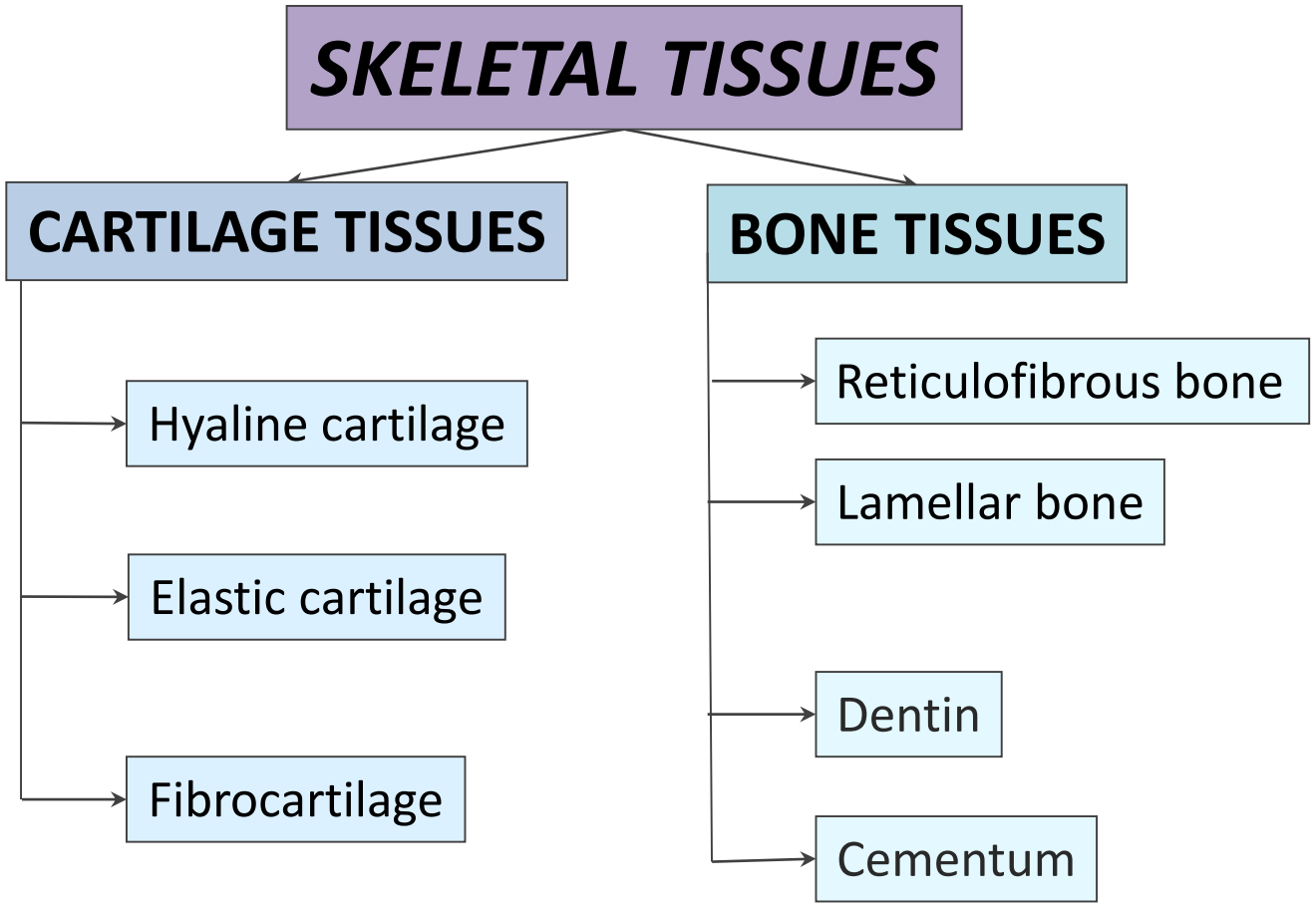
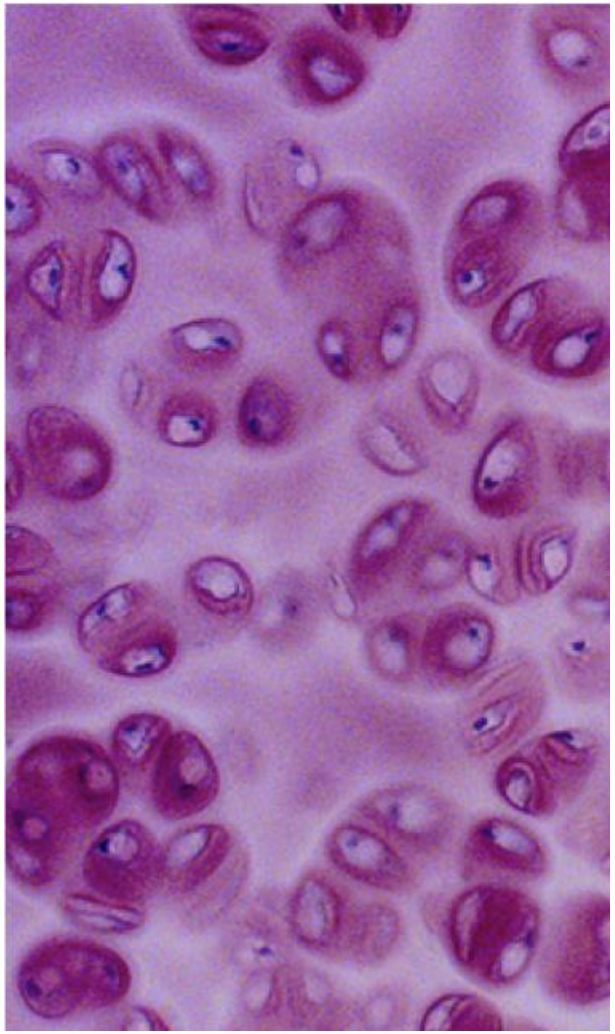
SKELETAL CONNECTIVE TISSUES
CARTILAGE TISSUES

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

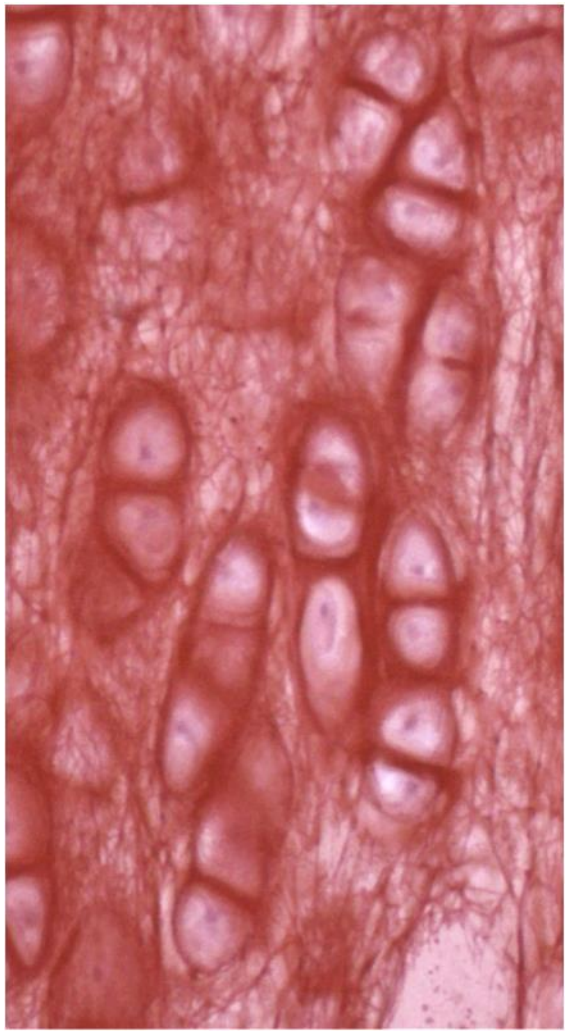
SKELETAL CONNECTIVE TISSUES



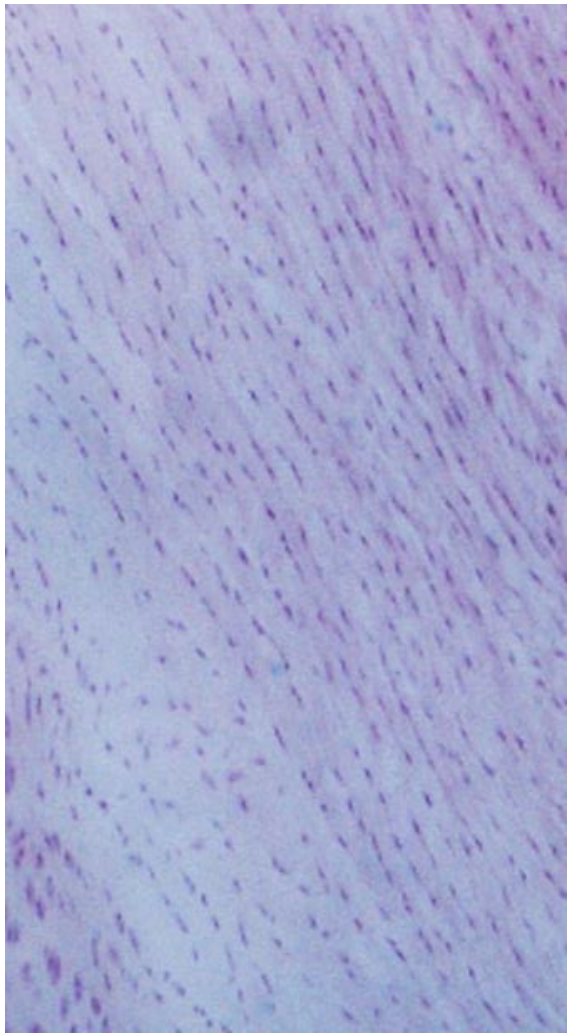
CARTILAGE TISSUES



Hyaline cartilage



Elastic cartilage



Fibrocartilage

CARTILAGE TISSUE COMPOSITION

CELLS - 5%

EXTRACELLULAR MATRIX – 95%

DIFFERONS OF CARTILAGE CELLS

Mesenchyme

↓

Pluripotent cell of skeletogenic mesenchyme

↓

Chondrogenic cell

↓

Chondroblast

↓

Chondrocyte

- Water – 65%
- Collagens – 15%

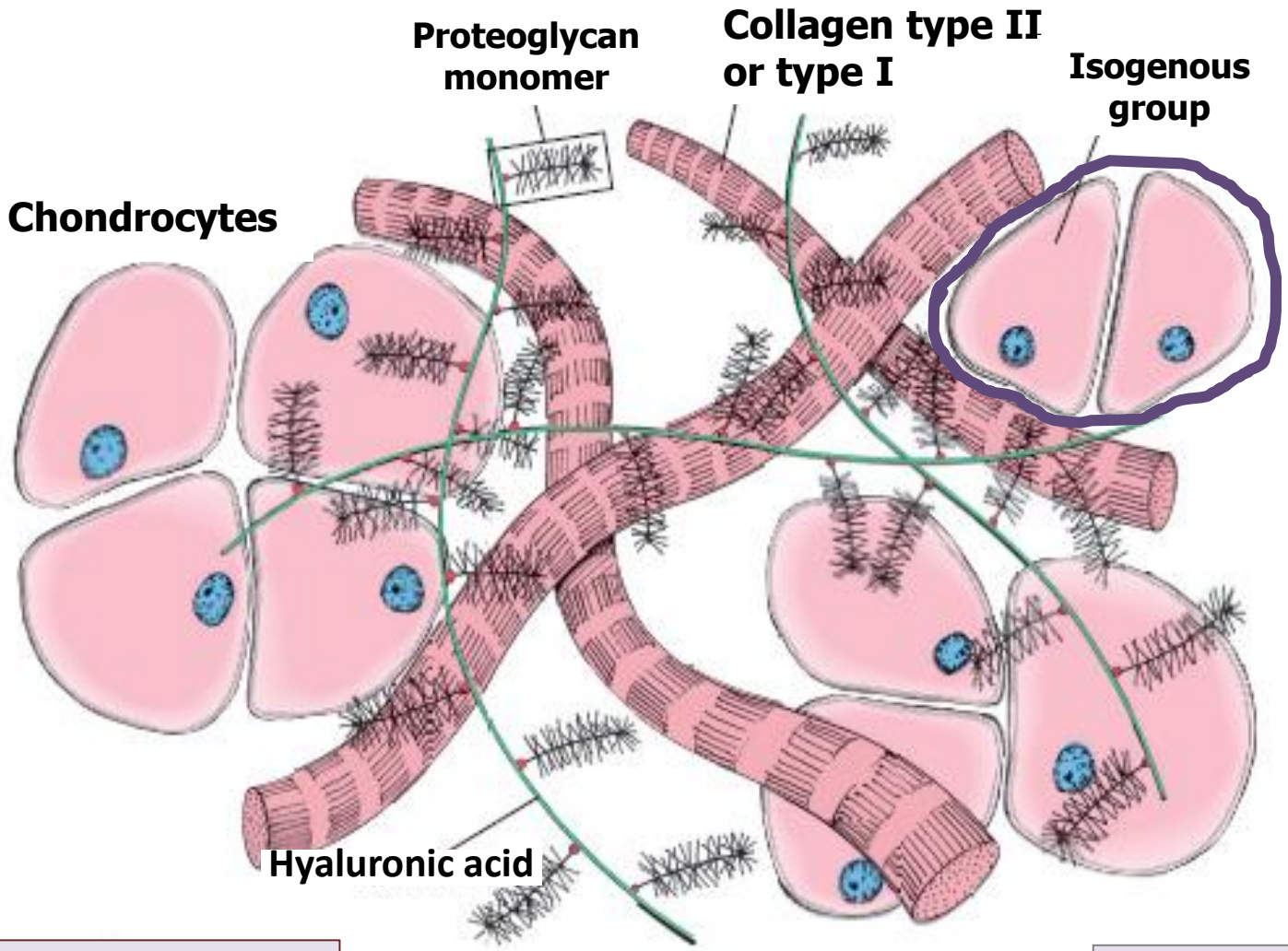
  of which:
  - Collagen type II – 80%
  - Collgens of other types – 20%
- Proteoglycans – 10%
- Glycoproteins (adhesive proteins) – 5%

STATIC population

CHONDROCYTES

- **retain *the ability to divide***
- **form *isogenous groups***

CARTILAGE TISSUE STRUCTURE

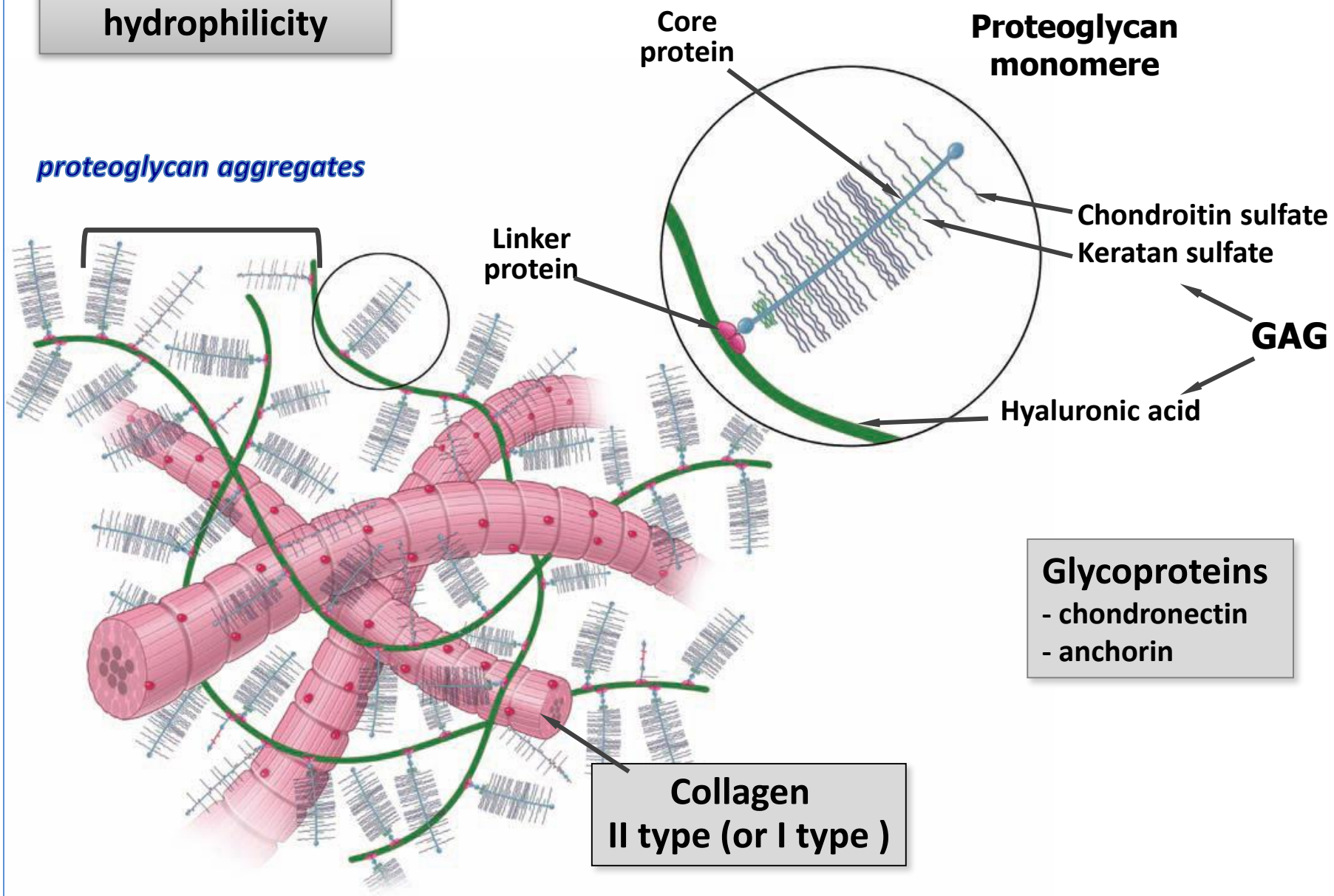


Glycosaminoglycans
- hyaluronic acid
- chondroitinsulfate
- keratansulfate

Glycoproteins
- chondronectin
- anchorin

EXTRACELULAR MATRIX OF CARTILAGE

Proteoglycans – hydrophilicity



Glycoproteins
- chondronectin
- anchorin

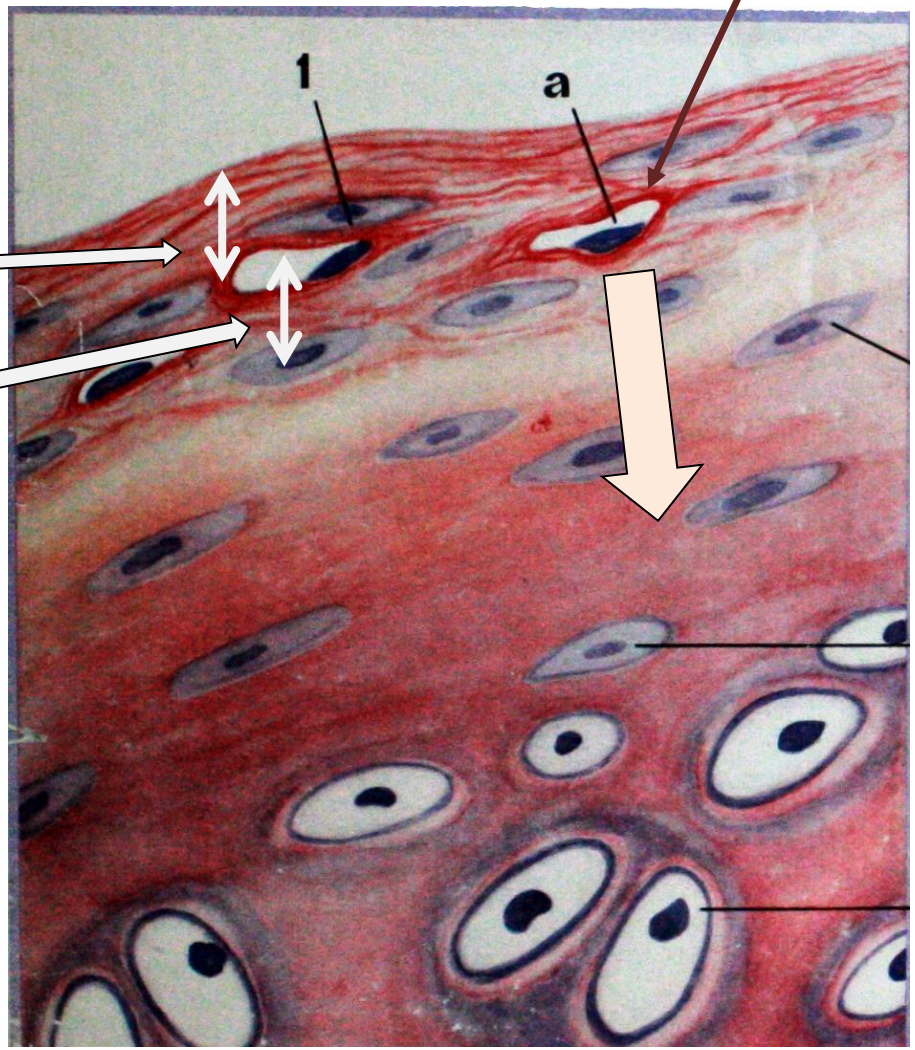
Collagen
II type (or I type)

CARTILAGE AS AN ORGAN

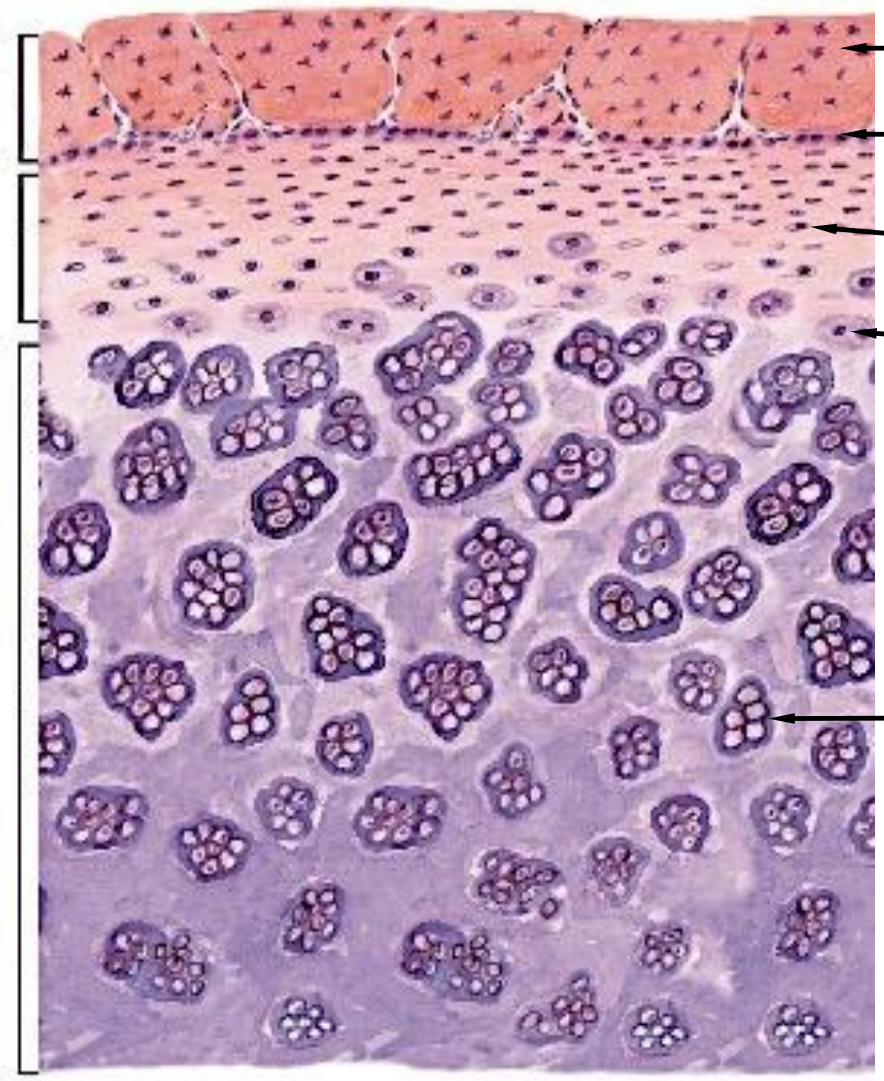
PERICHONDRIUM - **two layers**

- **Outer – fibrous:**
  - dense irregular CT + loose CT
- **Inner – chondrogenic:**
  - ground substance
  - chondrogenic cells
  - prechondroblasts

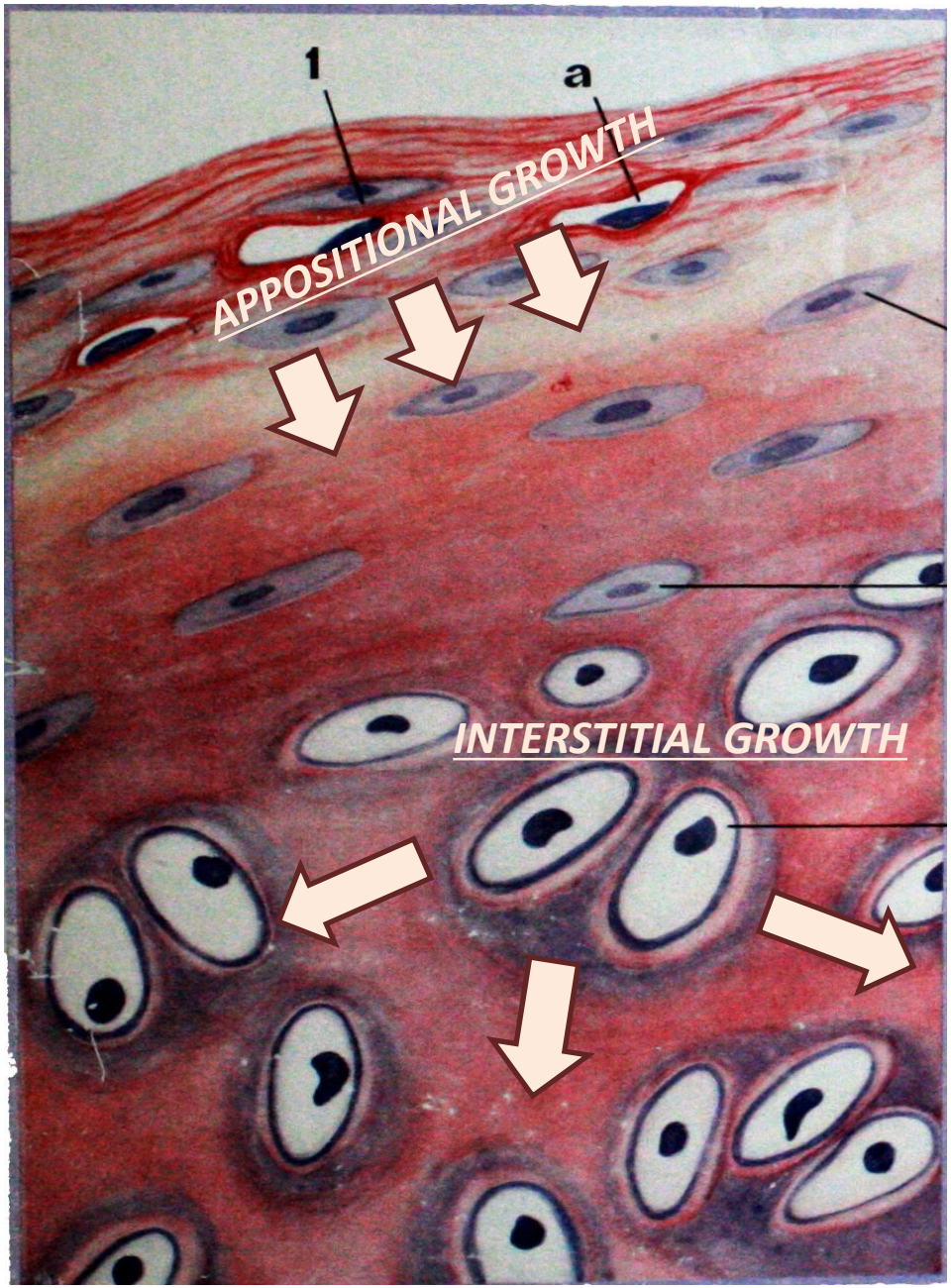
NUTRITION – by diffusion



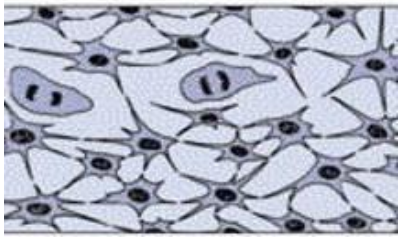
CARTILAGE AS AN ORGAN



GROWTH OF CARTILAGE

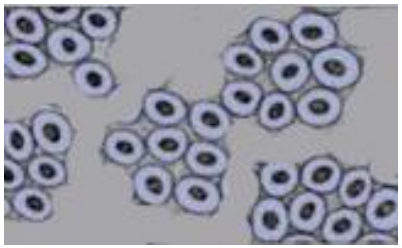


EMBRYONIC DEVELOPMENT OF CARTILAGE



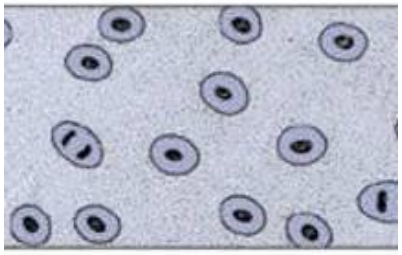
Pluripotent cells of skeletogenic mesenchyme

IN THE ABSENCE OF BLOOD VESELS



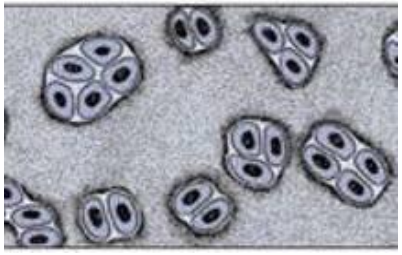
Chondrogenic cells

Chondrogenic islet



Chondroblasts

Chondrocytes



Mature cartilage tissue

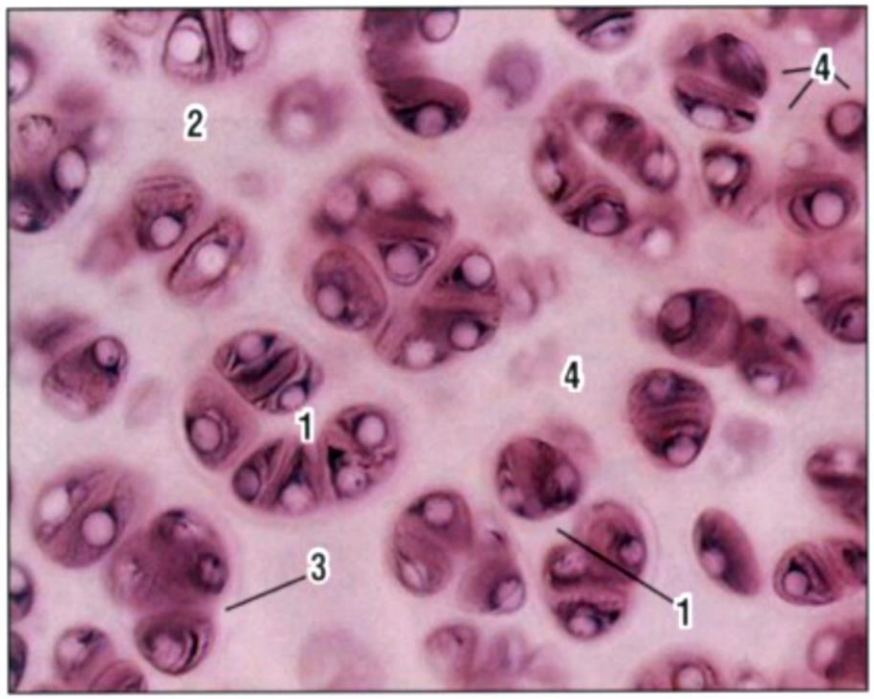
HYALINE CARTILAGE IN CROSS SECTION

STRUCTURE OF HYALINE CARTILAGE

I- perichondrium: 1- outer fibrous layer, 2- inner cellular (chondrogenic) layer;
II- zone of young cartilage: 3- single chondrocytes;
III- zone of mature cartilage: 4- isogenous groups of chondrocytes, 5- extracellular matrix

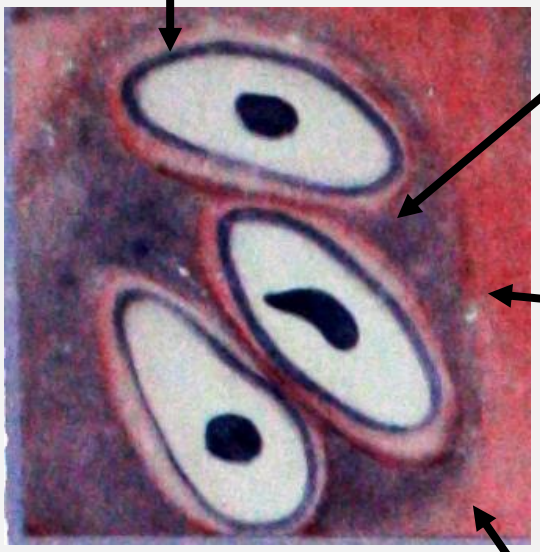
STRUCTURE OF HYALINE CARTILAGE

ZONE OF MATURE CARTILAGE



1- isogenous groups of chondrocytes;
2- extracellular matrix;
3- territorial matrix;
4- interterritorial matrix

Capsule - Network of type IV, VI , IX collagen fibers



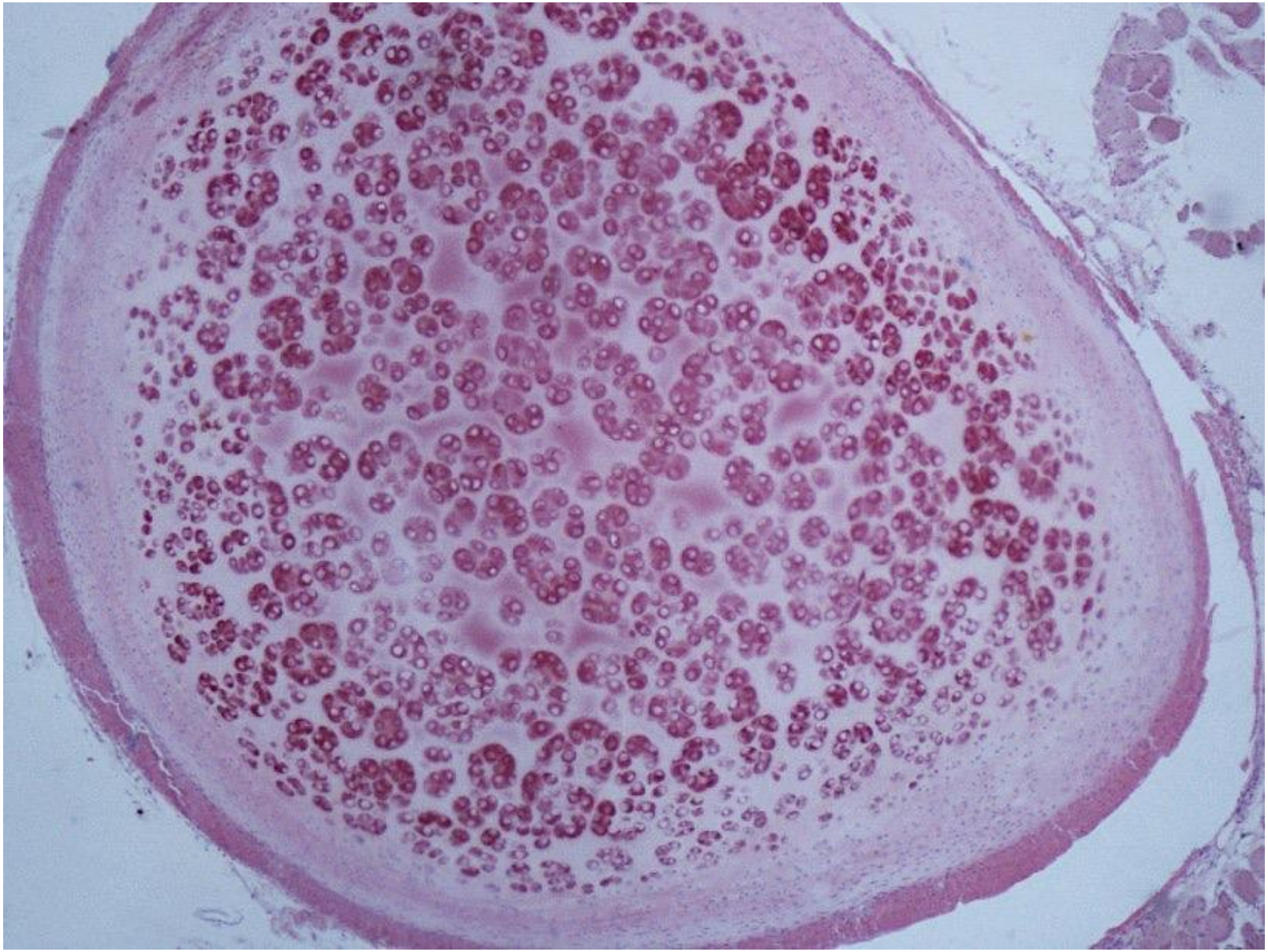
Territorial matrix

Amounts of sulfated glycosaminoglycans decrease

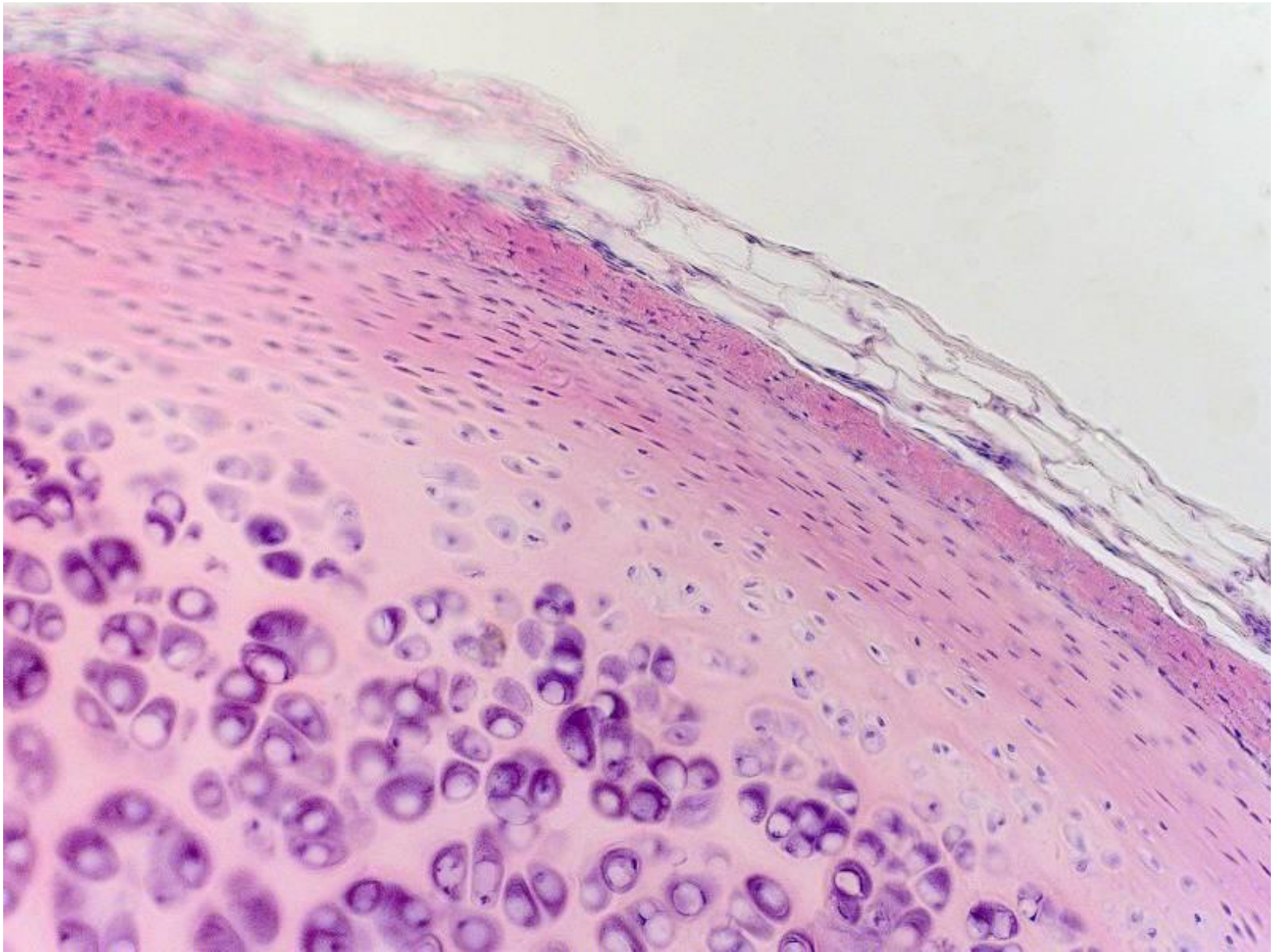
Interterritorial matrix

Type II collagen fibers

Slide №63 «Hyaline cartilage of a rib in cross section»
Staining: H&E



Slide №63 «Hyaline cartilage of a rib in cross section»
Staining: H&E



Slide №63 «Hyaline cartilage of a rib in cross section»
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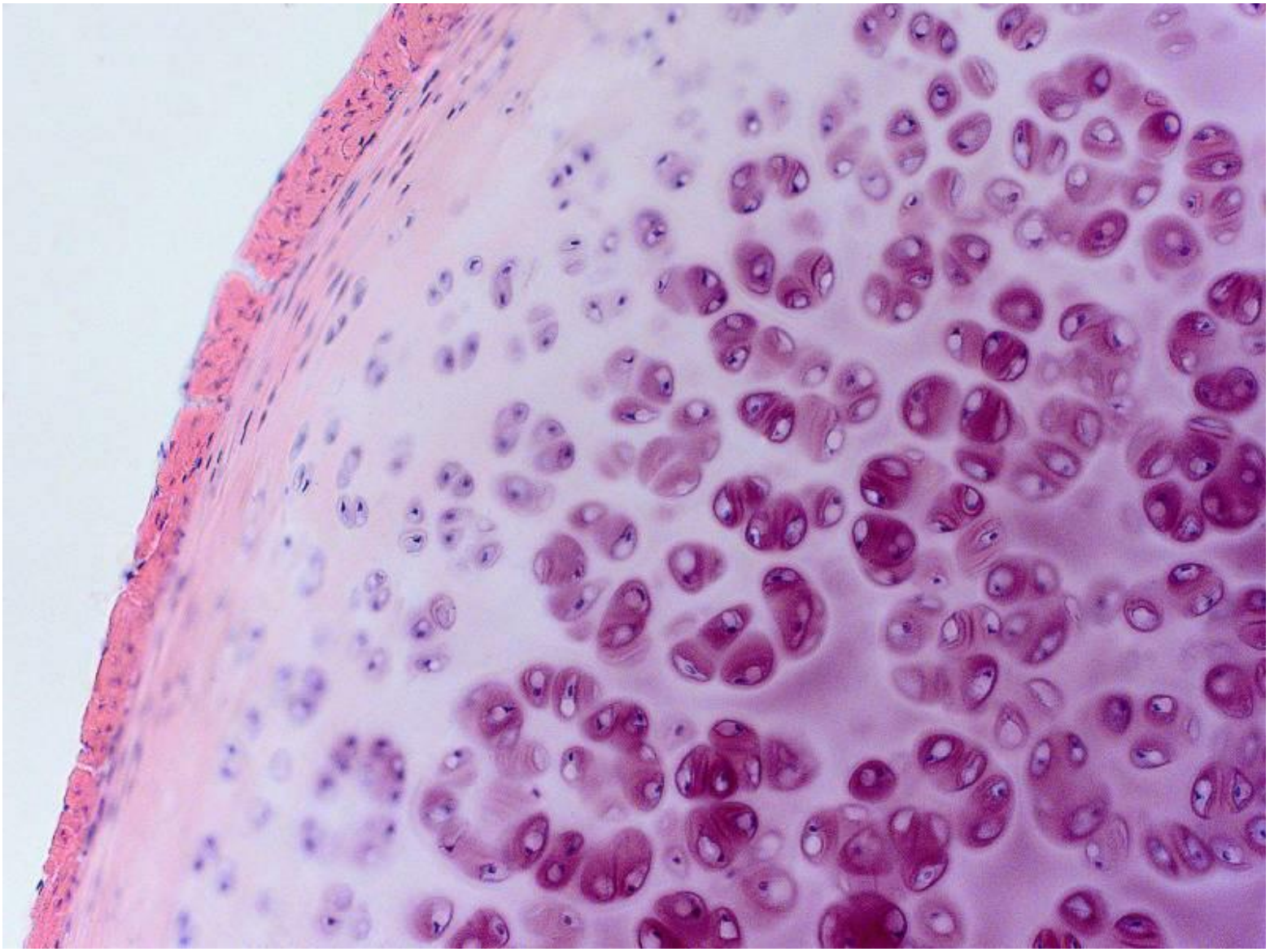

Slide №63 «Hyaline cartilage of a rib in cross section»
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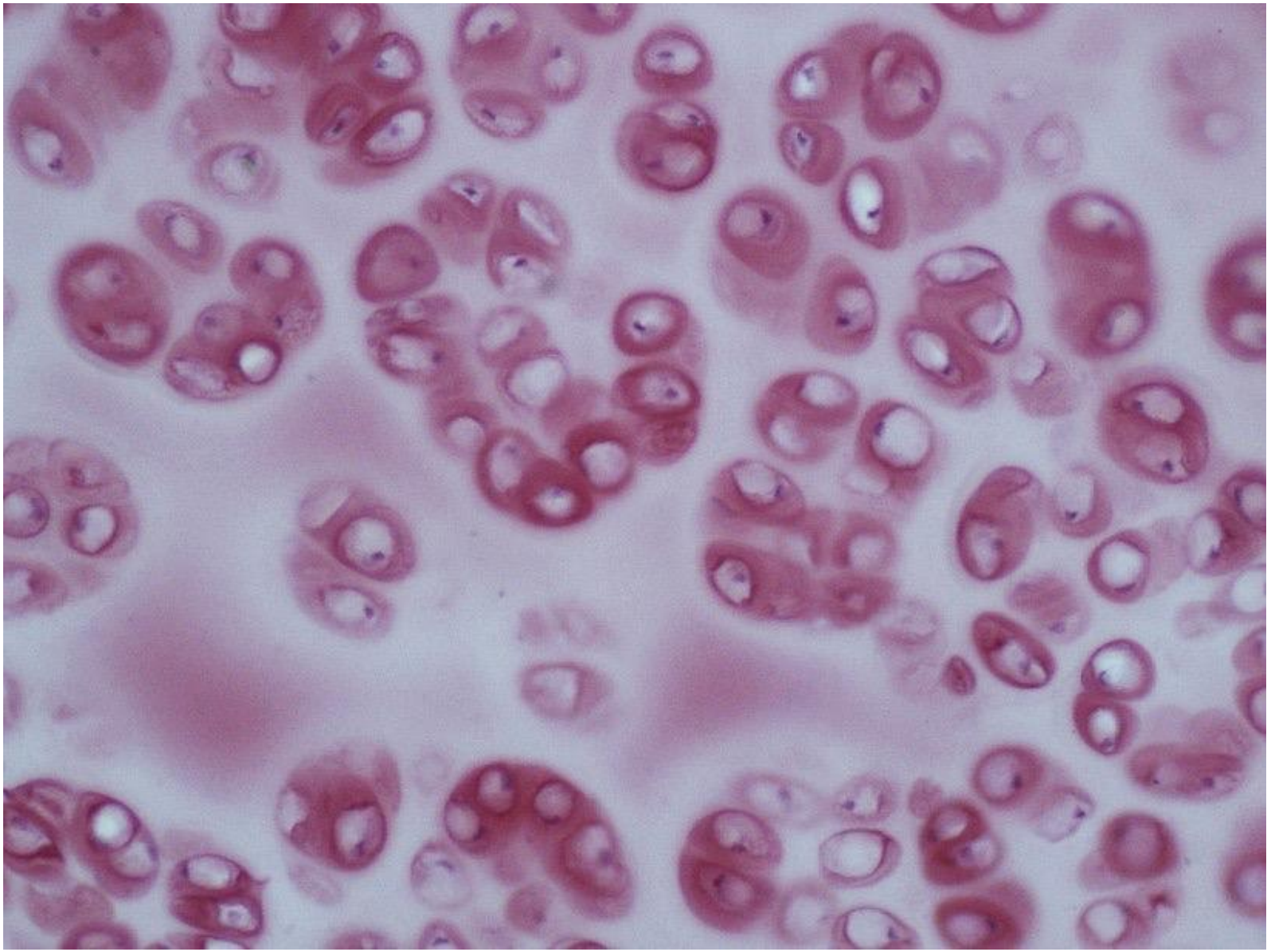
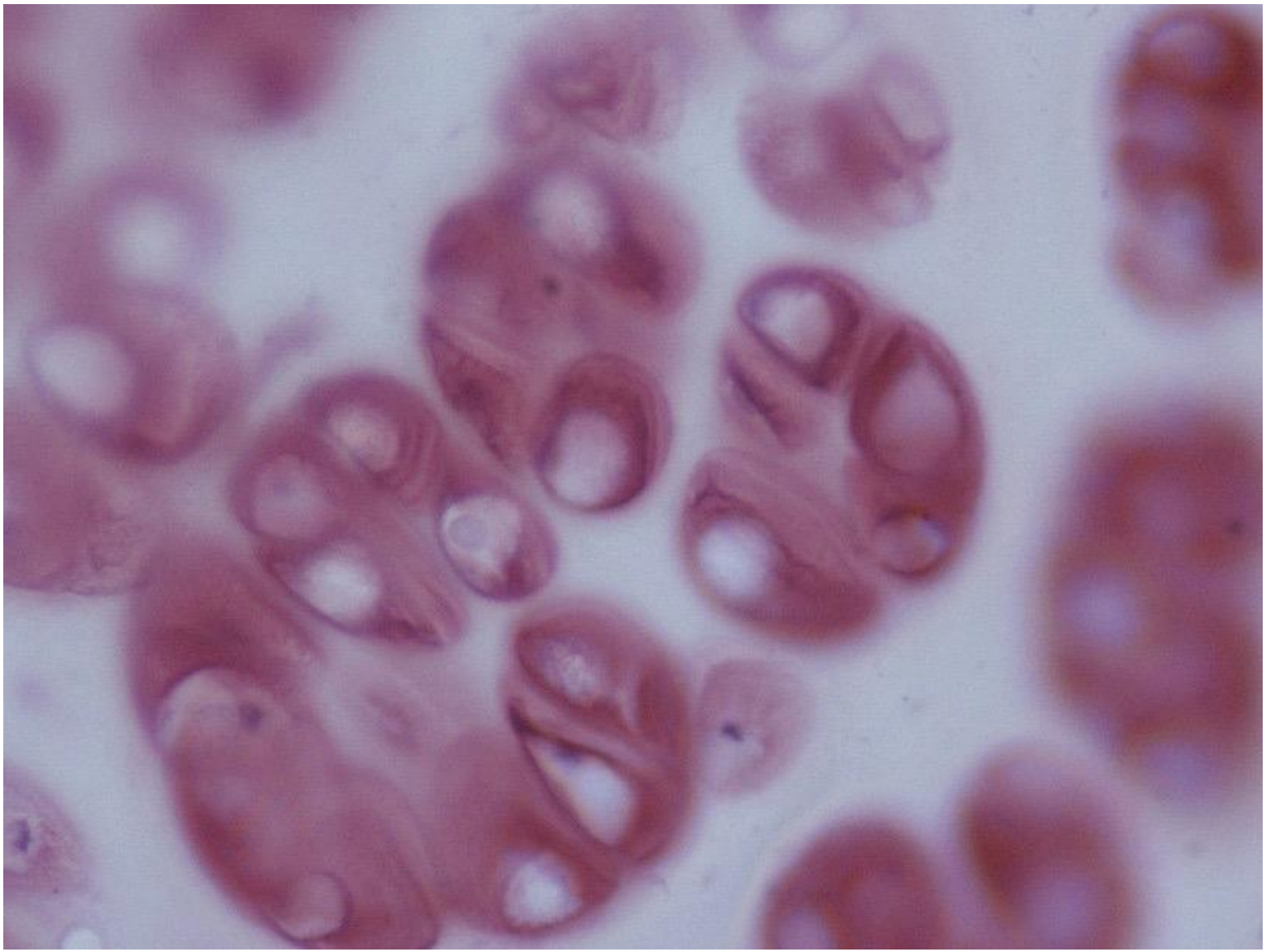
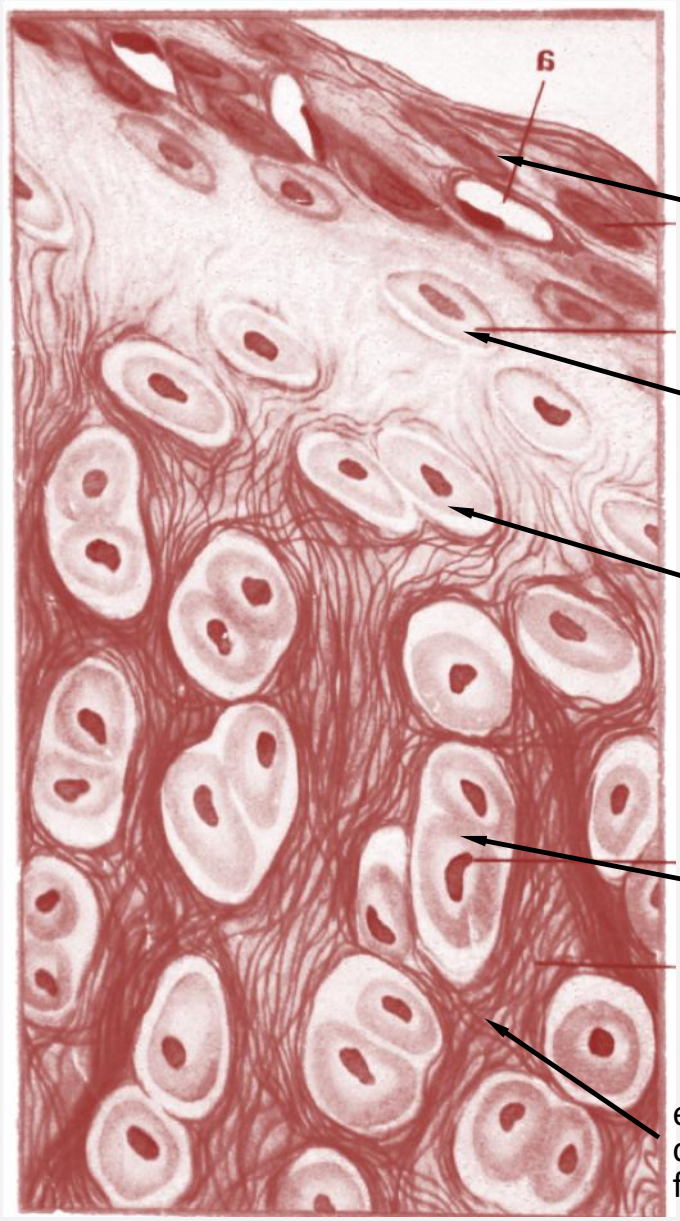


Slide №63 «Hyaline cartilage of a rib in cross section»
Staining: H&E



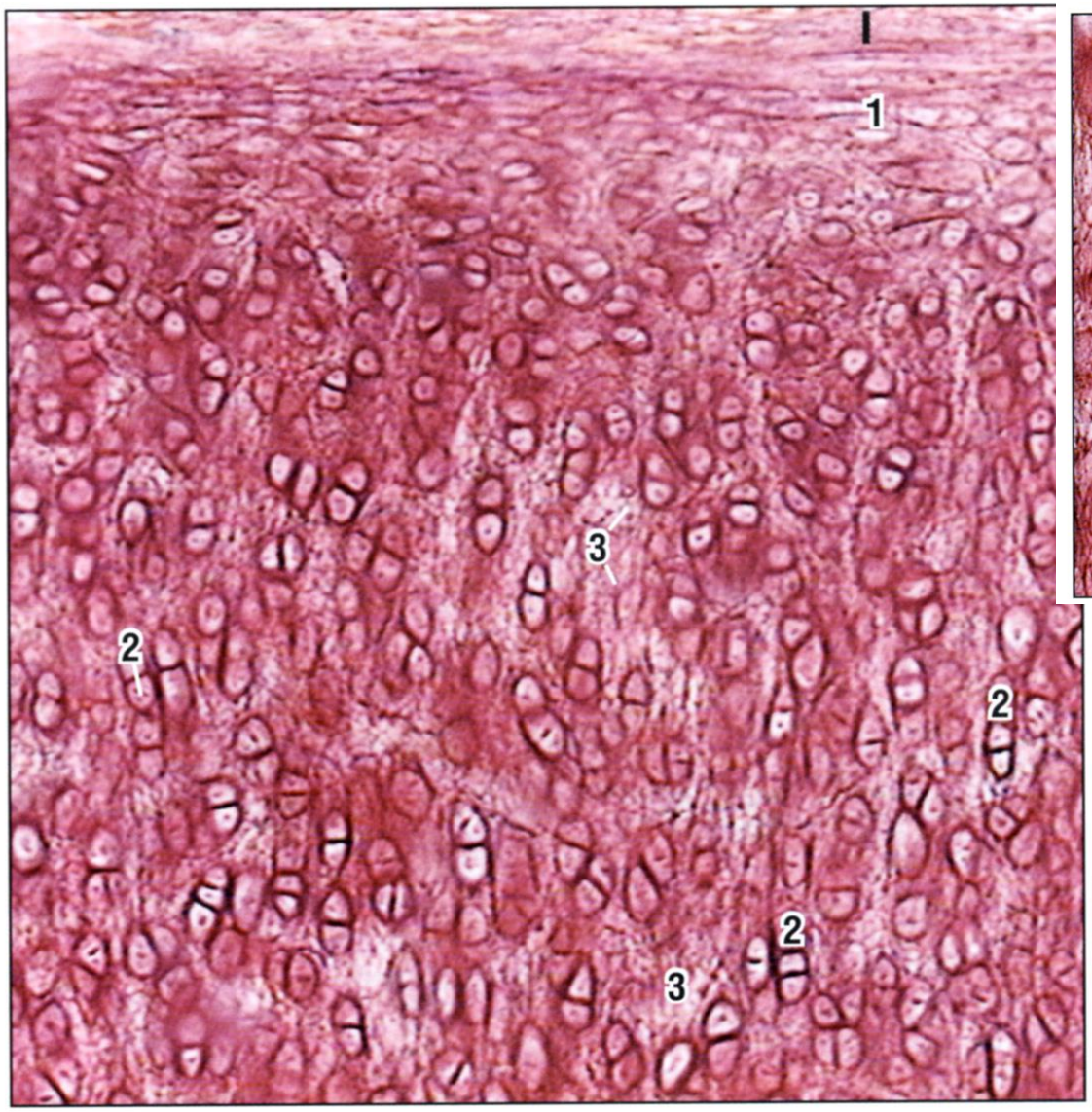
STRUCTURE OF ELASTIC CARTILAGE

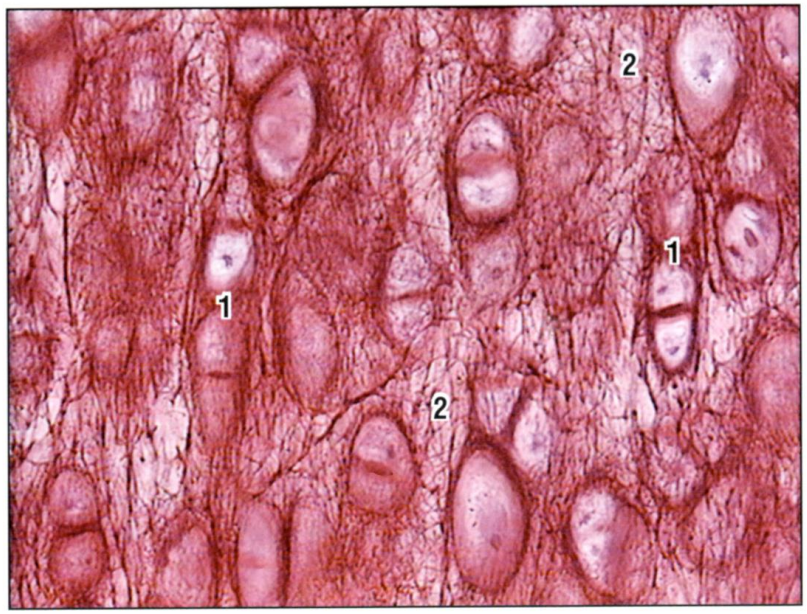
Special staining with resorcin-fuchsin and orcein



STRUCTURE OF ELASTIC CARTILAGE

EAR AURICLE IN CROSS SECTION



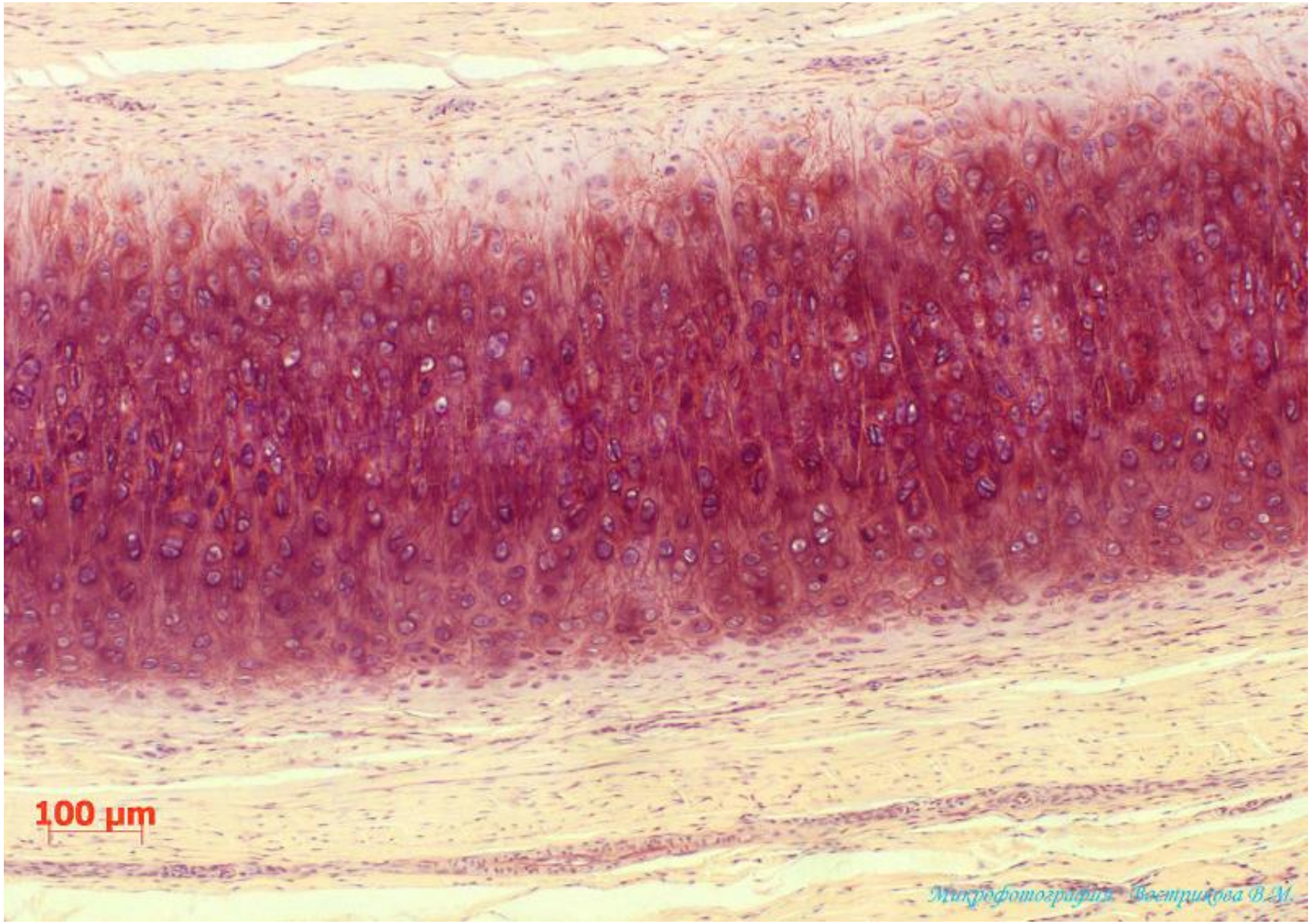


1- isogenous groups of chondrocytes (columns);
2- elastic fibers in the extracellular matrix of cartilage

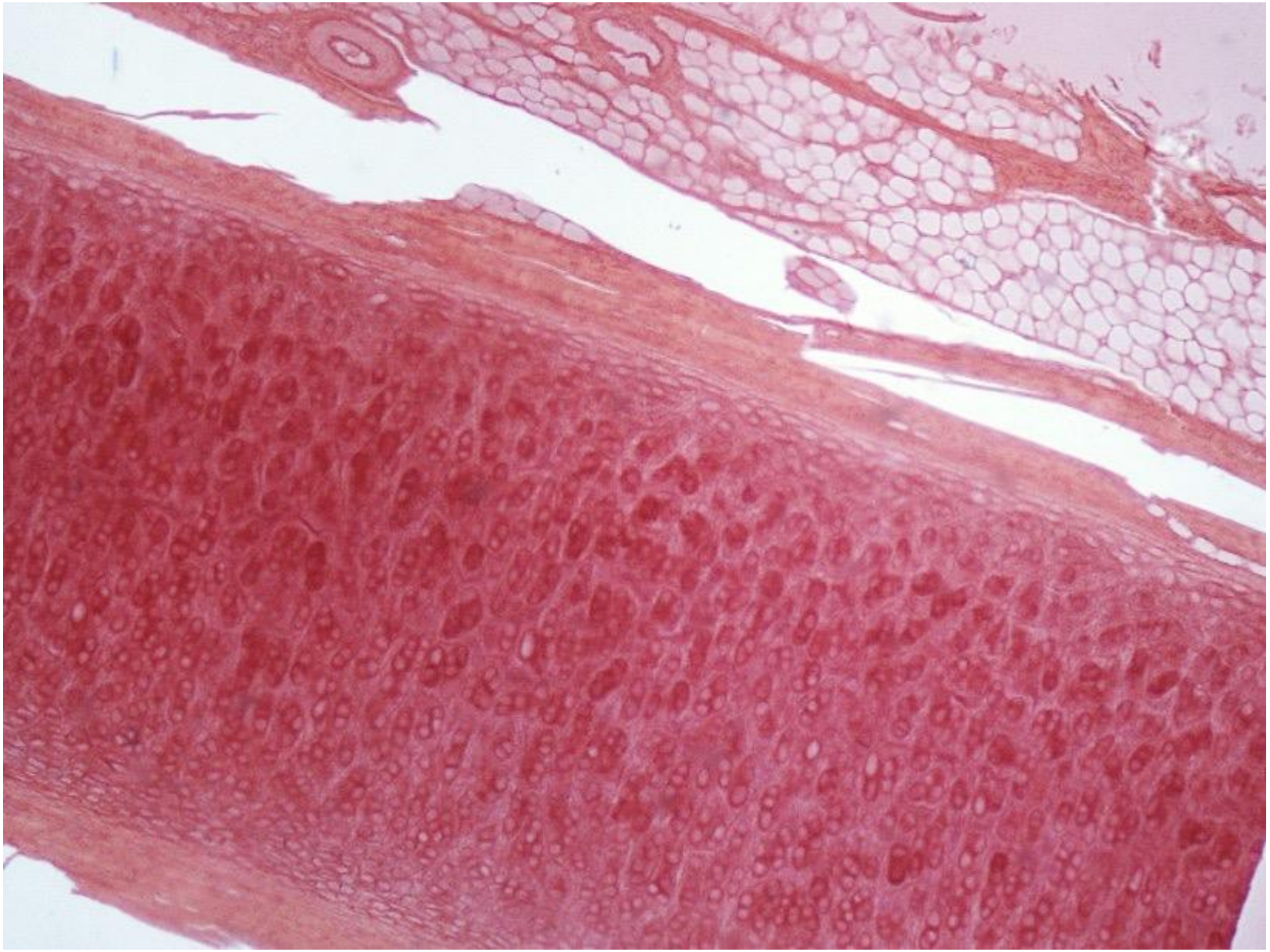
Special staining with hematoxylin and orcein

I- perichondrium:
1- single chondrocytes;
2- isogenous groups of chondrocytes (columns);
3- extracellular matrix containing elastic fibers

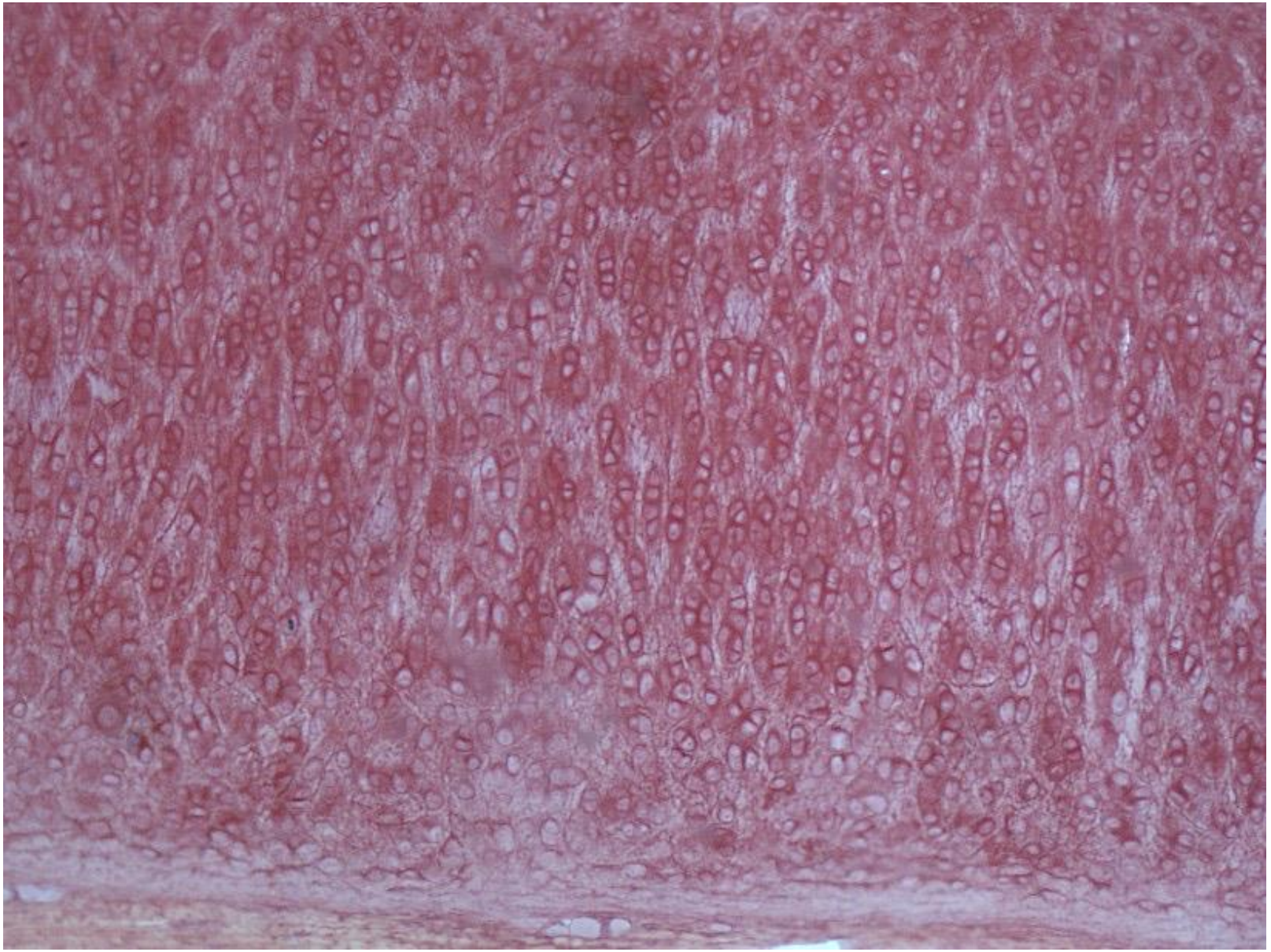
Slide №64 «Elastic cartilage of an ear auricle in cross section»
Staining: orcein



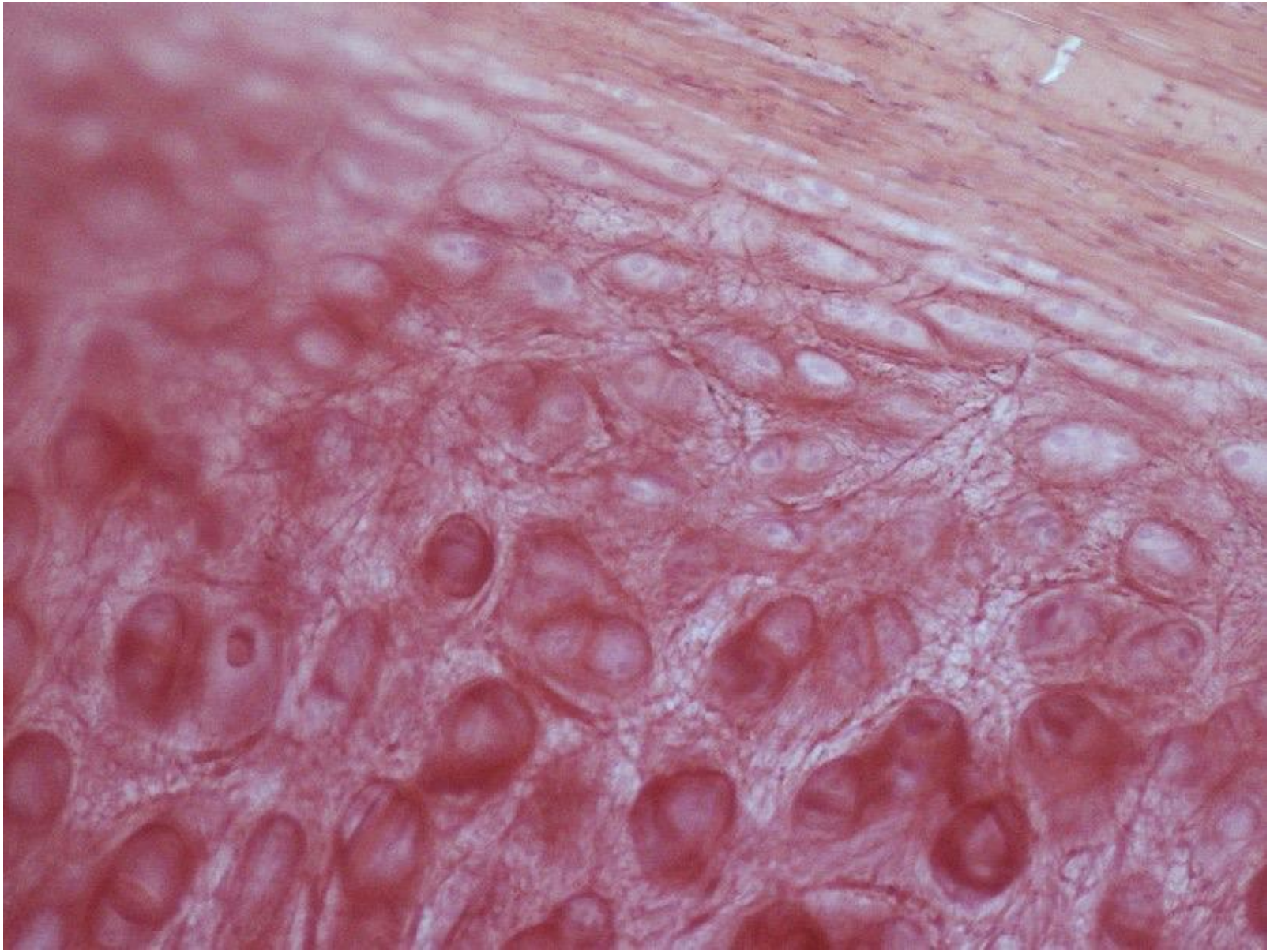
Slide №64 «Elastic cartilage of an ear auricle in cross section»
Staining: orcein



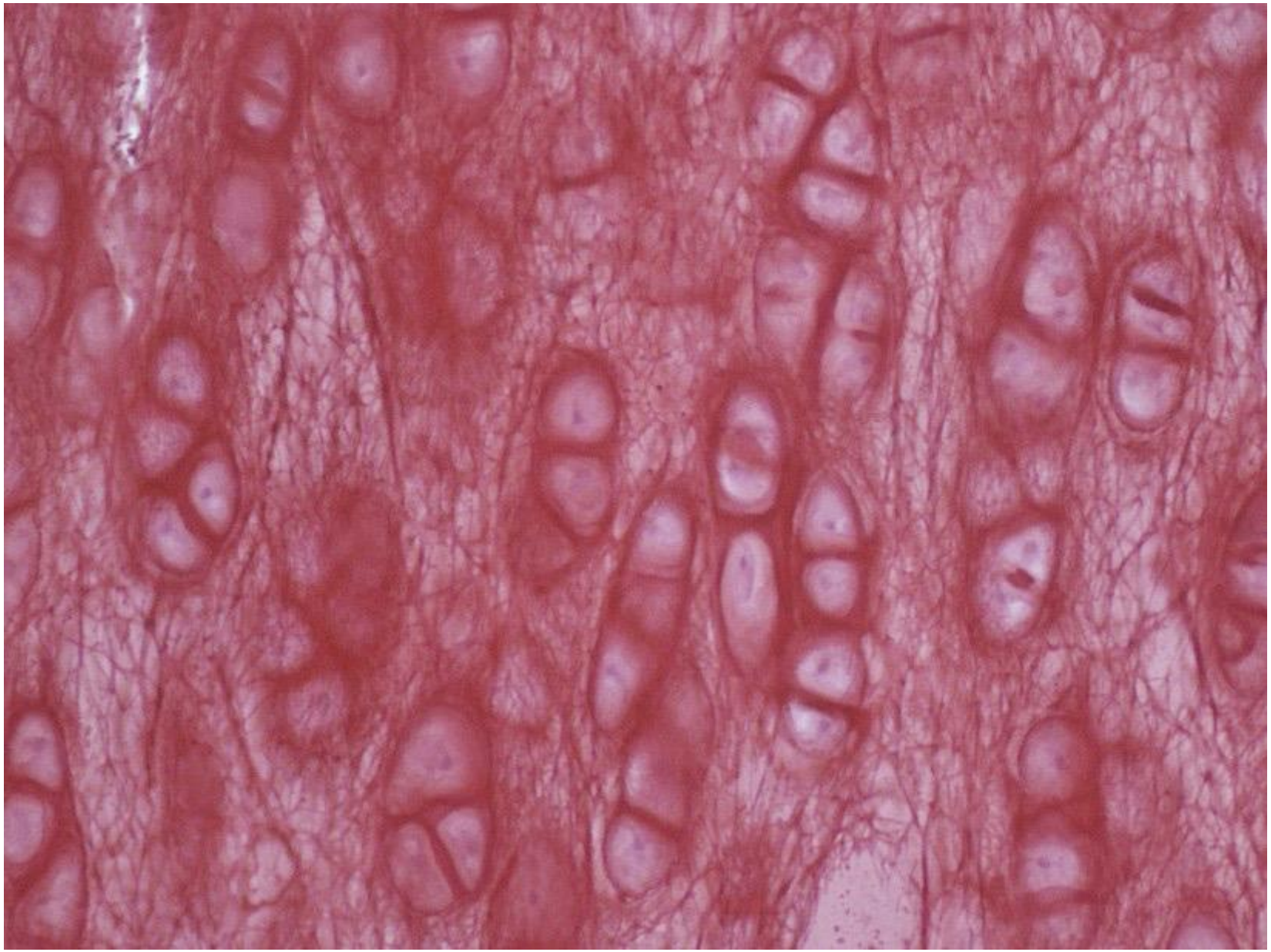
Slide №64 «Elastic cartilage of an ear auricle in cross section»
Staining: orcein



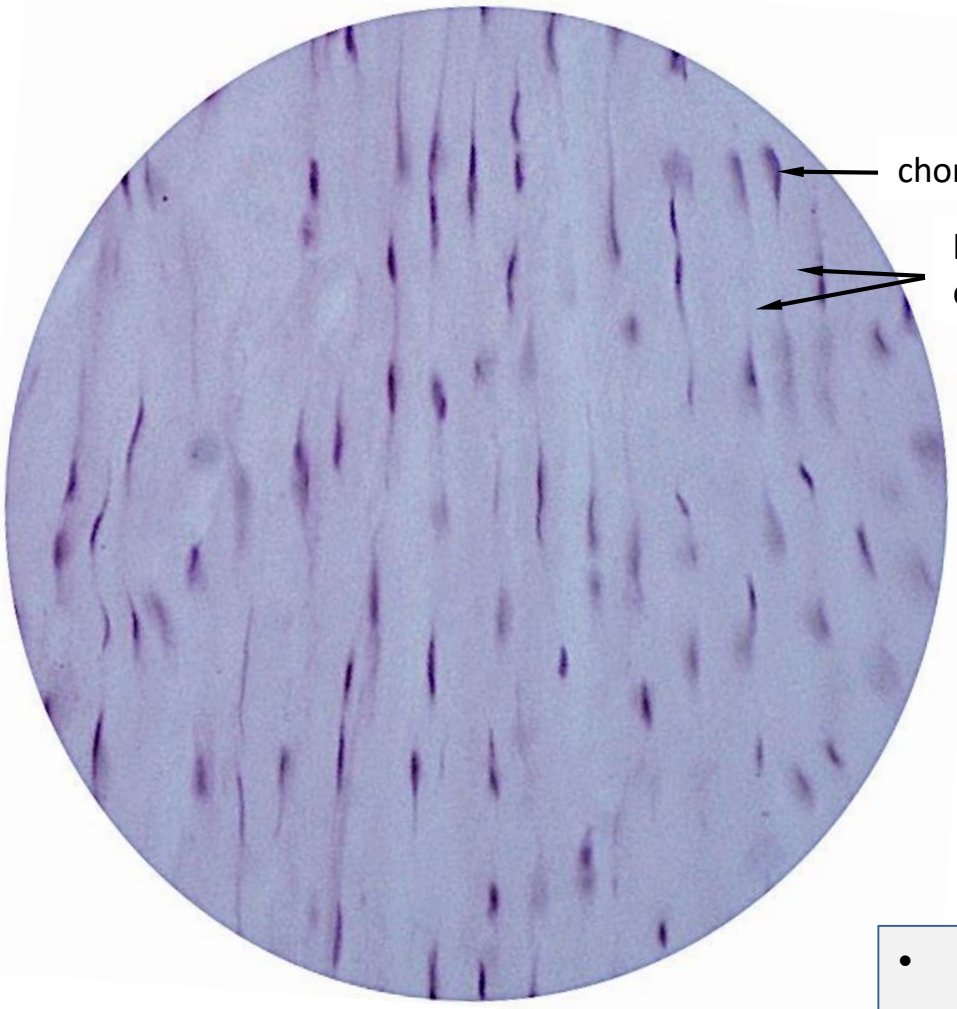
Slide №64 «Elastic cartilage of an ear auricle in cross section»
Staining: orcein



Slide №64 «Elastic cartilage of an ear auricle in cross section»
Staining: orcein



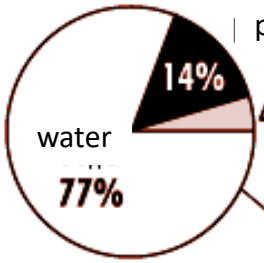
FIBROCARTILAGE OF INTERVERTEBRAL DISCS



- **NO isogenous groups**
  or they consist of two chondrocytes
- **NO perichondrium**
- **NO appositional growth**

FIBROCARTILAGE OF INTERVERTEBRAL DISCS

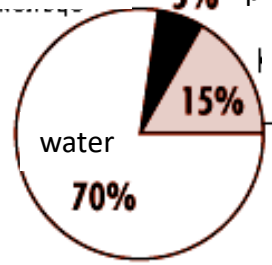
Nucleus Pulposus



proteoglycans

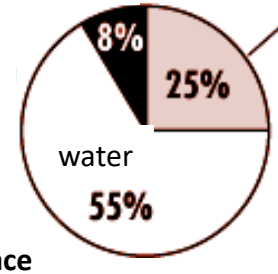
collagen

Annulus fibrosus



proteoglycans

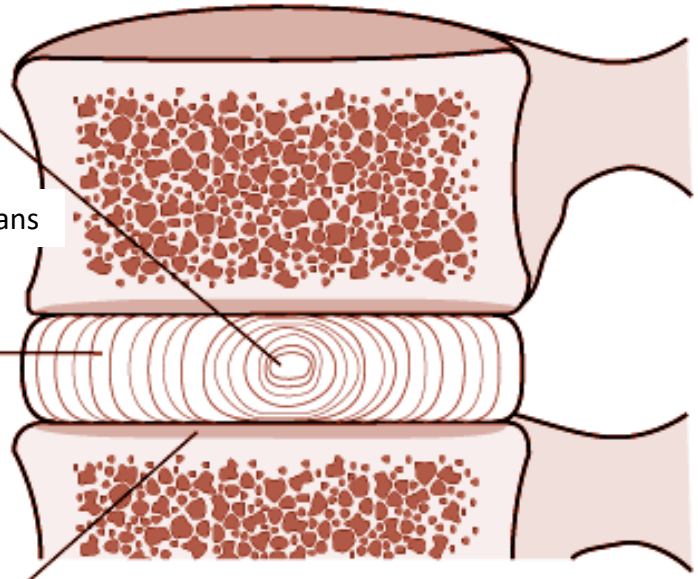
collagen

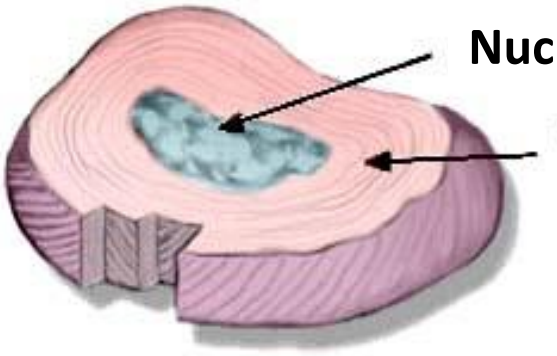


proteoglycans

collagen

Articular surface (hyalin cartilage)

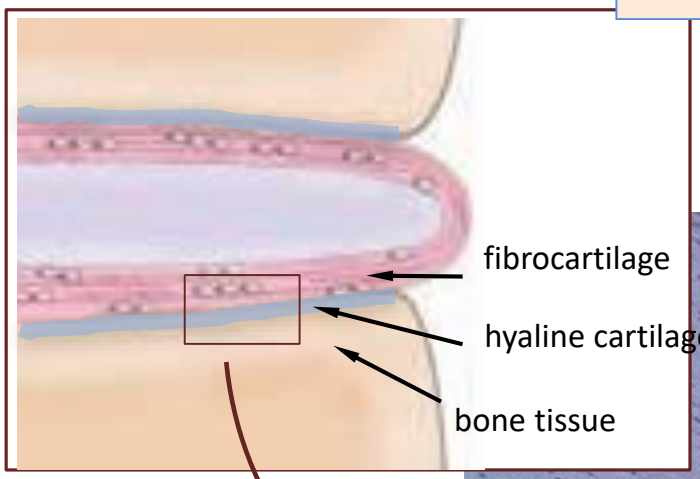


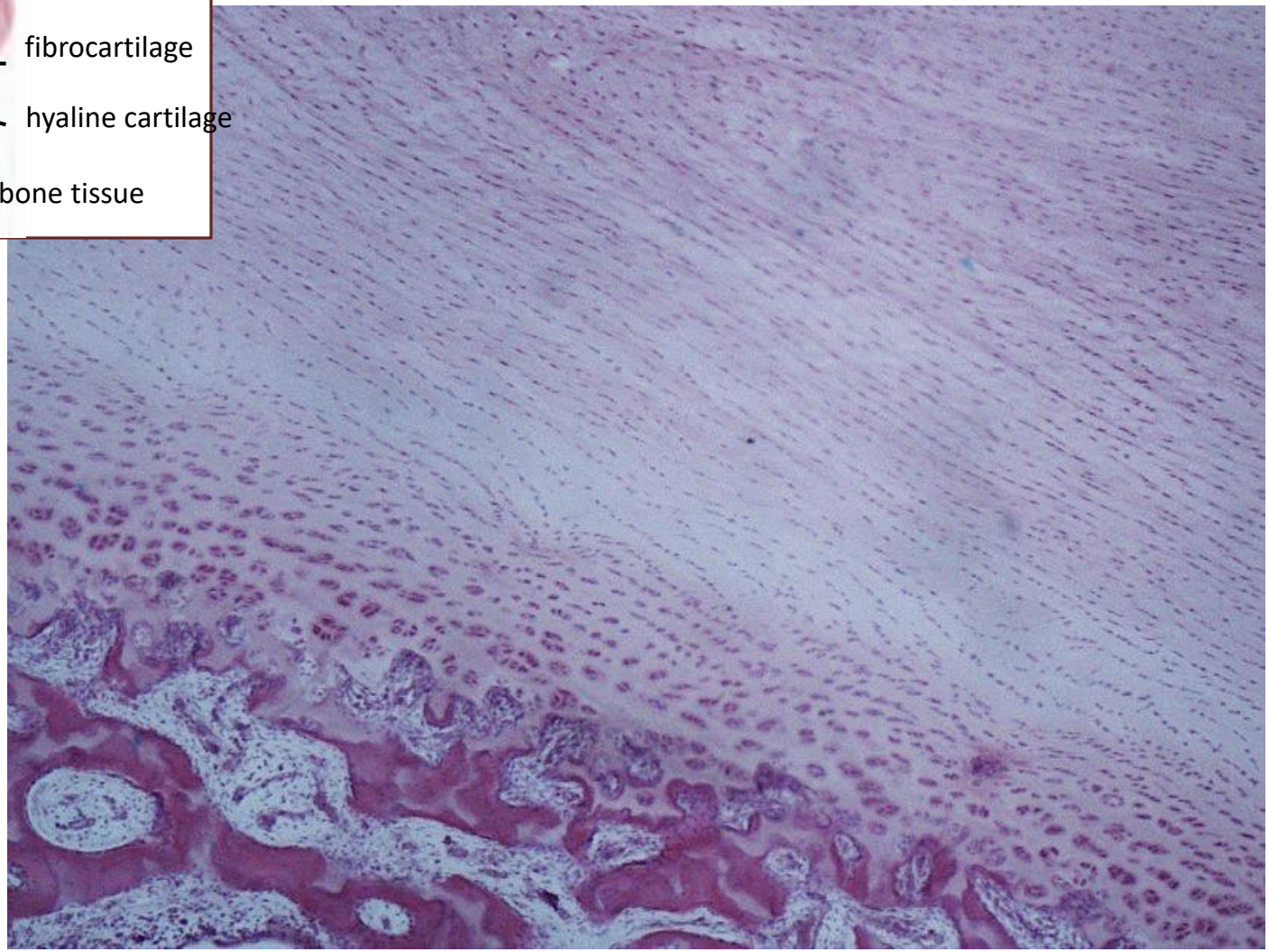


Nucleus pulposus

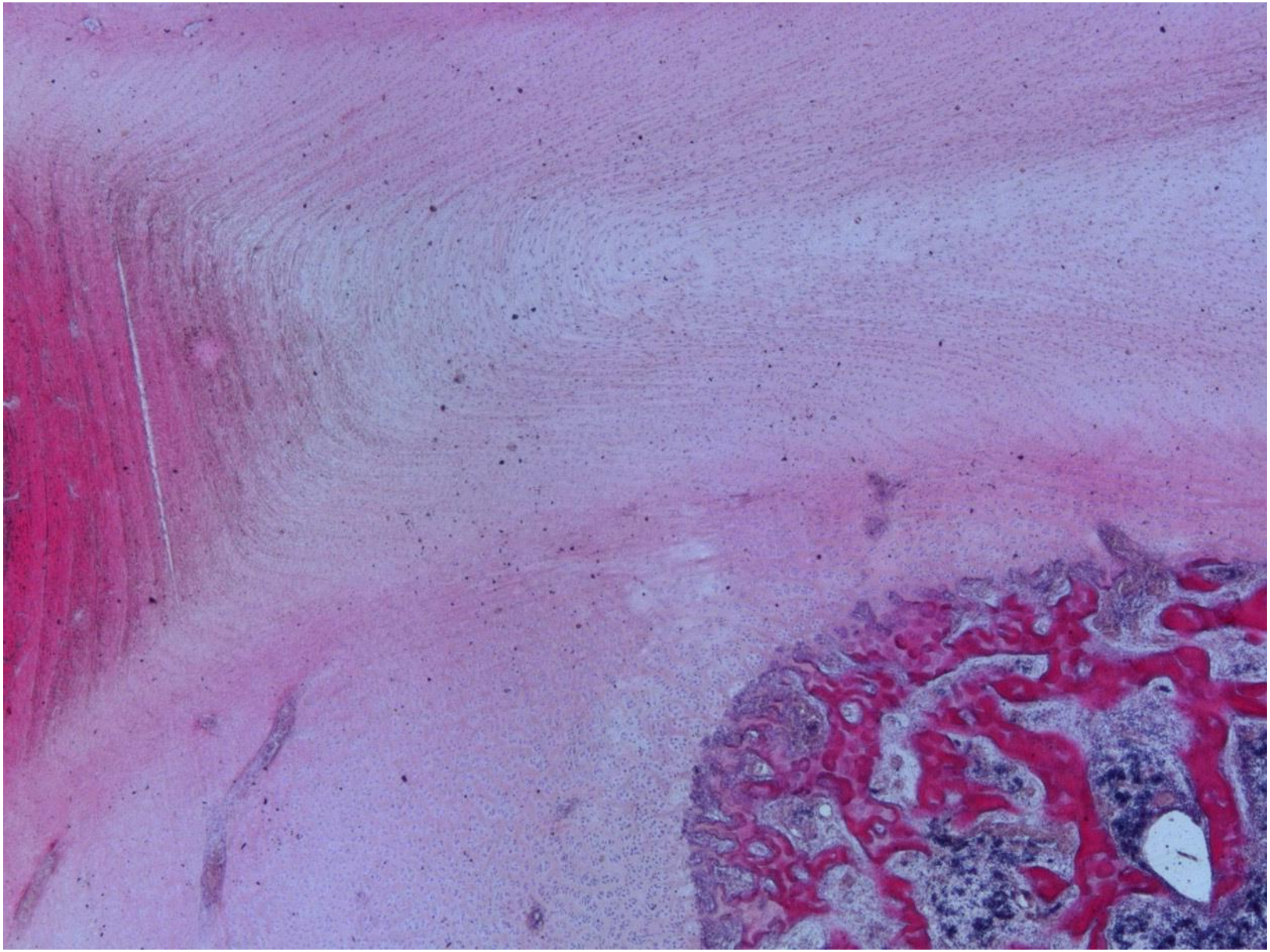
Annulus fibrosus

Slide №65 «Fibrocartilage of intervertebral disc, cross section»
Staining: H&E





Slide №65 «Fibrocartilage of intervertebral disc, cross section»
Staining: H&E



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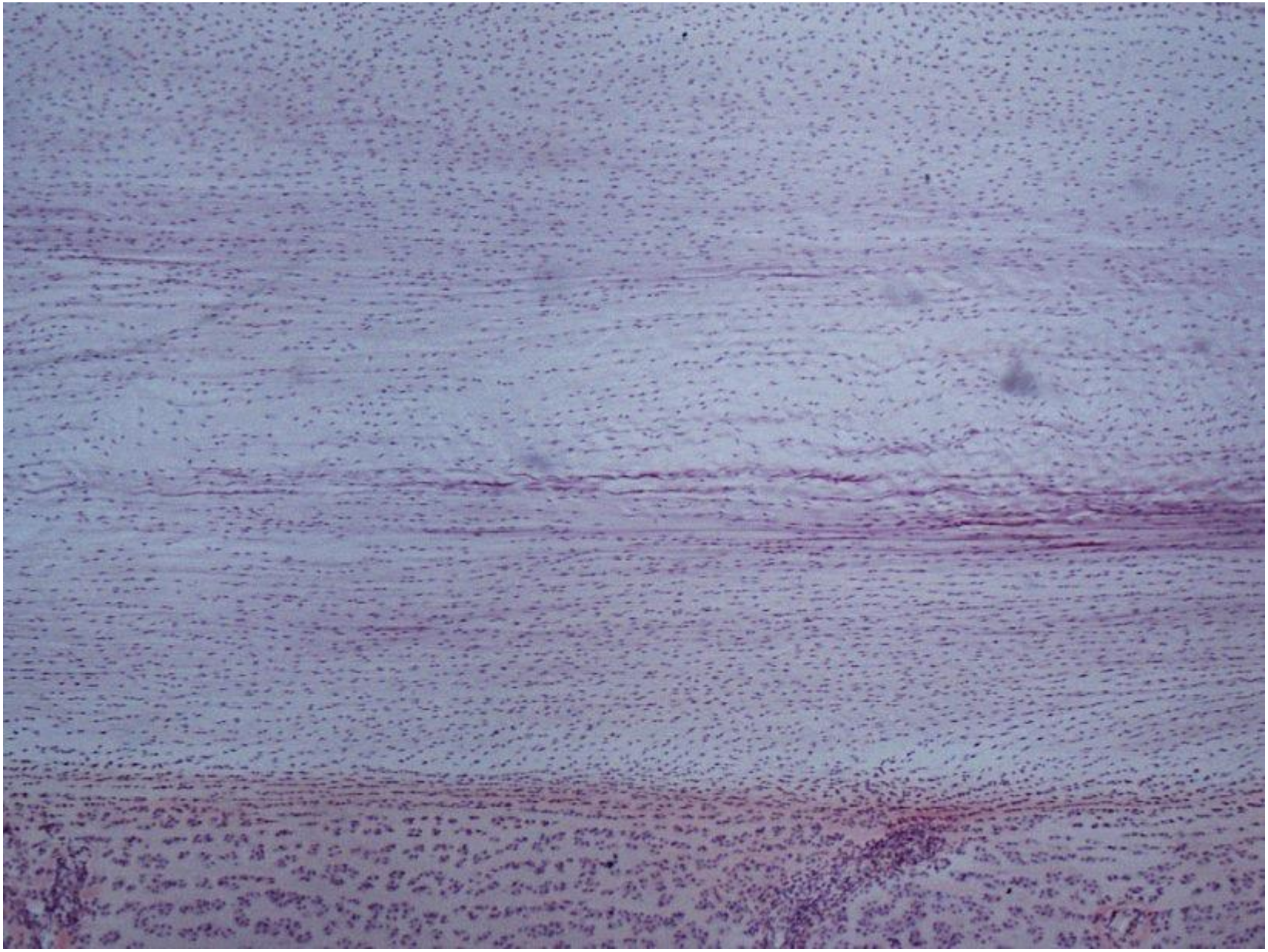

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Staining: H&E