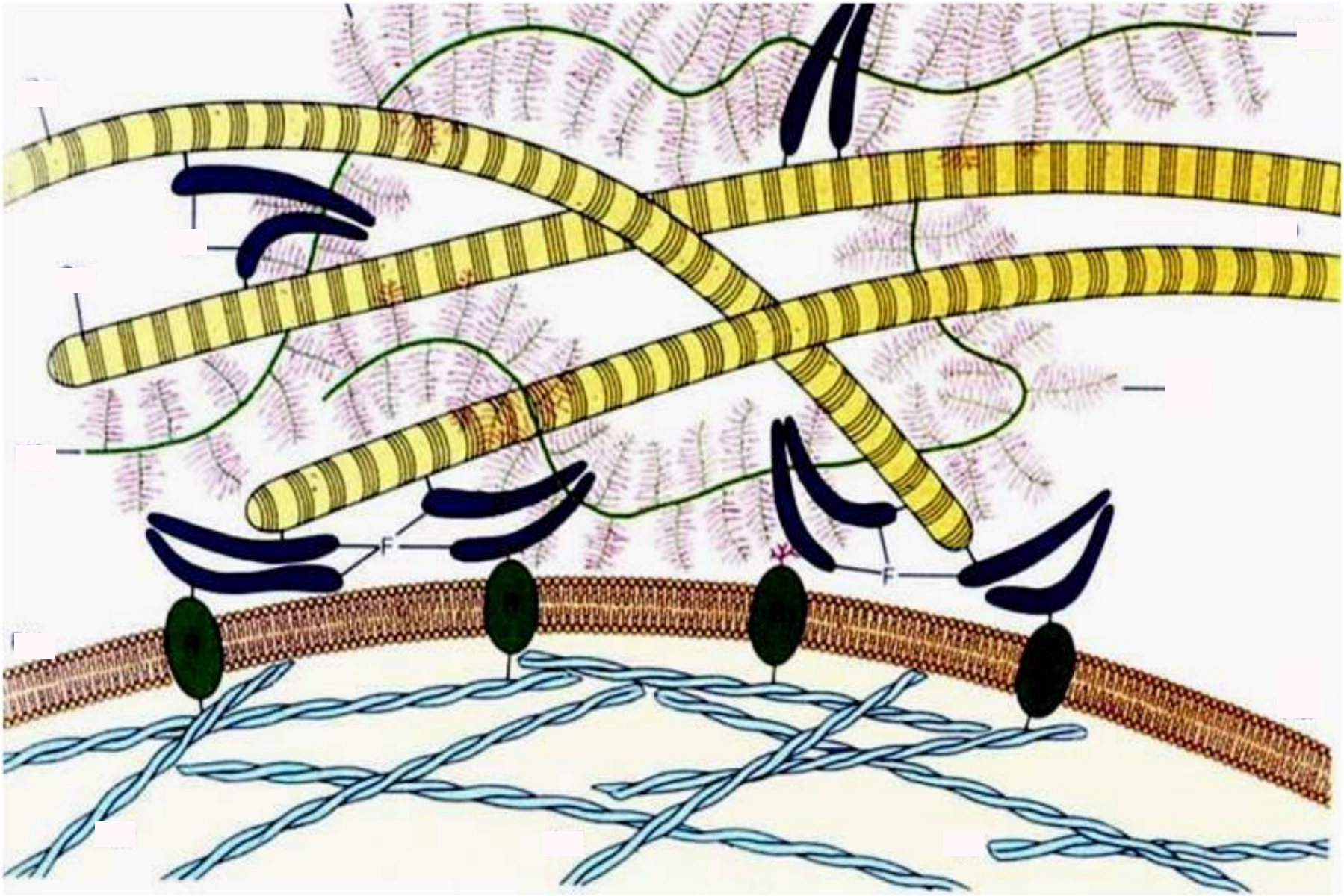


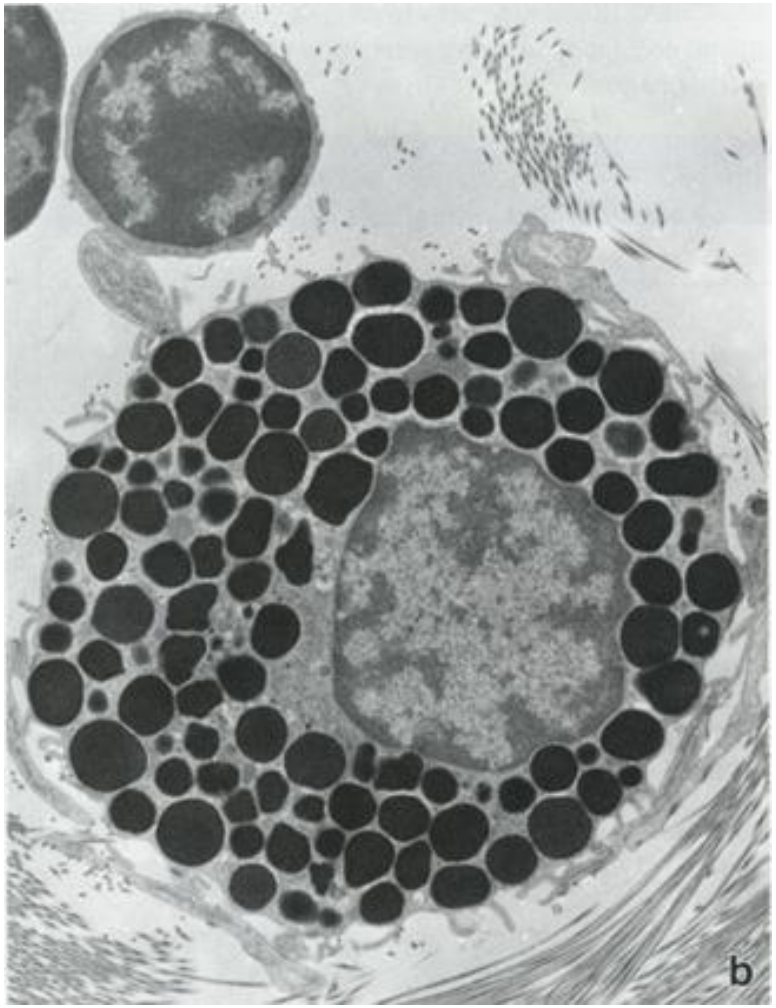

DIFFERONS OF CONNECTIVE TISSUES
chondrocyte
chondroblast
chondrogenic cell
myofibroblast
fibrocyte
fibroclast
fibroblast
fibrogenic cell
macrophage
histiocyte
osteoclast
monocyte
chondroclast
promonocyte
premonocyte
osteogenic cell
adventitial cell
MESENCHYME
hemopoietic stem cell
osteoblast
osteocyte
lipogenic cell
labrogenic cell
prelymphocyte
prolymphocyte
multivesicular
univesicular
mast cell
B lymphocyteт
brown fat cell
white fat cell
plasmocyte (from B cells only)

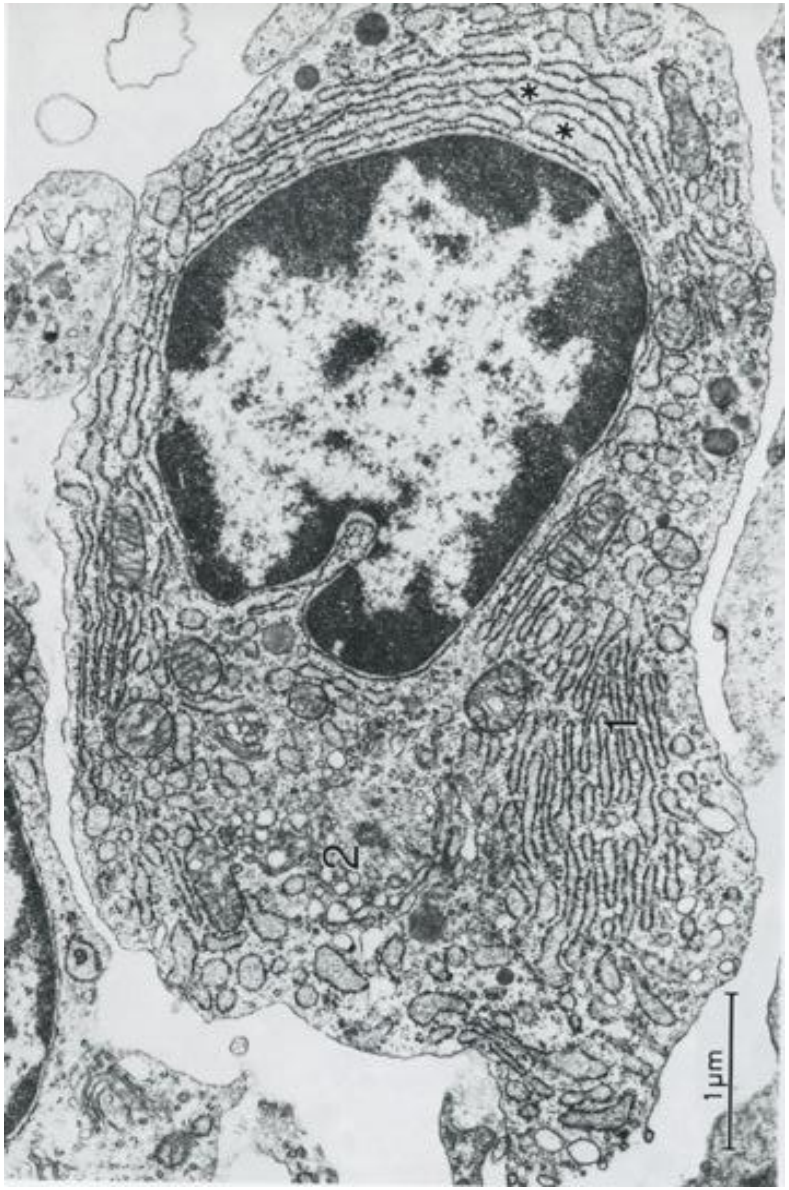
CONTROL QUESTIONS

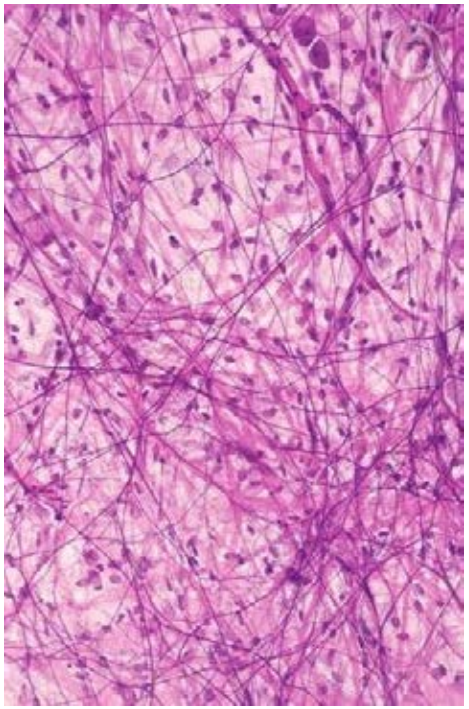


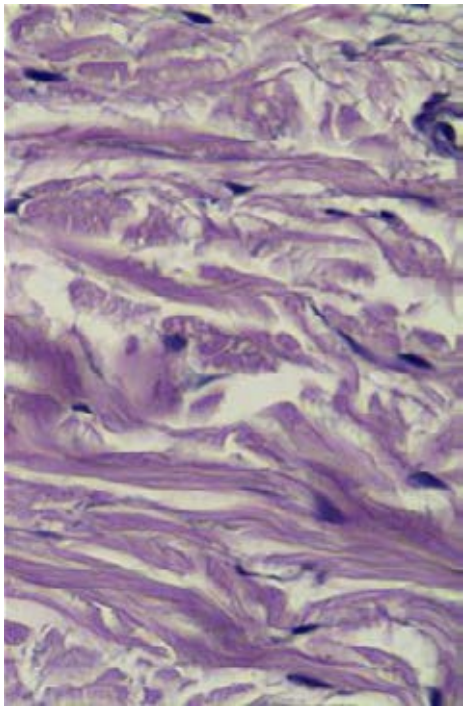


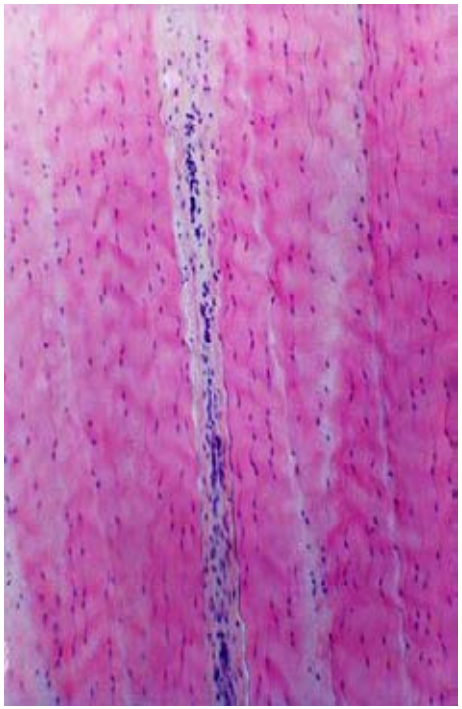

F
F


b

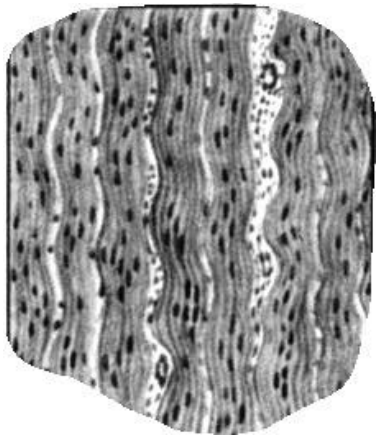

*
*
1
2
1µm

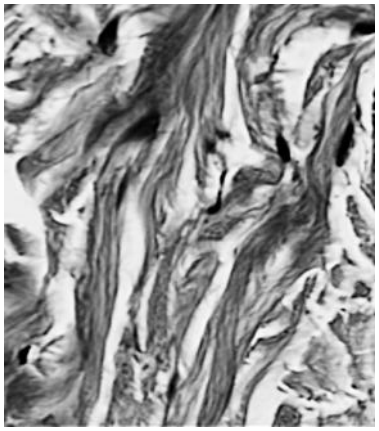


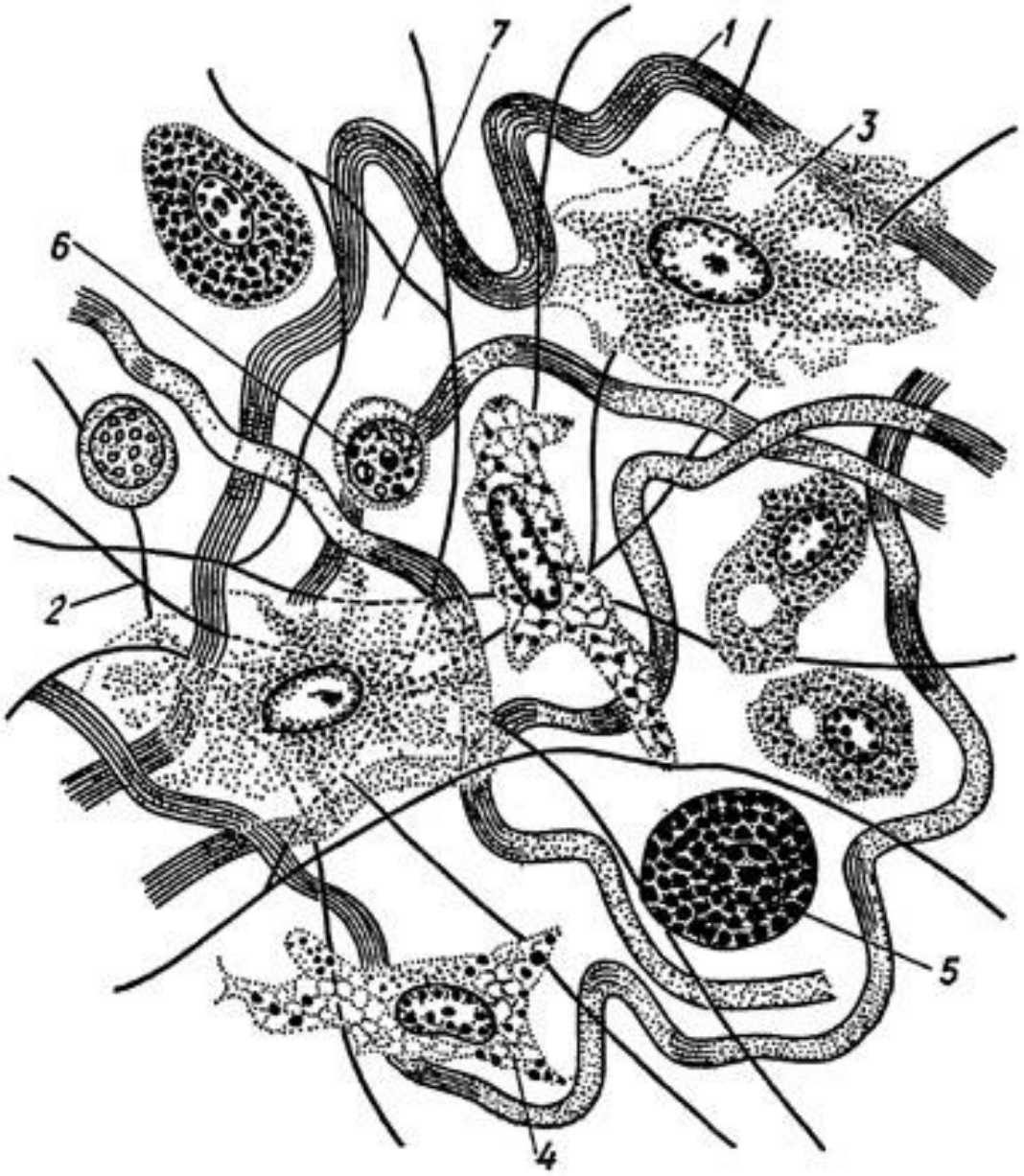


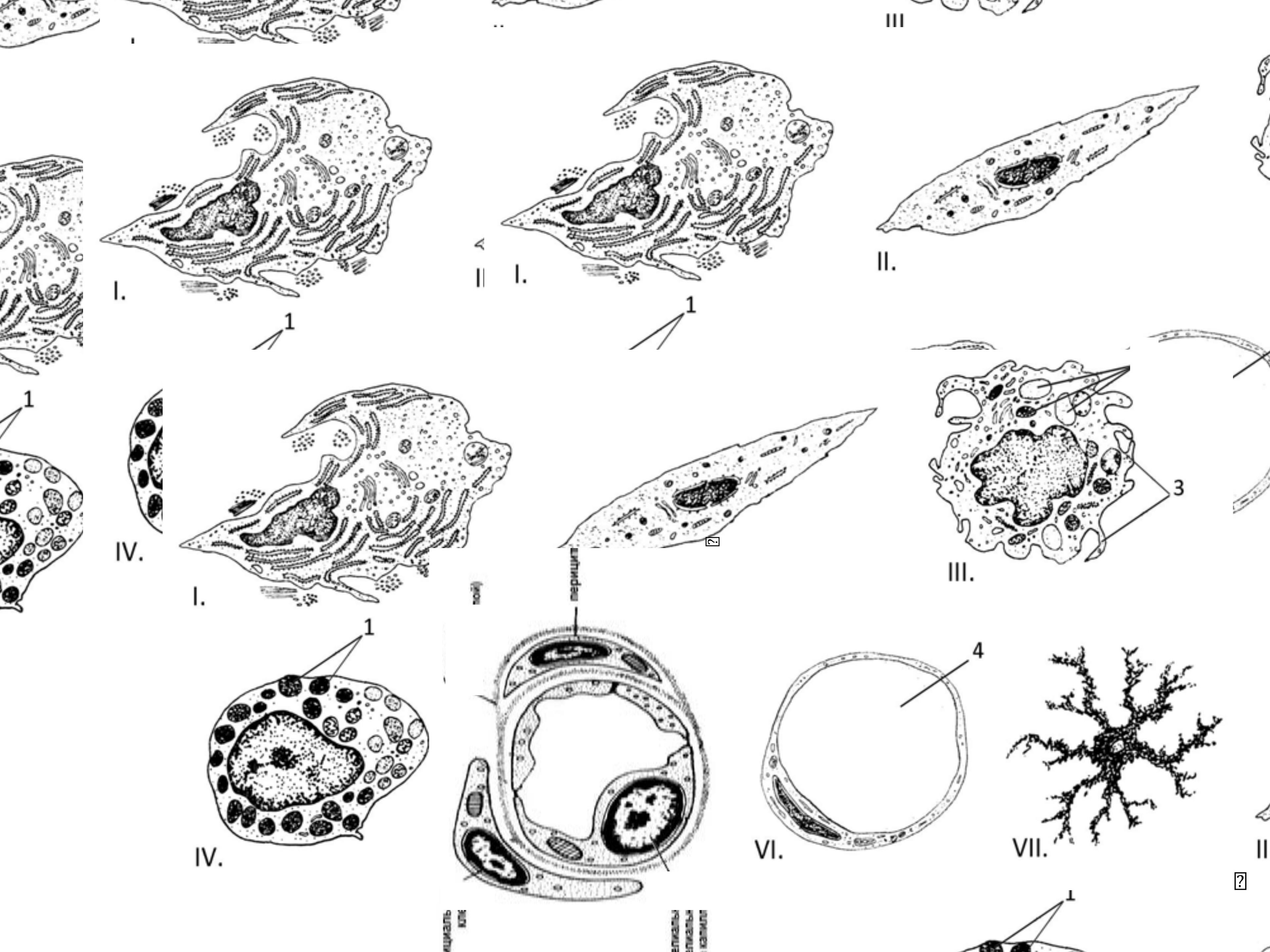


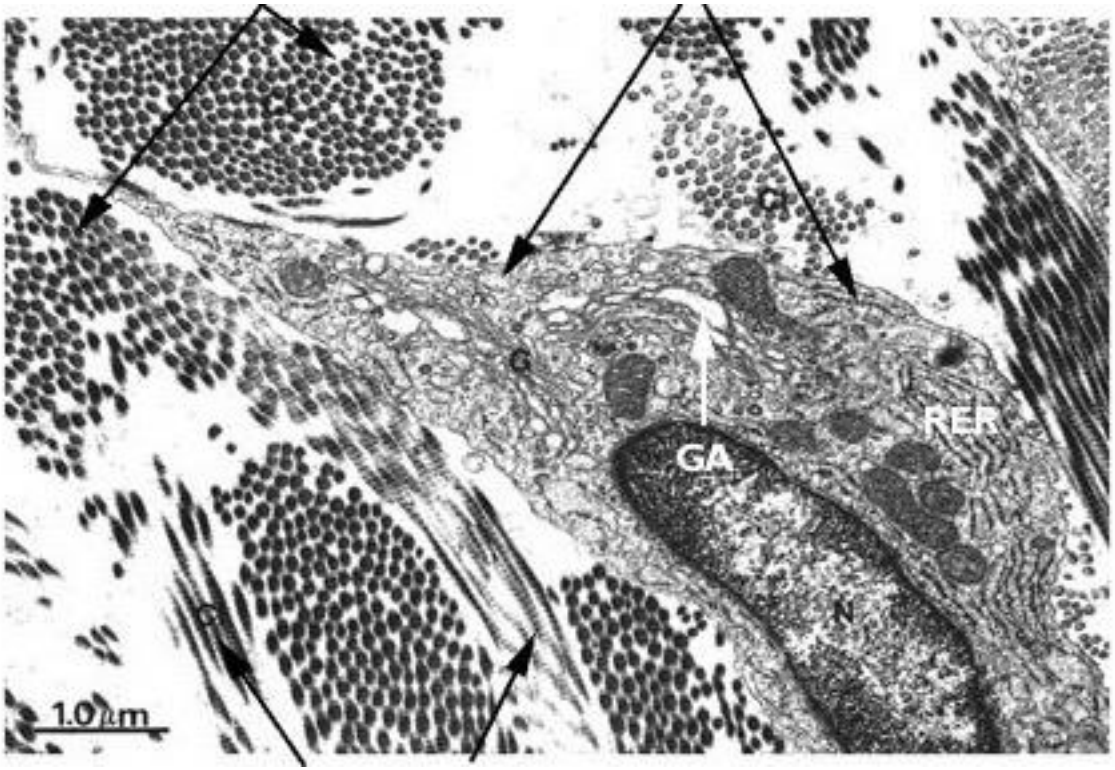

1
3
4
2
1
4
4
2
2
5

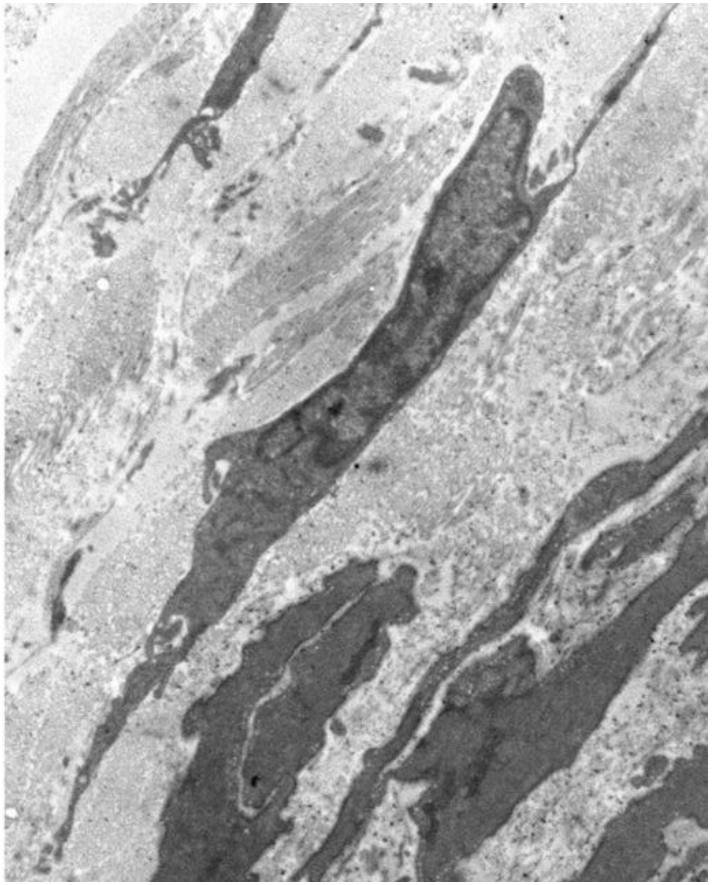





7
1
3
6
2
5
4

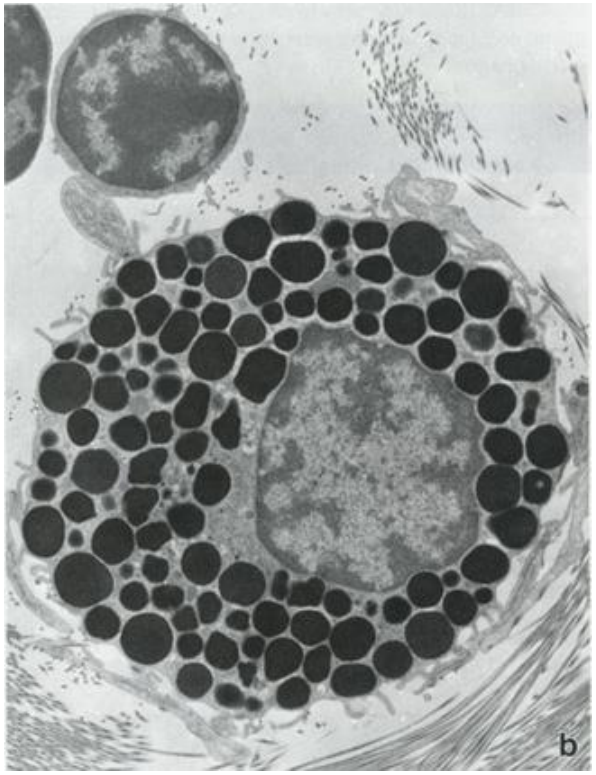

I.
II.
III.
IV.
VI.
VII.
1
3
4

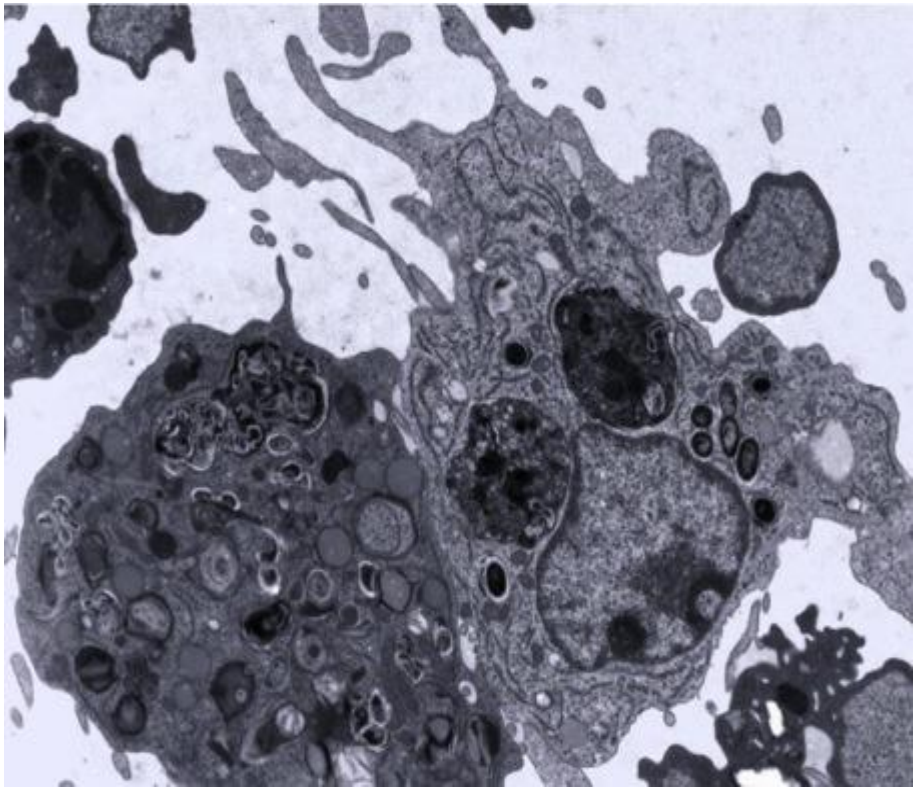

GA
RER
N
1.0 µm

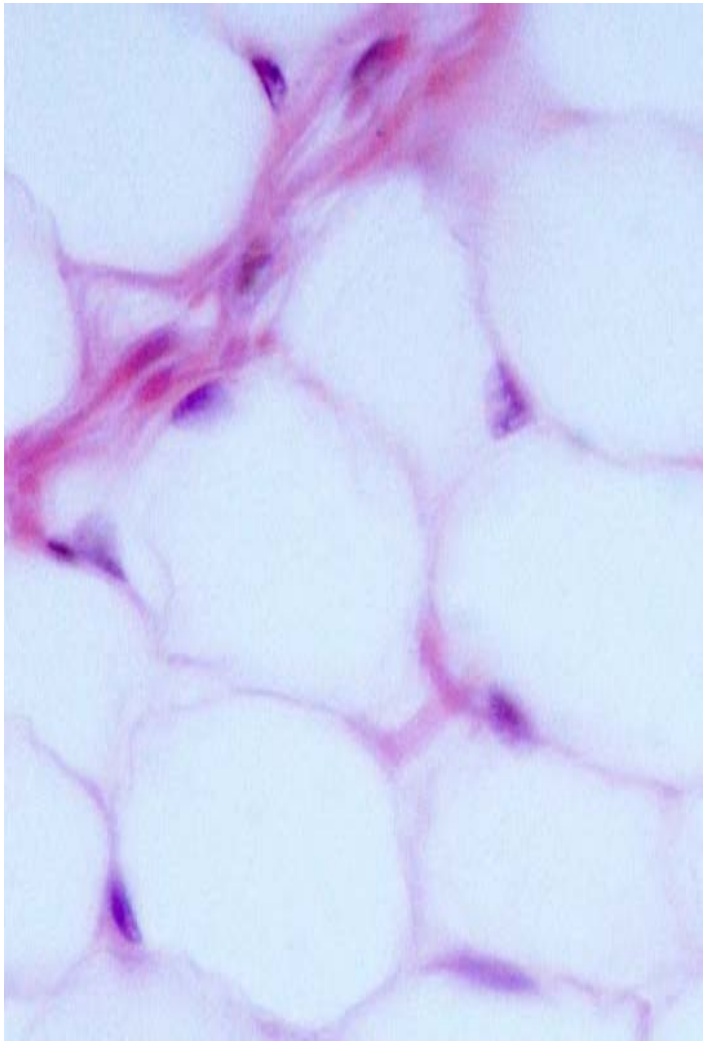


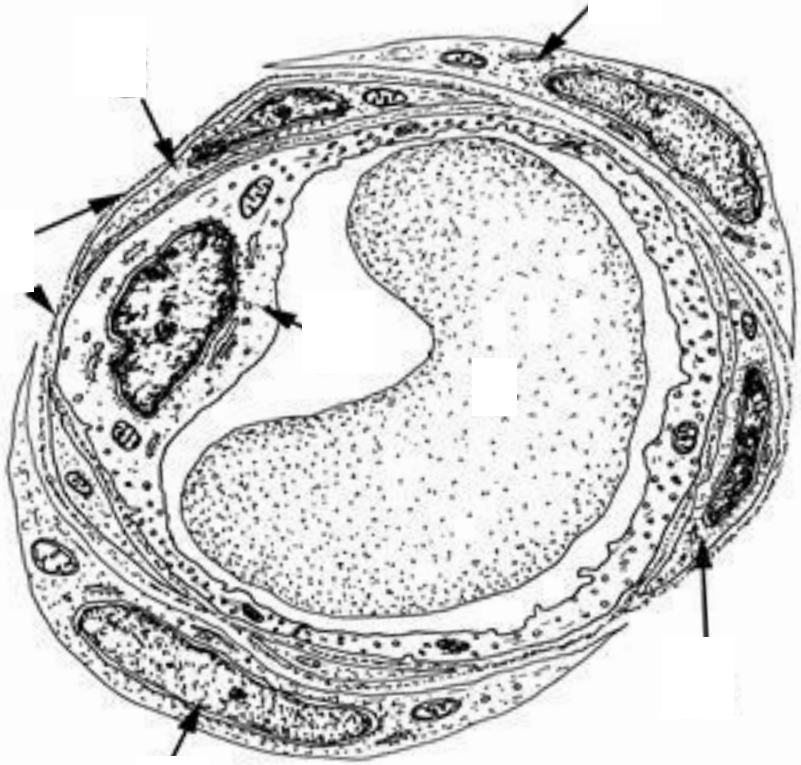
1μm
1
2

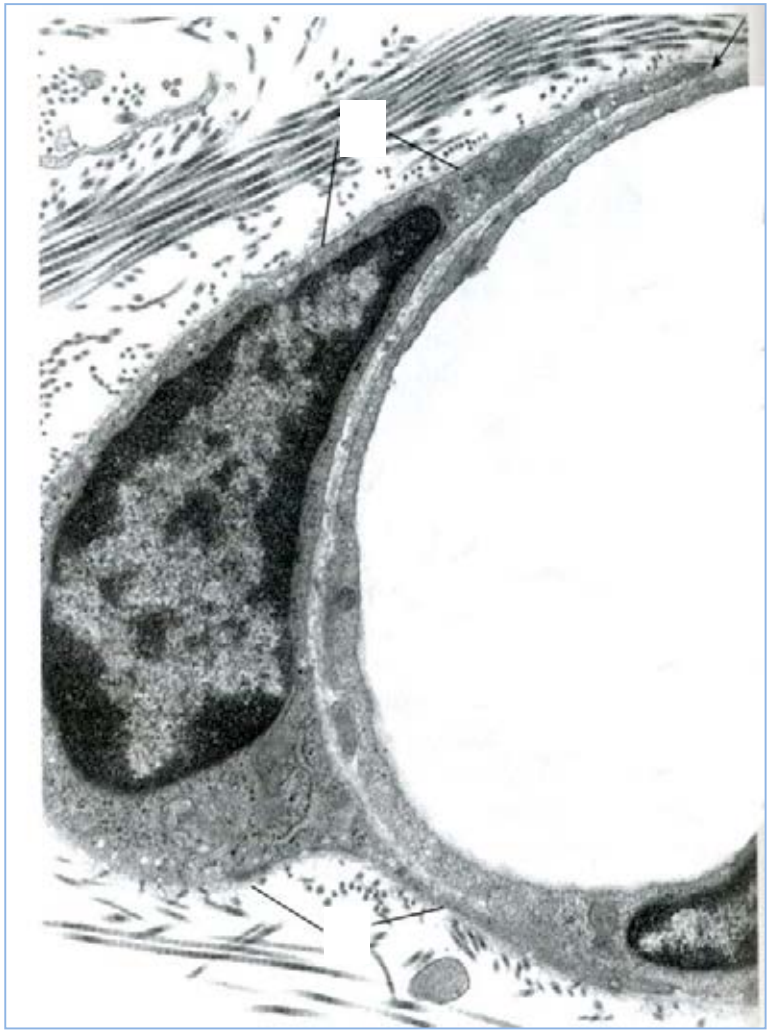
грЭПС
КГ
МТХ

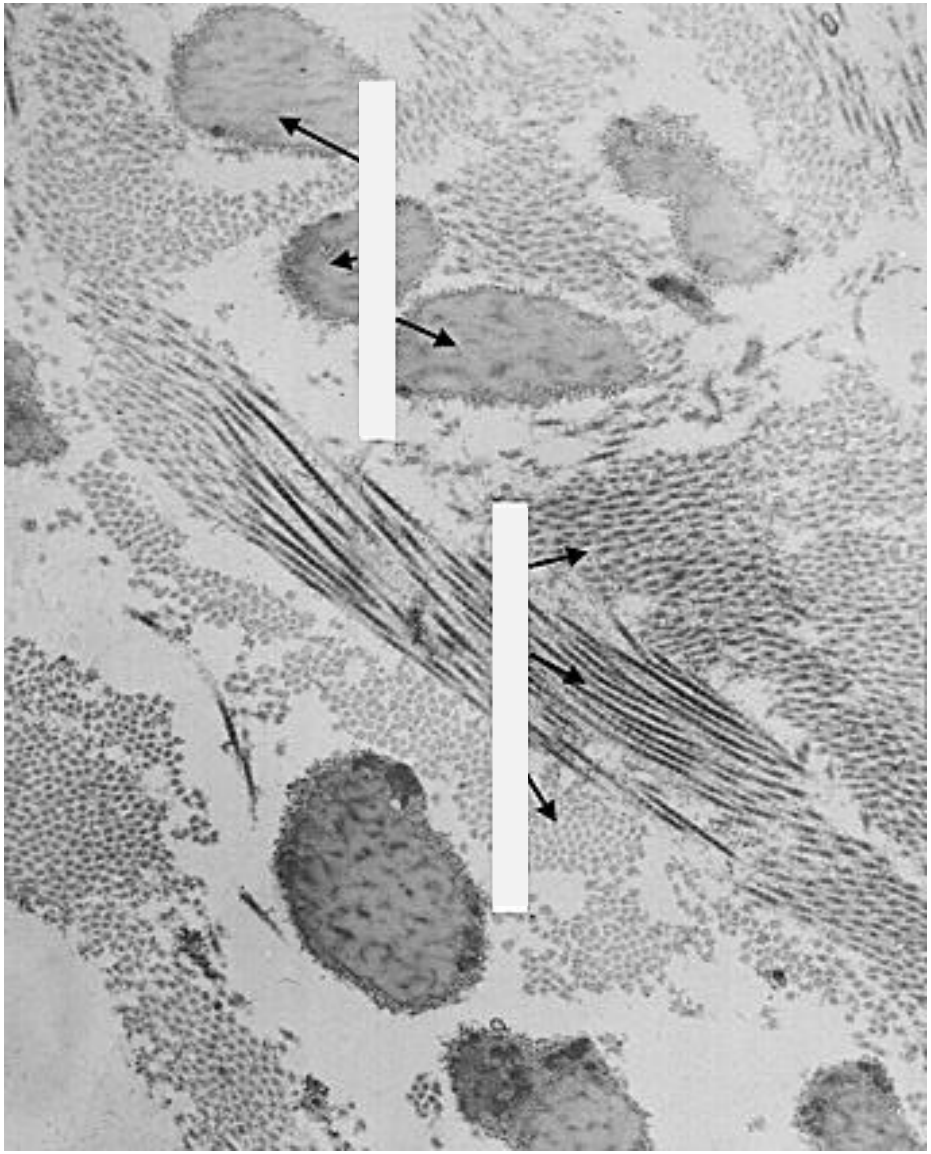

b

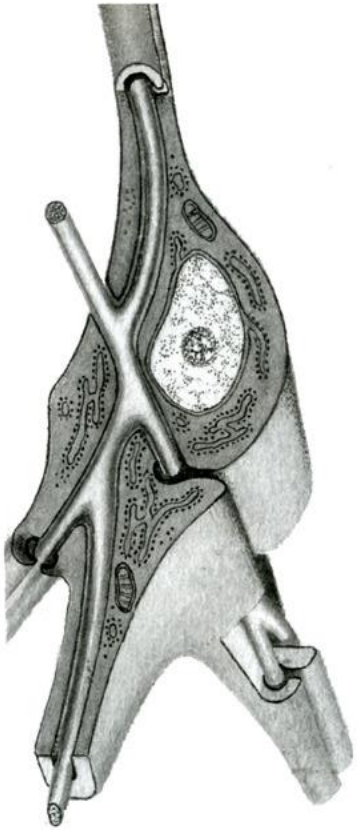


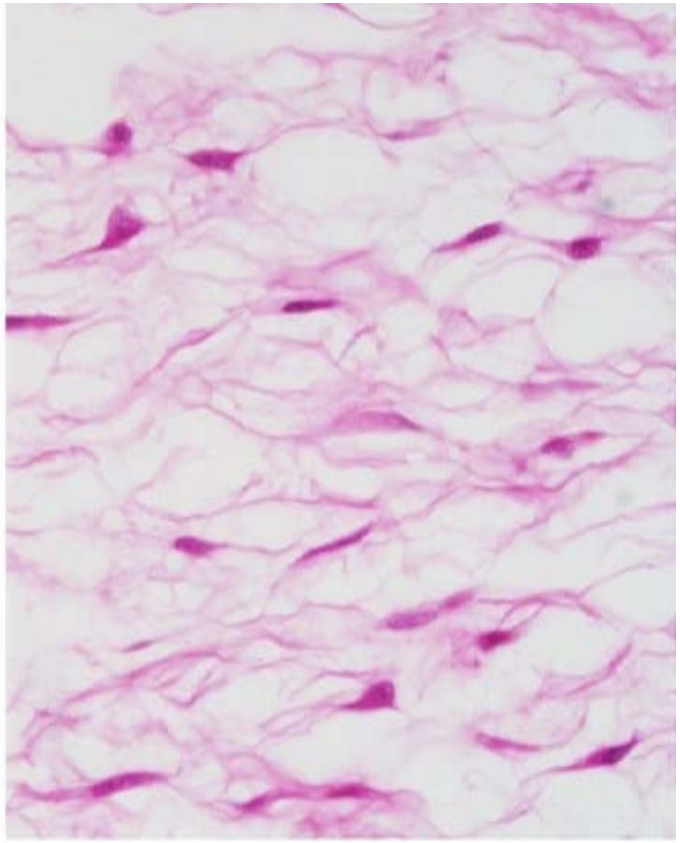


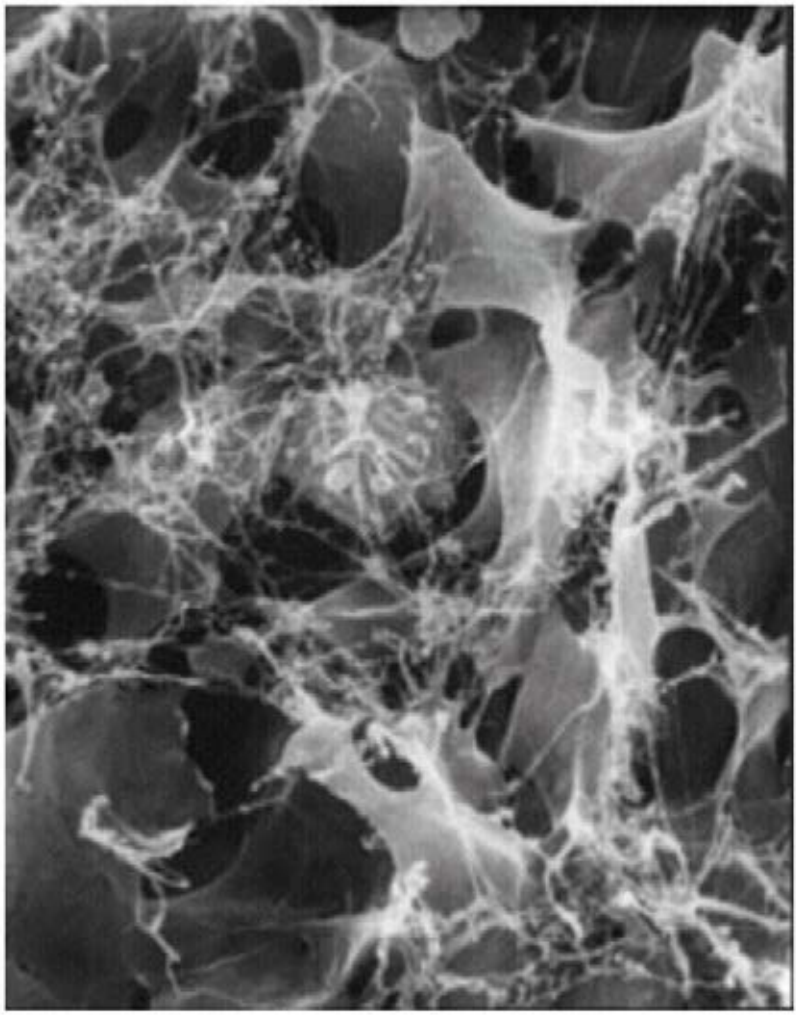


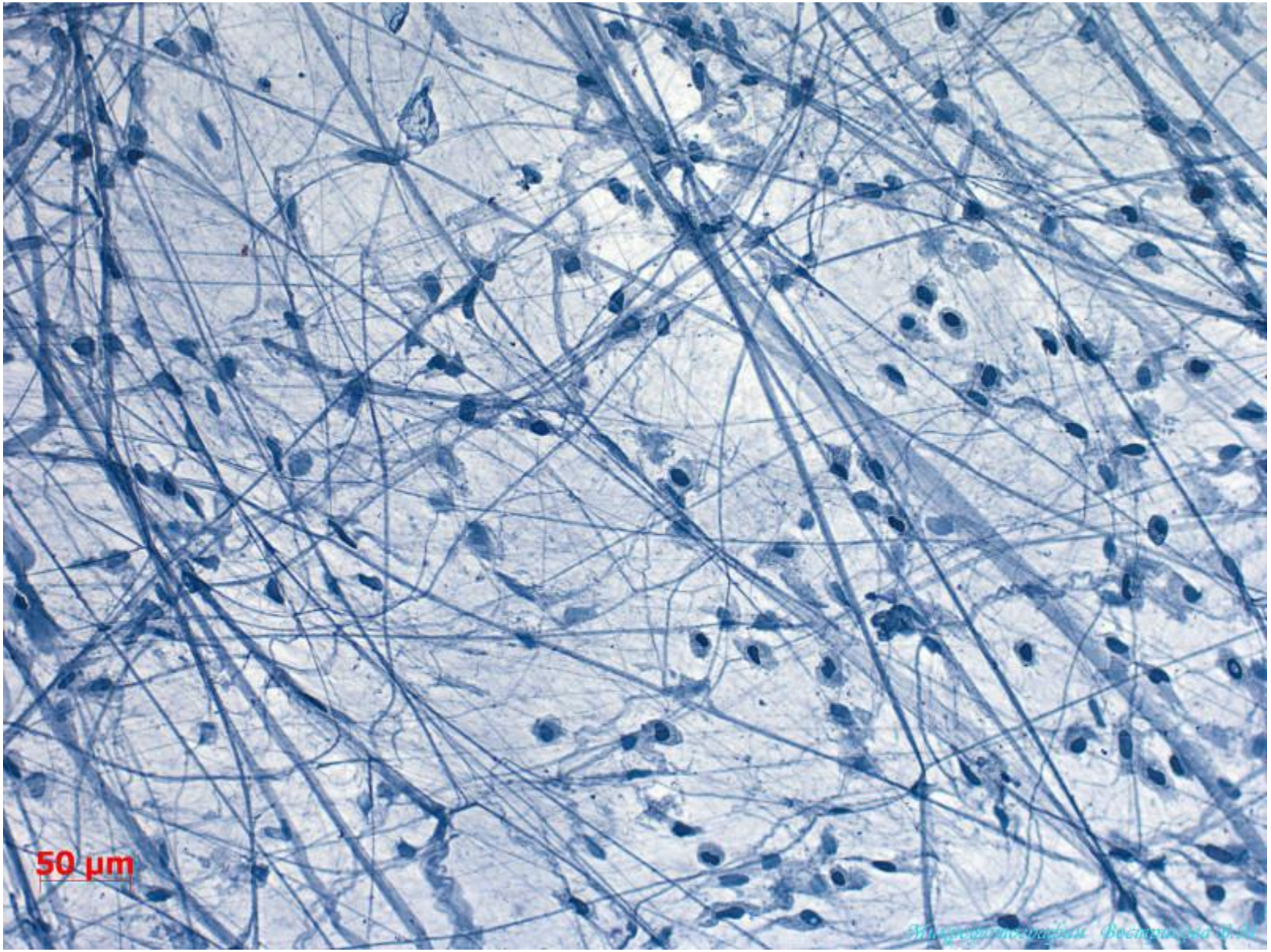











50 µm