

HOW TO CLASSIFY CONNECTIVE TISSUE PROPER TYPES

Tissue Name	Fiber Packing: Loose or Dense?	Fiber Orientation: Regular or Irregular?	Fiber Type: Collagen Elastic Reticular	Cell Number?	Example
Loose (areolar) CT	Loosely arranged (a lot of space between fibers = areolar)	Always Irregular	All three present, but in a low amount	Contain a lot of CT cells (very cellular)	Found in dermal papilla of skin, also as internal "scaffolding" of some organs, for ex.: the cores of villi of small intestine
Dense irregular CT	Many collagen fibers are densely packed	Irregular --fibers are arranged in all different directions and cut in various planes	Collagen	Fewer CT cells than in loose CT	Found in deep dermis of skin, non-lactating breast, organ capsules, etc.
Dense regular CT	Many collagen fibers are densely packed Or Many elastic fibers are densely packed	Regular --Collagen fibers and fibroblasts are arranged in a regular paralleled direction Regular --Elastic Fibers form parallel strands & are very large	Collagen And Elastic	Fewer CT cells than in loose CT --may be a little more than dense irregular CT	Found in collagenous tendons and ligaments Found in elastic ligaments such as the Nuchal Ligament & Yellow Ligament Found in Elastic lamina/lamellae/membrane as the <i>sheet form</i> in the wall of large blood vessels

FIBERS IN CONNECTIVE TISSUE PROPER

Name of Fiber	Descriptive Features	Functions (What do they do?)	Components?	Important Notes
Collagen Fibers (also called white fibers)	--White color in fresh tissue --stained red/pink in H&E Staining -- Some collagens (e.g., type I,II,III...) are fibril-forming, assembled into small fibrils which have a typical cross-striation appearance under EM as "banded" collagen fibrils	--Provide the tensile strength to CT	--Collagen: the most abundant protein in animals	Fibroblasts secreted the collagen --These are acidophilic or eosinophilic (=stained red/pink in H&E staining) --In Verhoeff staining: stained pink/red by acidic fuchsin --Many types: Collagen Type I: most predominant fiber in proper CT --white, flexible --adapts easily (skin, bone, tendon) Collagen Type II: (in cartilage) Collagen Type III: (in reticular fibers) Type IV & VII:(framework of basal lamina)
Reticular fibers (a subtype of collagen fibers)	--extremely thin, too thin to be visible under routine H&E staining	--Help to anchor vessels & nerve fibers -- Form a delicate support network for highly cellular tissues (lymphoid nodes, spleen, bone marrow, liver, etc.) -- Associated with blood vessels and lymphatic vessels, etc.	Composed of loosely packed banded individual <u>fibrils</u> made by <u>type III collagen</u>	-- Able to be stained black by silver staining (thus called <u>argyrophilic</u> fibers). --Argyrophilic means that they have a high affinity for silver salts (Ag+) --the binding Ag+ can be converted to metallic Ag which is deposited & appears as dark brown or black deposits
Elastic Fibers (also called yellow fibers)	--yellow color in fresh tissue, with "springiness" elasticity -- Diameter varies, usually thinner than collagen fibers	--Add resiliency to CT	Made by 2 components: --Microfibrils --Elastin (amorphous elastic protein)	--Produced by fibroblasts in CT or smooth muscle cells in the wall of blood vessels -- Small elastic fibers <u>can not be typically seen</u> on routine H&E staining. More visible by special elastin staining (Verhoeff staining for ex). --In Verhoeff staining: Stained dark black by iron-hematoxylin

CELLS IN CONNECTIVE TISSUE PROPER

Names of Cells	What part of CT proper ?	Description	Where are they found?	Function (What do they do?)	Important Notes
Fibroblasts	Fixed CT Cells	--spindle/fusiform shaped cells  --have elongated, flat, oval, nucleus		--They synthesize CT fibers (collagen, reticular, & elastic fibers) & ground substances (including the GAGs & glycoproteins) --structural support	--Most important & abundant long lived CT cells --Called fibrocytes when they become inactive
Adipocytes (fat cells) --Two forms: 1.) Unilocular (white) 2.) Multilocular (brown)	Fixed CT Cells	White: --single large fat (lipid) droplet in cytoplasm --fat (lipid) droplets are not membrane-bound Brown: --multiple small fat (lipid) droplets in cytoplasm --mitochondria content high	--scattered singly or in clumps in CT	--Metabolic --Energy storage --Thermal insulation	
Macrophages (also called histiocytes)	Fixed CT cells	--have an abundant foamy cytoplasm under optical microscope --contain many lysosomes in cytoplasm under TEM		Defense & Immunity--important in inflammatory rxn, they do the phagocytic activity during inflammation and do cleanup work in tissue	they derive from monocytes in blood tissues normally have them turned off
Mast Cells (Mastocytes)	Fixed CT cells	contain many secretory granules which contain heparin & histamine, & leukocyte attracts granules are basophilic & similar to that in the basophils of blood	often distributed along blood vessels	Defense & immunity--basophilic granules released in allergic reaction and inflammation	mastocytes are metachromatic. So u use metachromatic staining to the cell organelle a diff color than the dye solution.
Mesenchymal Cells	Fixed CT Cells	--star shaped Or --fusiform-shaped	Rare in adult tissues, alot in embryonic tissues	embryonic source of all CT cells	they are the stem cells in CT, & have the potential to differentiate into nearly all CT cells
Plasma Cells	Transient/Mobile Cells	appearance: clock face heterochromatin in nucleus the most abundant rER and golgi apparatus in cytoplasm prominent golgi apparatus; seen as a cleared area adjacent to the nucleus	very numerous in mucosa CT of the gut NOT normal components of blood, but are found in tissue	Defense and immunity--they are B lymphocytes that are activated & when activated they secrete large amounts of antibodies so their main function is antibody production	
Transient/Mobile Cells	Transient/Mobile Cells	They are the leukocytes (granule cells, lymphocytes, monocytes, neutrophils, eosinophils, & basophils) from the blood.		Defense & Immunity—they are defense cells that accumulate in CT during inflammation	they come & go, so there is not many of them in normal CT, but they become abundant during inflammation

