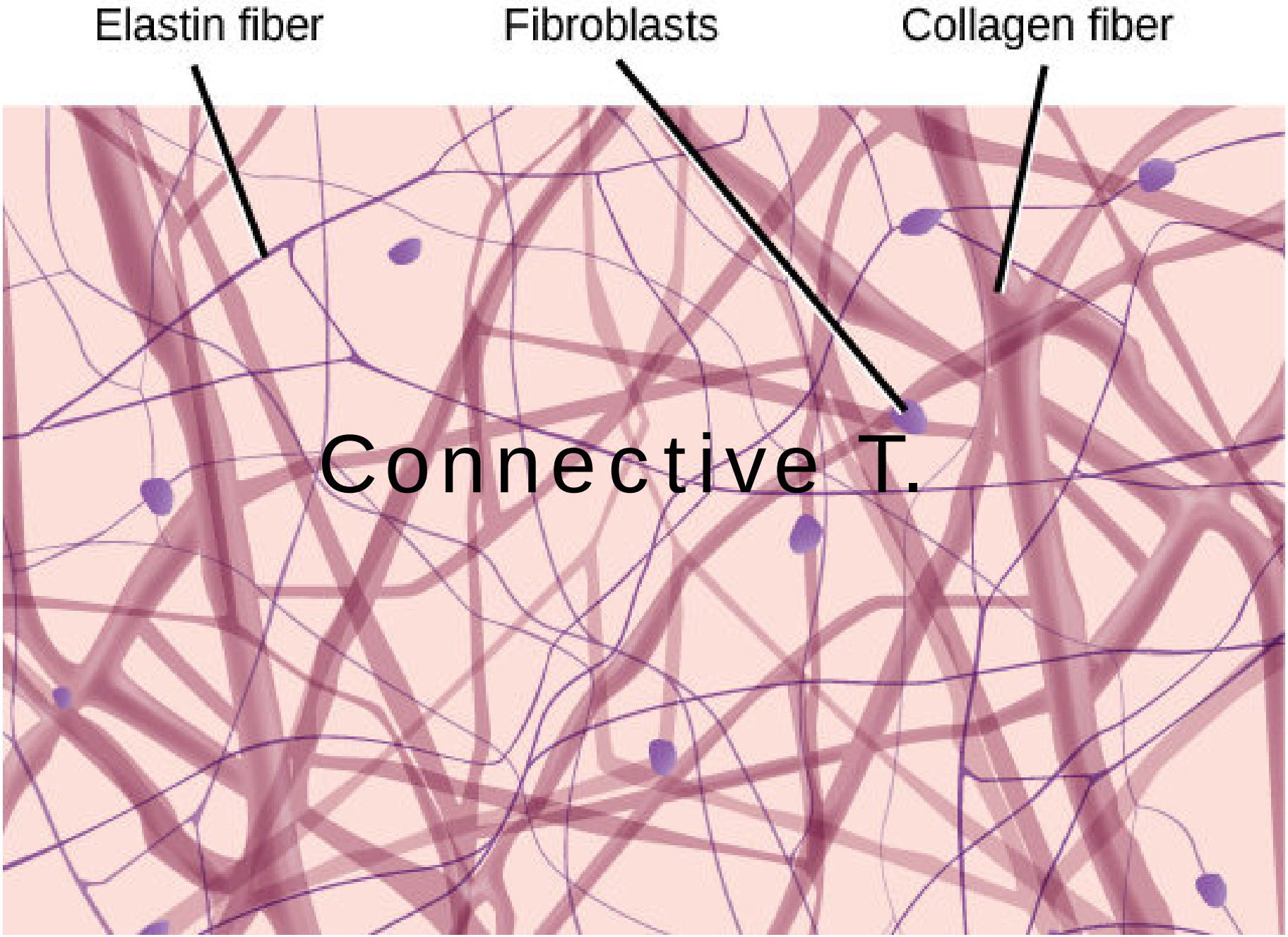

Elastin fiber
Fibroblasts
Collagen fiber
Connective T.

General Properties of Connective Tissue

One of the **four basic** types of tissues

widespread and abundant type of tissue in the human body

Major constituent is:

- Cells
- Fibers
- Ground substance

Fibers and ground substance are ECM

Functions:

- Architectural **framework** of the body
- **Bind** structures together
- provide **mechanical support** for other tissue
- **Protection:** inflammatory response
- Nutrition
- Wound repair
- **Stores fat** for energy, insulation, organ protection

Epithelium

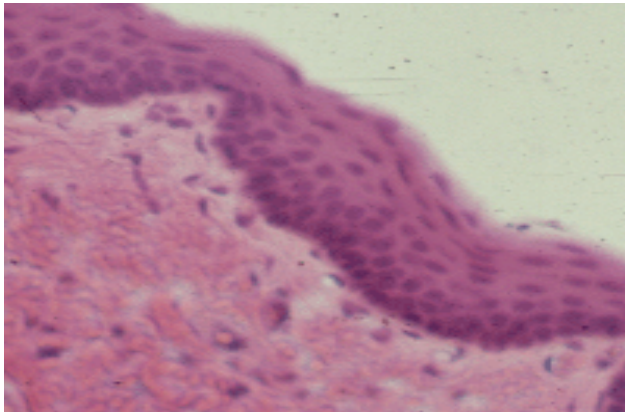
شغله بسيطة لابد من ذكرها. بدي امحي شوي من كلام من السلايد عشان الفراغ

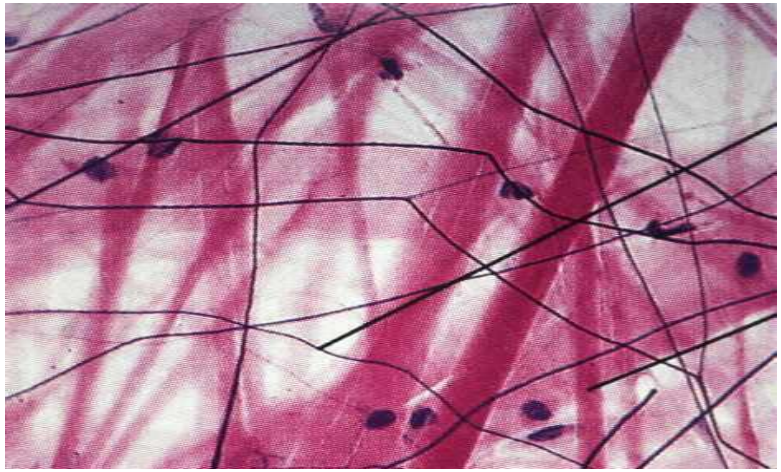
Because the component of connective T. exactly (Fibers and ground substance) .

Connective T.

- Cells: few, widely separated
- Intercellular substance: abundant

why



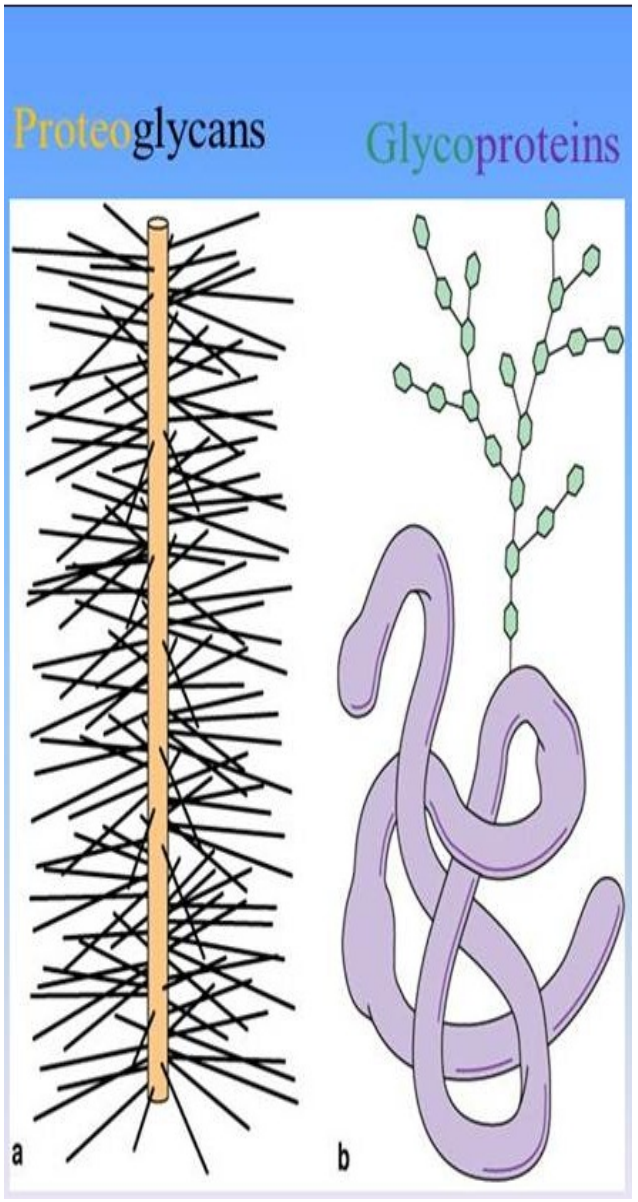


Ground Substance

1. **Glycosaminoglycans (GAG)**

liner Polysaccharides chain e.g. :

للاحتياط هنا انذكر كلمه وحد



هدا السلايد تبيض للسلايد اللي بعده

سأضع رقم 2002 في راسية السلايد للتميز

White fibers= Collagen

Why white
when it is gathering to form a bundles , it is shown by necked eye in fresh sate (without stain) ---white

-Most abundant
-highly carrying capacity
-have many type approximately 30

So when we would like to staining it in H&E….
it takes a pink color when it is reaction with E just

Reticular Fibers

Type 3 of collagen fiber

because it is a type of collagen fiber
there are many books that union it with white fibers

function as :
-provide support
-architectural framework

-Can not stain by H&E

Because it is form from reticular which collagen fiber tpe3 is one of component , it is found in organ that have rich cell in structure like (liver and bone marrow)

Yellow fiber

In fresh state(without stain) it shows as yellow color

Fresh state means without stain

*يعني بدون صبغه *بحالتها الطبيعية

Because it has a protein elastin , so when we tighten it ,, it will return to its normal state
easy -_-

Connective Tissue Fibers

2020

- White fibers = Collagen
  - most abundant protein in human body
  - contain protein collagen which gives the fibers flexibility and strength
- Reticular Fibers
  - specialized type of collagen fiber (Type III; reticulin)
  - Reticular fibers – thin, highly branched collagenous fibers that provide support
  - Silver stain is specific to demonstrate it
- Yellow fibers = **Elastic Fibers**
  - thin fibers or fenestrated sheets composed of various glycoproteins, including the protein elastin
  - contain elastin more elastic than collagen but not as strong
  - They are stained by orcein stain

Collagen fibers (white fibers)

هنا قمت بحذف كلمات من السلايد الأصلي للمساحه فقط

هان بتقلك العصفورة .. العضله بنهايتها بتكون بلون ابيض لذلك بسموها

Tendone

ف لاما بدك تسوي انقباض وانبساط للازم عالوتر يتحمل الظغط لذلك هو مكون من

White

- The most numerous
- are extremely tough.
- Formed of collagen protein
- They are stronger than steel fibers of the same size.
- They provide high tensile strength, which is the ability to resist longitudinal stress.
- Since fresh collagen fibers have a glistening white

- Over 90% of the collagen in the human body is type I collagen.
- 30 types of collagen have been identified, described, and divided into several groups according to the structure they form
- All of the types contain at least one triple helix

The five most common types are:

Reticular lamina

- it comes from connective tissue
  contain reticular fibers + type 7 of collagen fiber
- It comes from epithelial tissue + type 4 of collagen fiber
  (contain adhesion protein)

- Type IV: forms **basal lamina**, the epithelium-secreted layer of the basement membrane
- Type V: cell surfaces, hair, and placenta

Major Collagen Fiber Types

According to the chemical composition of collagen molecules

Collagen Type	Tissues	Function
Fibril-forming collagens (these are visible)		
I (most abundant)	Skin, tendon, bone, dentin	Resistance to tension
II	Cartilage, vitreous of eye	Resistance to pressure
III (reticulin)	Skin, muscle, blood vessels, liver, etc.	Structural framework and stability
Network-forming collagens		
IV	All basement membranes	Support and filtration
Fibril-associated collagens with interrupted triple helices (FACIT)		
VI, IX	Assoc. w/ type I and II fibrils	Fibril-fibril / fibril-ECM binding
Anchoring filament collagens		
VII	Epithelia	Epidermis to basal lamina

example

Hyaline cartilage

Globe -shape

- **Fibrillar**

(Type I, II, III, V, XI)

- **Non-fibrillar**
  - FACIT (Fibril Associated Collagens with Interrupted Triple Helices) (Type IX, XII, XIV, XIX, XXI)
  - Short chain (Type VIII, X)
  - Basement membrane (Type IV)
  - Multiplexin (Multiple Triple Helix domains with Interruptions)

(Type XV, XVIII)

  - MACIT (Membrane Associated Collagens with Interrupted Triple Helices) (Type XIII, XVII)
  - Microfibril forming (Type VI)
  - Anchoring fibrils (Type VII)

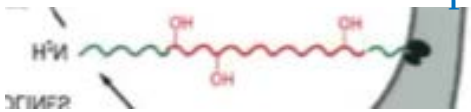
اكمن مصطلح احفظوا يا وتين

برضو تبيض للي بعدو

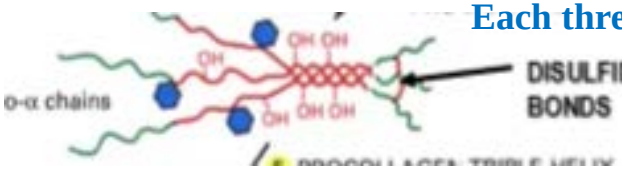
-Osteoblast : in bone
-Chondroblast : in cartilage
-Fibroblast: cell in C.T. produced collagen and other fiber
Blast-cell: highly activation cell -__-

Sequence of Amino acid

Alpha helix ….

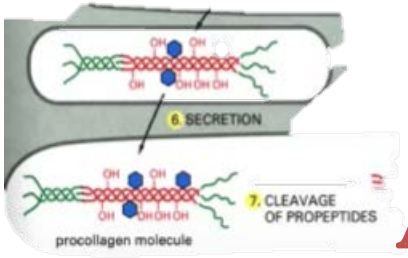


Each three of amino acid form triple helix



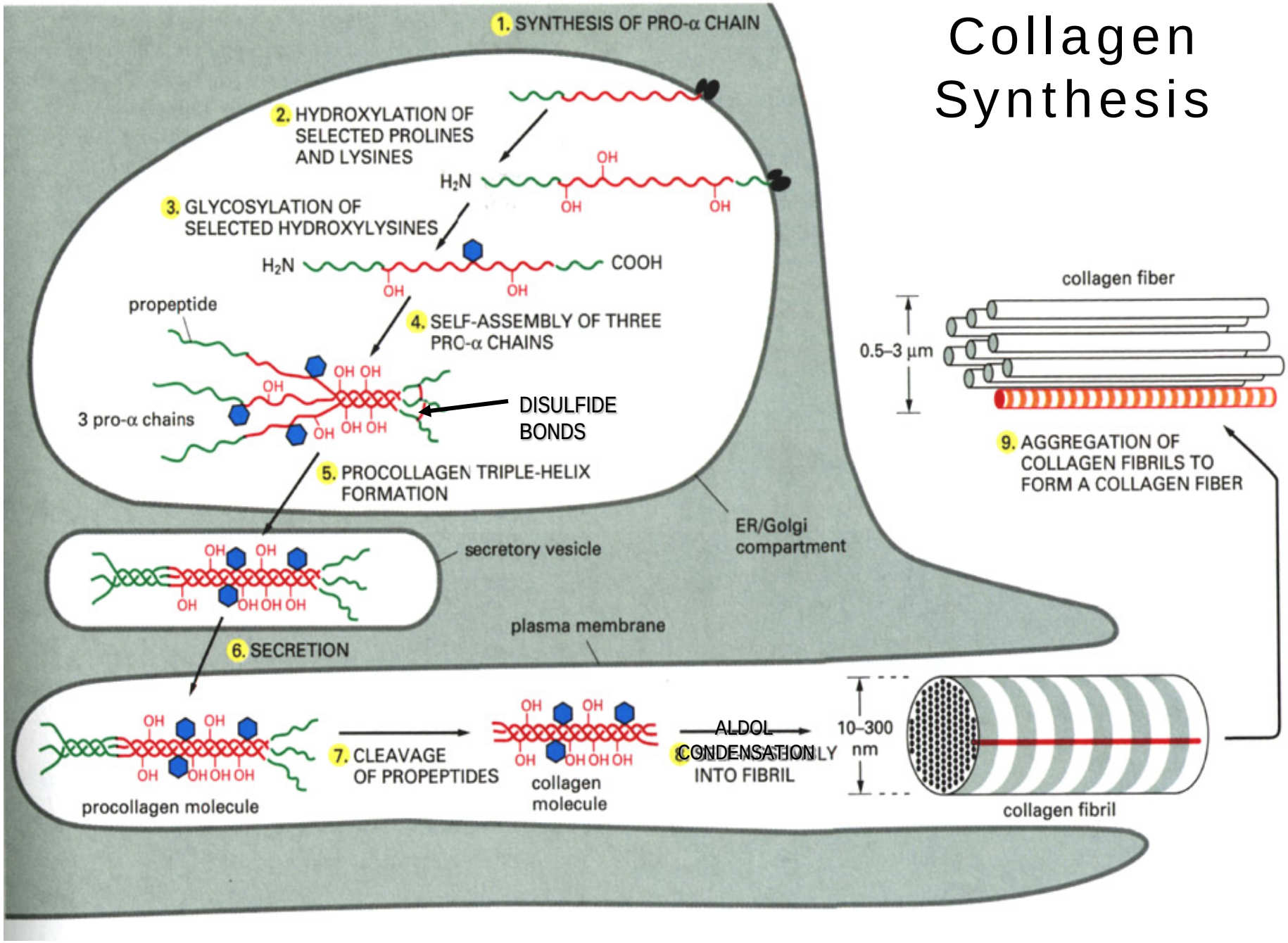
Procollagen triple helix

If cell want to synthesis of protein , it should secret it to out, so the triple helix goes to Golgi Apparatus then enclosed by vesicle and comes out .
بس سهله -_-

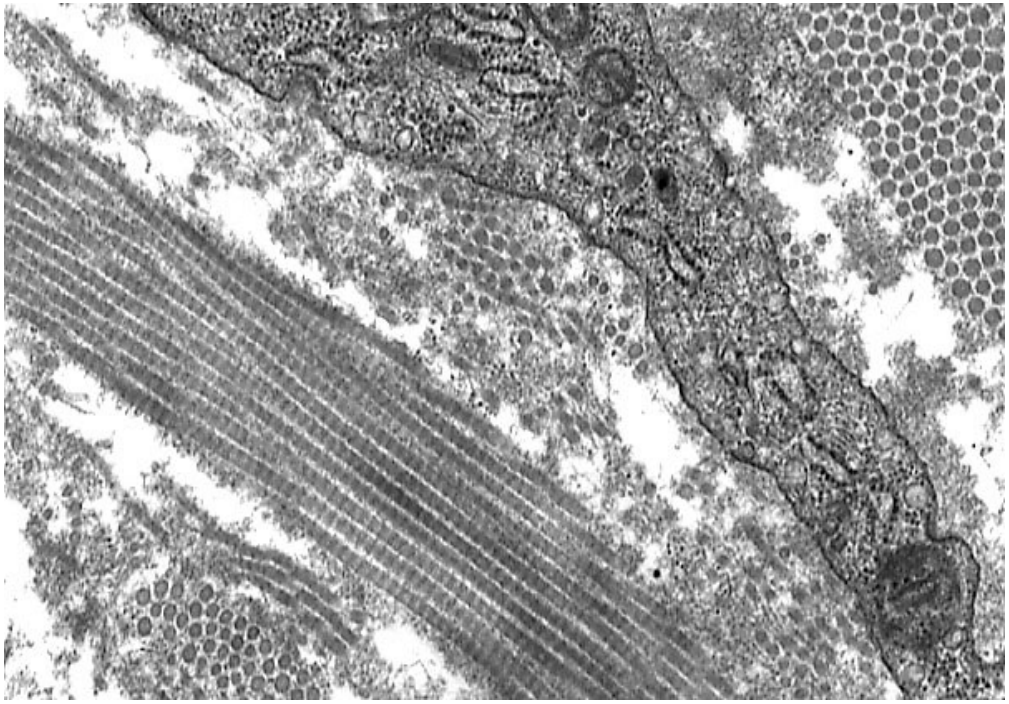


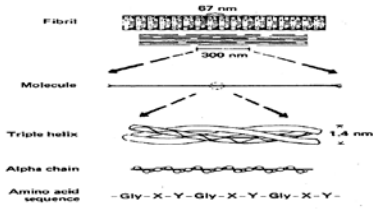
Active protein when > 3D

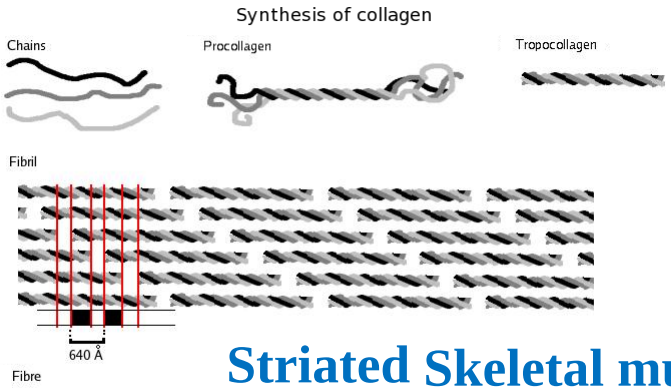
Collagen Synthesis

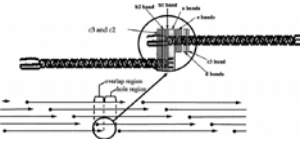


Collagen fiber in EM

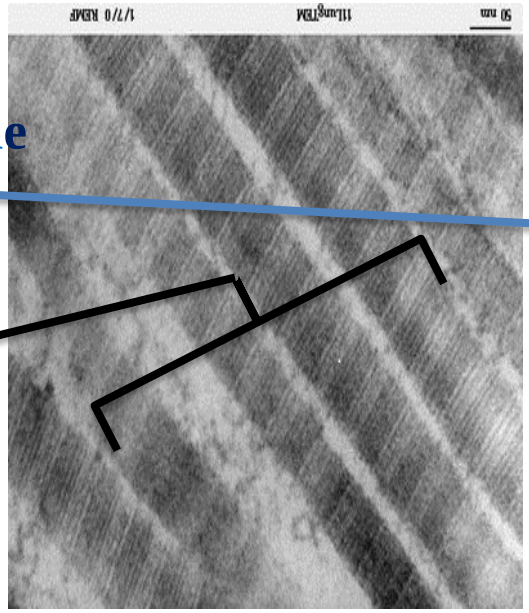


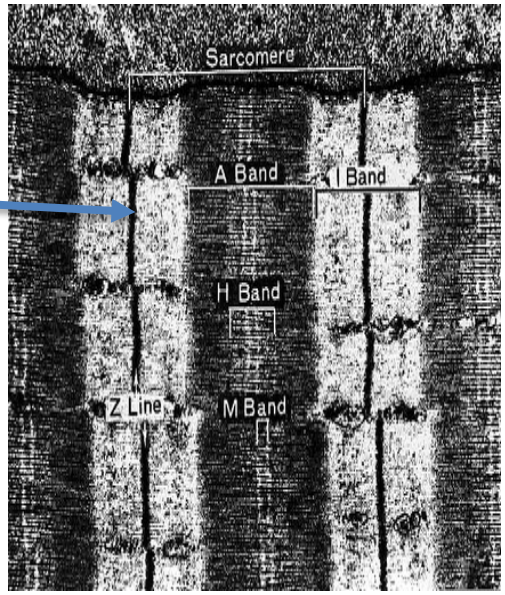






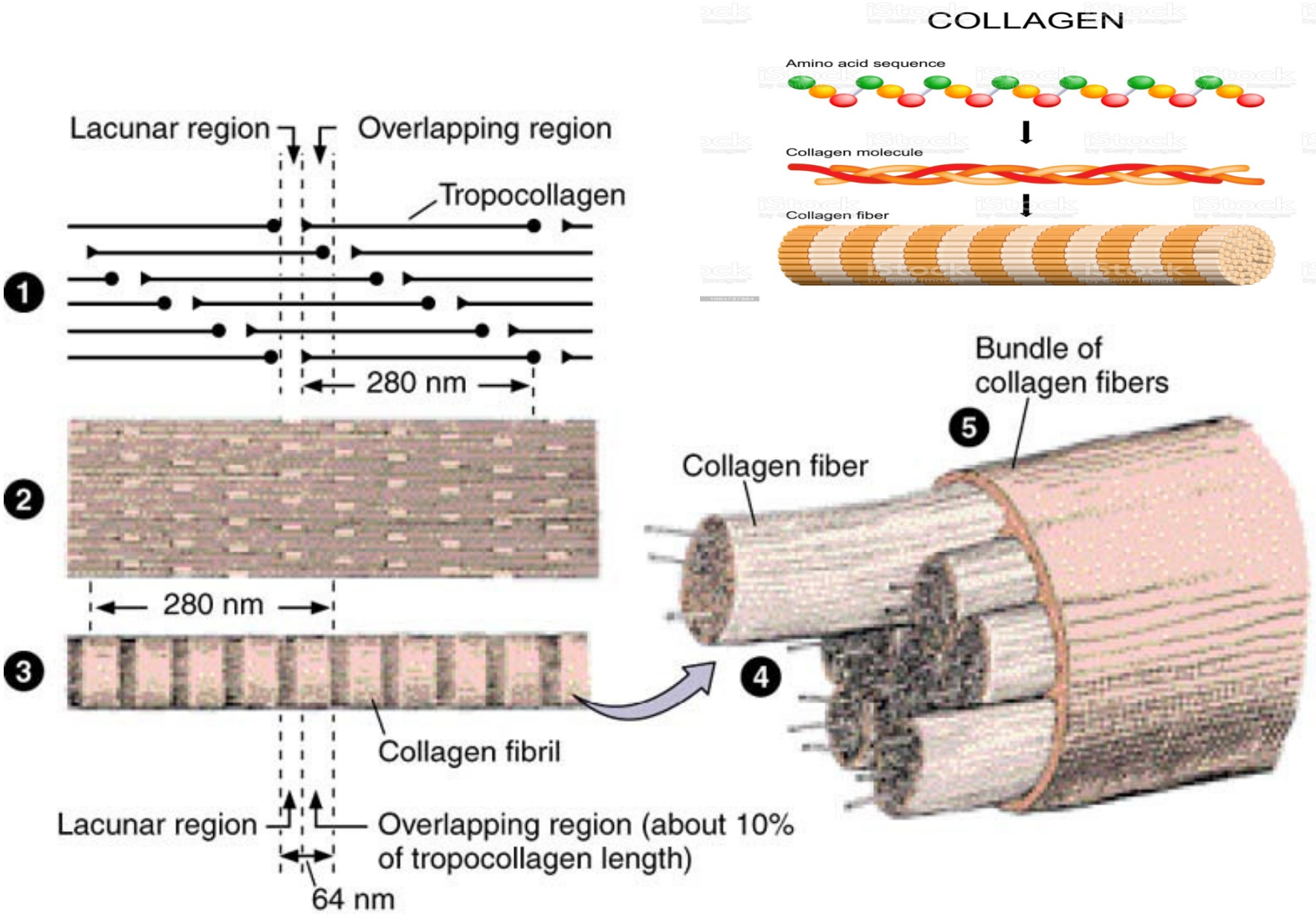
Striated Skeletal muscle





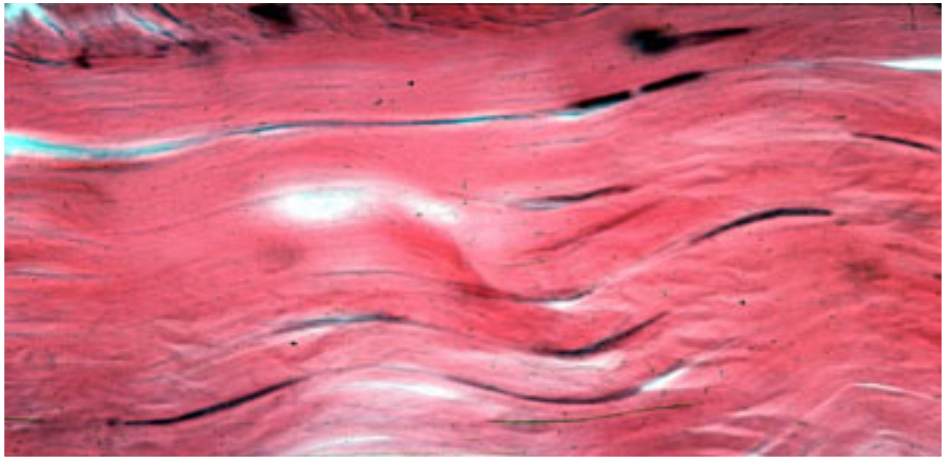
Due to the Overlapping between connective tissue (collagen fiber) it shows this.

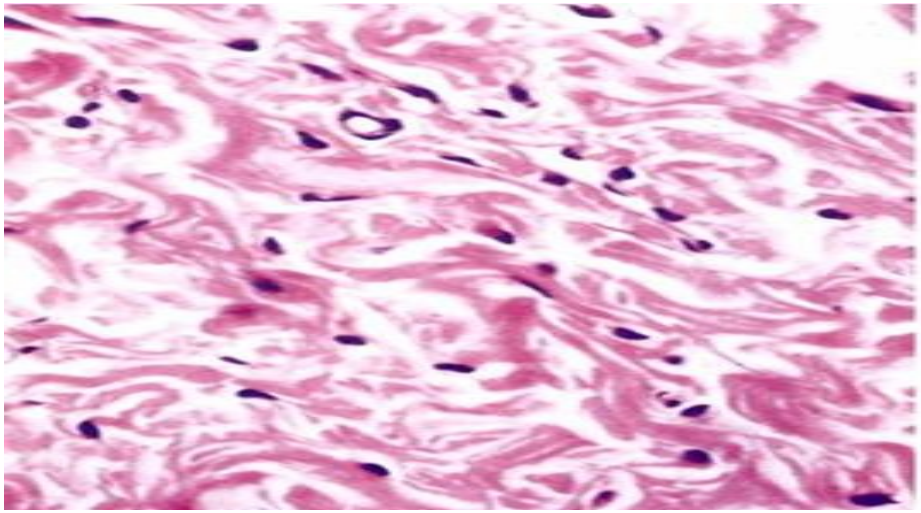
Assembly of collagen fiber bundles



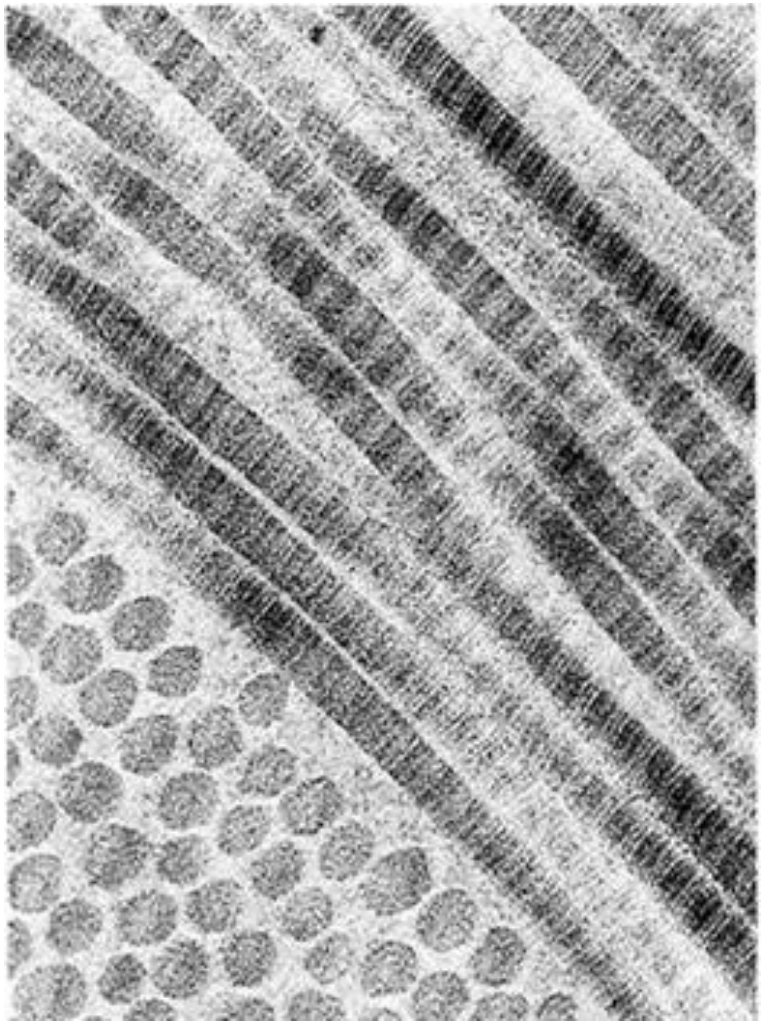
Collagen Fibers

H & E

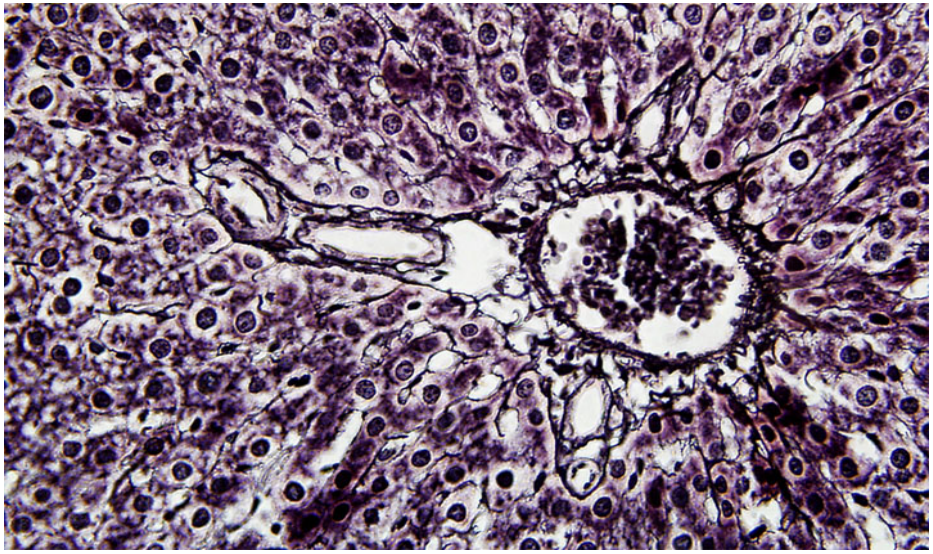


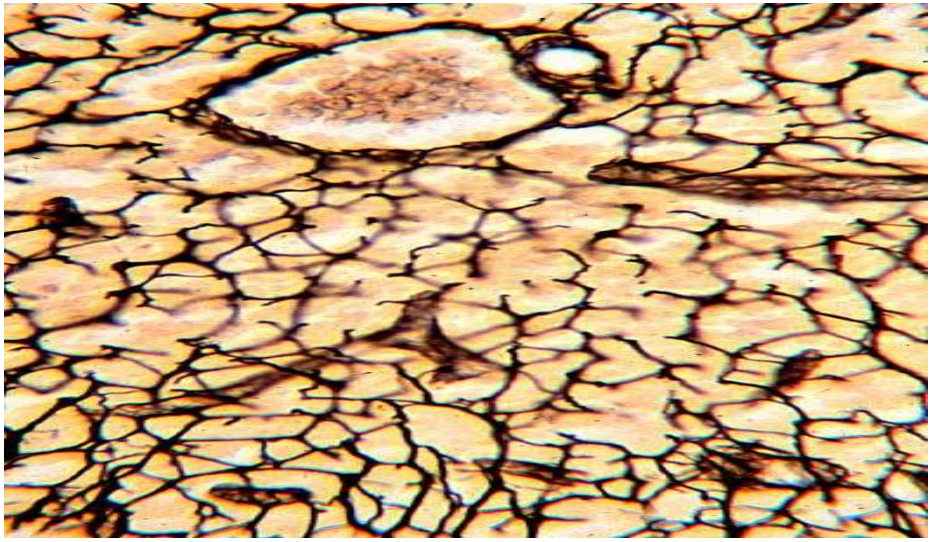


E M



Reticular (Reticulin) Fibers





- **Form a delicate supporting framework** for highly cellular tissues (endocrine glands, lymph nodes, liver, bone marrow, spleen, smooth muscle).
- **Composed mainly of Type III collagen,**

Sliver stain

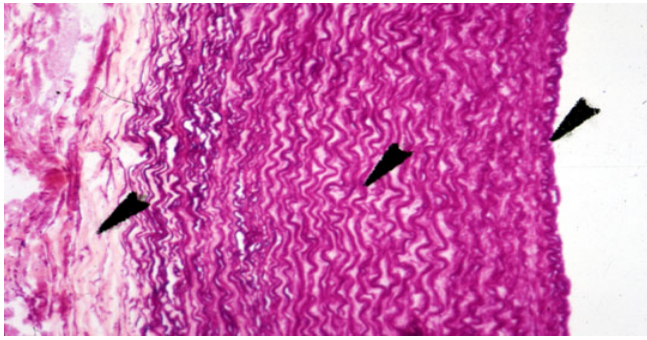
- **Stain : argyrophilic stained with** silver stain
- **Thinner than type I & form network**

Thick

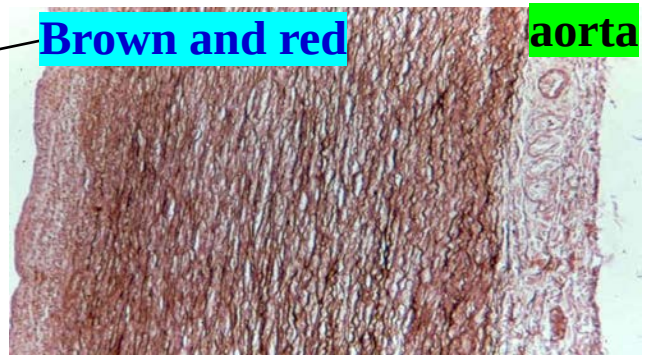
- made by **reticular cells** (specialized fibroblasts) and vascular smooth muscle cells

Elastic Fibers

Elastic fibers
can be stretched to one and one-half times their length, but recoil to their initial length when released.
Fresh elastic fibers appear yellow so it is called yellow fibers.



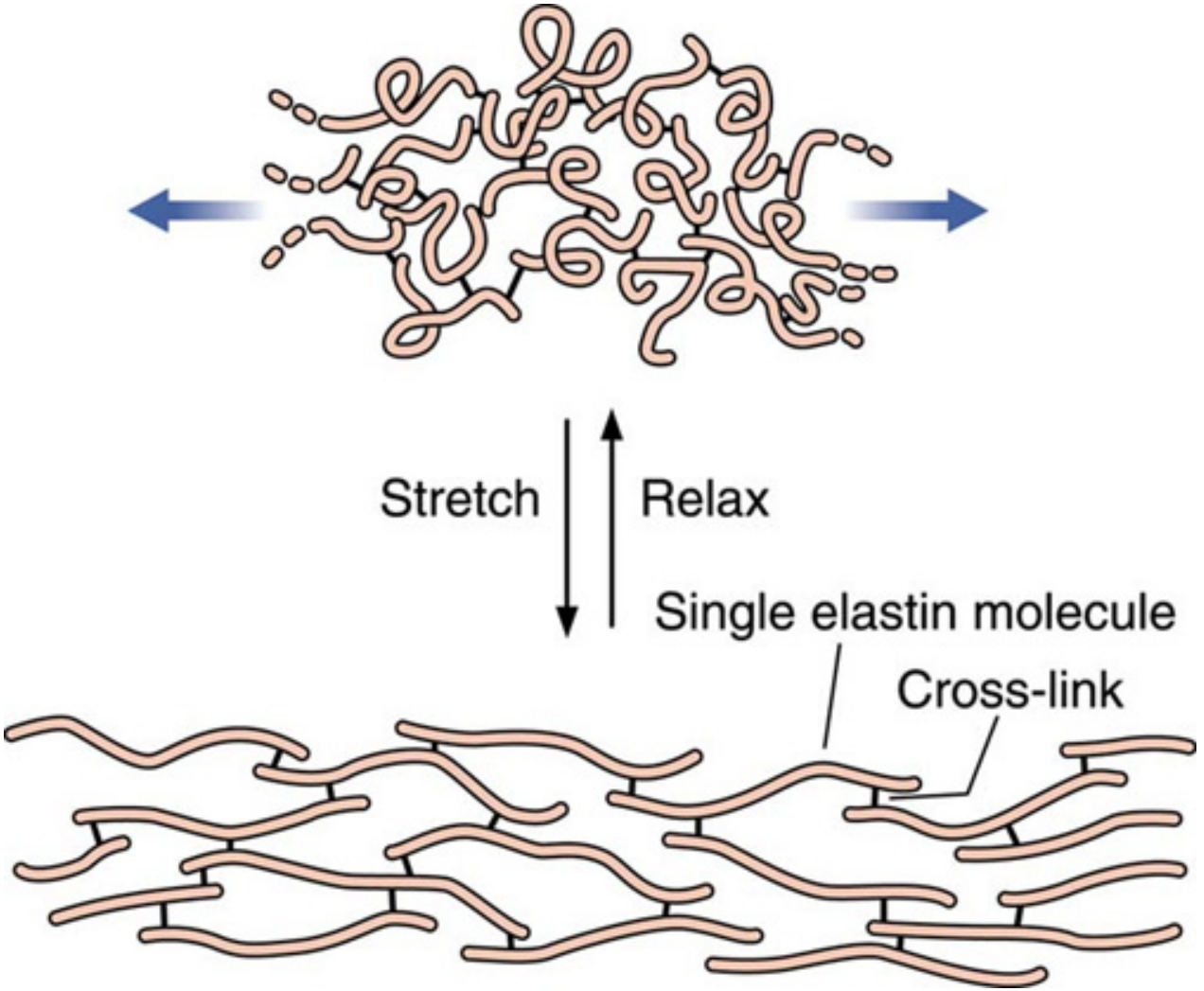
Stain : H&E , Orcein , VVG

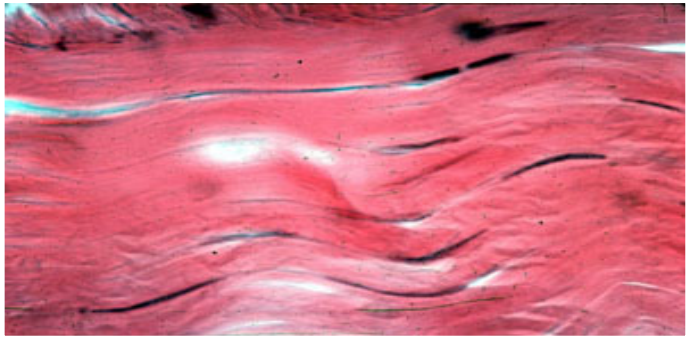


Elastin: is rich in elastin protein

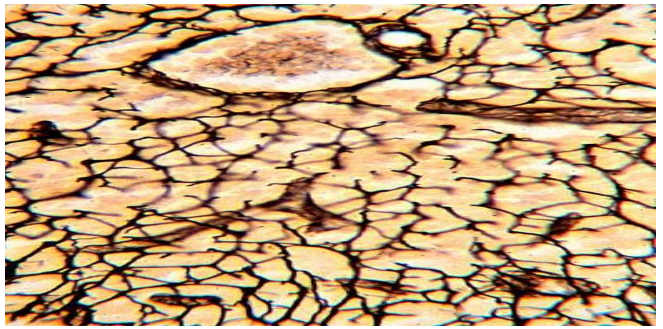
They are found where greater elasticity is needed present in large amounts in ligaments, lung, skin, bladder, and walls of blood vessels.

Network of elastin molecules can stretch and recoil like a rubber band





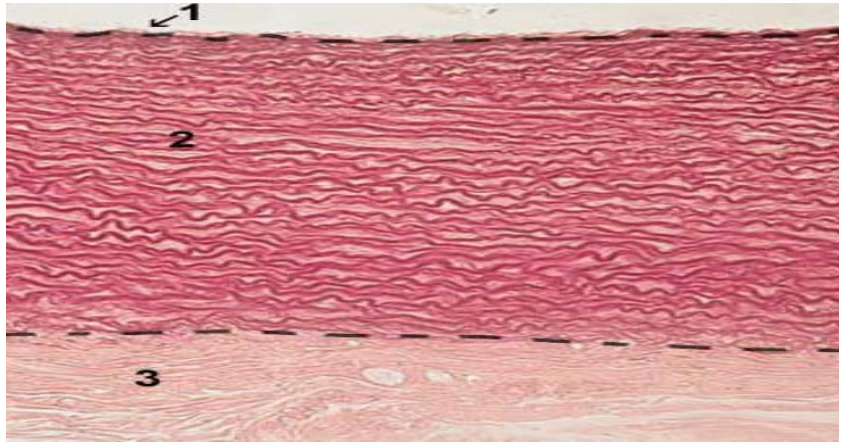
Fibers



- The most numerous
- White if in great number (white fibers)
- Strong and flexible
- Fibers do not branch but bundles can do
- Formed of **collagen protein**
- Stain pink with eosin
- Types of Collagen Fibres

- Thin branching
- Not stained by H&E
- Stained dark brown with silver stain
- Consist of type III collagen
- Supportive function

- Yellow if in great number (Yellow fibers)
- Elastic and stretchable
- Fibers can branch and unit
- Formed of **elastin** protein
- Stained weakly by H&E
- Stain brick red by orcein
- Stain dark violet with V.V.G stain.



Connective Tissue Cells

Resident cells cells

UDMCs

- Fibroblasts
- Adipocytes
- Pigment cells

Immigrant (Free) cells

- Monocytes/
- histocytes/
- **macrophages**
- Plasma cell
- **Mast cells**
- **Leucocytes**
- derived from hematopoietic stem cells and involved in immune function and inflammation

Specialised

- Reticular cells (reticular tissue)
- Pericytes (blood vessels)
- CHondriocytes (cartillage)
- Osteocytes (bone)
- Blood cells

C.T. CELLS

Fixed cells= resident

1. UDMC
2. Fibroblast , fibrocytes
3. Fat cell = adipocytes
4. Pigment cell

Free cells = immigrating

1. Macrophages
2. Plasma cell
3. Mast cell
4. White blood cells= Leucocytes

Thank You