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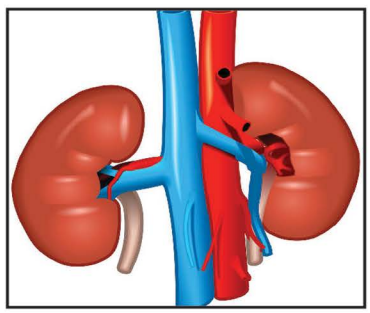
• Anatomy • Embryology • Histology • Physiology • Biochemistry • Microbiology • Pathology • Pharmacology • Forensic Medicine • Social and Preventive Medicine • Biostatistics • ENT • Ophthalmology • General Medicine • Surgery • Obstetrics and Gynecology • Pediatrics • Psychiatry • Dermatology • Orthopedics • Radiology • Anesthesiology

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CHAPTER

3

Histology

- Reticular fibers consist mainly of collagen type III.
- The elastic fiber system is composed of three types of fibers—oxytalan, elaunin, and elastic.
- Microfibrils composed of various glycoproteins, including **fibromodulin I and II** and a large molecule called **fibrillin.**
- Mutations in the fibrillin gene result in Marfan syndrome, a disease characterized by a lack of resistance in the tissues rich in elastic fibers. Large arteries → rich in components of the elastic system → blood pressure is high in the aorta → patients with this disease often experience aortic rupture.
- Elastic tissue, which occurs infrequently, is present in the yellow ligaments of the vertebral column and in the suspensory ligament of the penis.
- Mucous tissue has an abundance of ground substance composed primarily of hyaluronic acid. It is a jellylike tissue containing very few fibers. The cells in this tissue are mainly fibroblasts. Mucous tissue is the principal component of the umbilical cord, where it is referred to as **Wharton's jelly.** It is also found in the pulp of young teeth.
- Collagen, hyaluronic acid, proteoglycans, and small amounts of several glycoproteins are the principal macromolecules present in all types of cartilage matrix. Elastic cartilage, characterized by its great pliability, contains significant amounts of the protein elastin in the matrix.
- As a consequence of various functional requirements, three forms of cartilage have evolved, each exhibiting variations in matrix composition.
- In the matrix of **hyaline cartilage,** the most common form, type II collagen is the principal collagen type the more pliable and distensible **elastic cartilage** possesses, in addition to collagen type II, an abundance of elastic fibers within its matrix.
- **Fibrocartilage,** present in regions of the body subjected to pulling forces, is characterized by a matrix containing a dense network of coarse type I collagen fibers.
- In adult mammals, hyaline cartilage is located in the articular surfaces of the movable joints, in the walls of larger respiratory passages (nose, larynx, trachea, bronchi), in the ventral ends of ribs, where they articulate with the sternum, and in the **epiphyseal plate,** where it is responsible for the longitudinal growth of bone.
- Cartilage proteoglycans contain chondroitin 4-sulfate, chondroitin 6-sulfate, and keratan sulfate, covalently linked to core proteins. Up to 200 of these proteoglycans are noncovalently associated with long molecules of hyaluronic acid, forming **proteoglycan aggregates** that interact with collagen. The aggregates can be up to 4 m in length.
- In addition to type II collagen and proteoglycan, an important component of cartilage matrix is the structural glycoprotein **chondronectin,** a macromolecule that binds specifically to glycosaminoglycans and collagen type II, mediating the adherence of chondrocytes to the extracellular matrix. The cartilage matrix surrounding each chondrocyte is rich in glycosaminoglycan and poor in collagen. This peripheral zone, called the **territorial,** or **capsular,** matrix, stains differently from the rest of the matrix.
- Elastic cartilage is found in the auricle of the ear, the walls of the external auditory canals, the auditory (eustachian) tubes, the epiglottis, and the cuneiform cartilage in the larynx.
- In areas of bone undergoing resorption, osteoclasts lie within enzymatically etched depressions in the matrix known as **Howship's lacunae.**

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- α-Actinin and desmin (an intermediate filament protein) are believed to tie adjacent sarcomeres together, thus keeping the myofibrils in register.
- Lipofuscin pigment granules (aging pigment), often seen in long-lived cells, are found near the nuclear poles of cardiac muscle cells.
- **Desmin** (**skeletin**) has been identified as the major protein of intermediate filaments in all smooth muscles, and **vimentin** is an additional component in vascular smooth muscle.
- In addition to contractile activity, smooth muscle cells also synthesize collagen, elastin, and proteoglycans, which are extracellular products normally associated with the function of fibroblasts.
- Smooth muscle is capable of an active regenerative response. After injury, viable mononucleated smooth muscle cells and pericytes from blood vessels undergo mitosis and provide for the replacement of the damaged tissue.
- The internal surface of all components of the blood and lymphatic systems is lined by a single layer of a squamous epithelium, called endothelium.

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- Statistics is dealt as a separate chapter.
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