Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Oral cavity and salivary glands. (Histology chapter 10)

Be able to:

- **Define and use:** oral mucosa, gingiva (gum), masticatory mucosa, marginal gingiva, dentogingival junction, hemidesmosome, gingival sulcus (groove), alveolar (attached) gingiva, gingival (interdental) papilla; skin and mucosal aspect of lip, vermillion zone, cheek, hard palate, mucoperiosteum, soft palate; saliva, amylase, lactoferrin, lysozyme, secretory immunoglobulin (IgA), minor salivary glands, buccal gland, molar gland, labial gland, lingual glands, palatine glands, major salivary glands, parotid gland, sublingual gland, submandibular gland, serous demilune, acinus, tubule, serous and mucous cells, intercalated duct, intralobular duct, striated duct, interlobular duct, main excretory duct; tooth, crown, cervix, root, pulp cavity, root canal, apical foramen, enamel, enamel prism (rod), ameloblast, hydroxyapatite crystal of enamel, Hunter-Schreger bands, enamel incremental lines (striae of Retzius), dentino-enamel junction, dentin, dentinal tubule, odontoblast process (Tomes' fibre), peritubular dentin, intertubular dentin, dentinal incremental lines, predentin, primary dentin, secondary dentin, tertiary dentin, acellular and cellular cementum, cementoblast, cementocyte, dental pulp, odontoblast, periodontium, periodontal ligament, dentoalveolar ligament, alveolar periosteum; tongue, filiform papilla, fungiform papilla, foliate papilla, vallate papilla, groove of papilla, terminal sulcus, serous glands of von Ebner, mucous glands of Weber, taste (gustatory) bud, taste pore, gustatory and supporting cell, lingual glands, anterior (apical) lingual gland, lingual tonsil, skeletal striated muscle; palatine tonsil, tonsillar crypt, lymphoid follicle, tonsillar hemicapsule
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the internal organization of the lip. **Compare** the histological structure of skin aspect, vermillion zone, and mucosal aspect of lip. **Correlate** this to their functions.
- **Describe** the internal organization of the tooth including the pulp cavity. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the soft palate. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the tongue. **Compare** the histological structure of the body of the tongue vs. the root of the tongue. **Correlate** their microstructure with their functions.
- **Describe** the internal organization of the parotid gland. **Correlate** this with its function.
- **Compare** the internal organization of the sublingual vs. submandibular glands. **Correlate** their microstructure with the type of their secretion.
- **Compare** the structure and occurrence of predentin, primary dentin, secondary dentin, and tertiary dentin.
- **Describe** the structure, function and distribution of taste buds.
- **Compare** the histological structure, function, and distribution of four types of lingual papillae.
- **Describe** the impact of the dentogingival junction and the depth of gingival sulcus on health status of the periodontium.
- **Predict** the impact of reduced function of salivary glands on oral mucosa and on teeth.
- **Predict** the impact of protein or vitamin C deficiency on periodontal ligament.

Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Gastrointestinal system. (Histology chapter 11)

Be able to:

- **Define and use:** mucosa, epithelial layer, lamina propria, lamina muscularis of mucosa, submucosa, submucosal neural plexus (of Meissner), muscular layer, inner circular smooth muscle layer, myenteric neural plexus (of Auerbach), outer longitudinal smooth muscle layer, adventitia, subserosa, serosa, serosal lamina propria, mesothelium; diffuse enteroendocrine cells; esophagus, esophageal gland, stomach, gastric pit, cardial gastric gland, gastric gland proper, mucous neck cell, chief cell, parietal (oxyntic) cell, enteroendocrine cell, stem cell, pyloric gland, internal oblique smooth muscle layer, G (gastrin) cell, chyme, hydrochloric acid, pepsinogen, gastric intrinsic factor, leptin; small intestine, intestinal villus, enterocyte, glycocalyx, microvillous (striated) border, goblet cell, smooth muscle cell of villus, central lymphatic vessel (lacteal), intestinal crypt (of Lieberkühn), Paneth cell, lysozyme, solitary lymphoid nodule, aggregated lymphoid nodule (Peyer's patch), M (microfold) cell, duodenum, duodenal submucosal (Brunner's) gland, jejunum, ileum, large intestine, colonocyte, taenia coli, appendix, colon, rectum, anal canal, anorectal junction, anal sinus (crypt), dentate (pectinate) line, anal skin glands; liver, fibrous (Glisson) capsule, hepatic trabecula, hepatocyte, bile, bile canaliculus, cholangiocyte, canal of Hering, hepatic stellate cell (of Ito), sinusoid, perisinusoidal space (of Disse), hepatic macrophage (Kupffer's cell), portal area, periportal space, bile ductule, portal triad, interlobular artery, interlobular vein, interlobular bile duct, classical hepatic lobule, central vein, liver acinus, central zone (III), intermediate zone (II), peripheral zone (I), portal lobule, gall bladder, mucosal gland of gall bladder, bile duct, sphincter of Oddi, hepatopancreatic ampulla, pancreas, exocrine component of pancreas, pancreatic lobule, pancreatic acinus, centroacinar cell, intercalated duct, intralobular duct, interlobular duct, excretory duct, pancreatic duct, endocrine component of pancreas, islets of Langerhans, A (glucagon) cell, B (insulin) cell, D (somatostatin) cell; peritoneum, serosa, mesothelial cell, lamina propria; cholecystokinin, sekretin
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the internal organization of the esophagus. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the stomach. **Correlate** its microstructure with its function.
- **Compare** the internal organization of the duodenum, jejunum, ileum, and large intestine. **Correlate** their microstructure with their functions.
- **Describe** the internal organization of the appendix. **Correlate** its microstructure with its function. **Discuss** the reasons why might be appendix prone to inflammation.
- **Describe** the internal organization of the liver. **Correlate** its microstructure with its function.
- **Describe** the directions of blood flow and bile flow in the liver.
- **Compare** the definitions of classical hepatic lobule, liver acinus, and portal acinus.
- **Describe** the internal organization of the pancreas. **Correlate** its microstructure with its function.
- **Compare** the effects of cholecystokinin and secretin on pancreas and gallbladder.
- **Compare** the impact of parasympathetic vs. sympathetic nerve supply on the muscle layer of the gut.
- **Predict** how could be peristalsis affected by a missing or deficient enteric nervous plexus.
- **Predict** the impact of destruction or loss of gastric mucosa on hemopoiesis.
- **Predict** the impact of increased number or excessive activity of G-cells of stomach and duodenum.

Goals and outcomes – Respiratory system. (Histology chapter 12)

Be able to:

- **Define and use:** nasal vestibule, respiratory region of the nasal cavity, pseudostratified columnar ciliated epithelium, goblet cell, basement membrane, olfactory region, bipolar neurons, serous olfactory (Bowman) glands, nasal gland, paranasal sinuses, laryngeal vestibule, vestibular folds, laryngeal ventricle, glottis, stratified squamous nonkeratinized epithelium, laryngeal seromucous glands, epiglottis, thyroid cartilage, cricoid cartilage, arytenoid cartilage, vocal folds, vocal ligament, trachea, tracheal gland, fibromusculocartilagineous layer, trachealis muscle, membranous wall, tracheal cartilages, adventitia, bronchial tree, diffuse endocrine cells, bronchus, spiral muscle layer, bronchial cartilage, lung parenchyma, pulmonary interstitium, pulmonary lobule, bronchiole, terminal bronchiole, Clara cell, pulmonary acinus, respiratory bronchiole, alveolar duct, alveolar saccule, pulmonary alveolus, alveolar epithelium, type I (squamous) pneumocyte, type II pneumocyte, surfactant, lamellar body, alveolar macrophage (dust cell), interalveolar septum, elastin, alveolar pore, blood air barrier (alveolocapillary membrane), continuous endothelium, BALT (bronchus-associated lymphoid tissue), eosinophils, inflammation, sympathetic and parasympathetic nerve fibers, serosa, mesothelium, parietal and visceral pleura, submesothelial layer, pleural cavity
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the internal organization of the trachea. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the epiglottis. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the lung. **Correlate** its microstructure with its function.
- **Compare** the epithelium lining the vocal folds with that lining the rest of the larynx. **Correlate** this with the function of the vocal folds.
- **Compare** the histological structure of the conducting and respiratory portion of the airway.
- **Compare** the histological structure of bronchi vs. bronchioles. **Correlate** this to their functions.
- **Compare** the structure of type I vs. type II pneumocytes. **Correlate** this to their functions.
- **Describe** the layers of the blood-air barrier. **Discuss** its function.
- **Compare** the effect on sympathetic vs. parasympathetic nerve fibres on smooth muscle cells within the bronchial tree.
- **Discuss** the role and migration pathways of alveolar macrophages.
- **Predict** what would happen if the product of type II pneumocytes would not be present or would be inactivated.
- **Predict** the impact of a genetic defect in transport of Cl^- ions across the cell membrane in bronchi and bronchioles.
- **Predict** the impact of loss of elastin (caused e.g. by elastase from neutrophils and macrophages) on lungs.
- **Predict** the outcome of hypercontractility of bronchial smooth muscle, edema of the mucosa, and excessive secretion of bronchial glands caused by eosinophilic inflammation of the bronchial tree.

Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Urinary system. (Histology chapter 13)

Be able to:

- **Define and use:** perirenal fat capsule, fibrous capsule, kidney lobe, renal cortex, renal medullary ray, renal column, renal medulla, renal pyramid, renal papilla, area cribrosa, nephron, renal corpuscle, vascular pole, afferent and efferent glomerular arterioles, glomerular (Bowman's) capsule, visceral and parietal layers, podocyte, primary and secondary process, pedicles, urinary space, mesangium, extraglomerular and intraglomerular mesangial cells, glomerular capillaries, fenestrated endothelium, basement membrane, filtration membrane, filtration slit diaphragm, glomerular ultrafiltrate, urinary pole, renal tubule, convoluted and straight proximal tubule, microvilli, brush border, folded basal labyrinth, intermediate tubule, nephron (Henle's) loop, descending limb, ascending limb, thin limb, distal tubule, macula densa, collecting duct, papillary duct (of Bellini), juxtaglomerular complex, juxtaglomerular cell, renin, angiotensin I, angiotensin II, angiotensin-converting enzyme, interlobar artery and vein, arcuate artery and vein, vasa recta, peritubular capillary network, erythropoietin, calcitriol, renal pelvis, minor calyces, major calyces, urothelium (transitional epithelium), umbrella cell, ureter, mucosa, internal longitudinal layer, external circular layer, adventitia, urinary bladder, female urethra, urethral glands (of Littre)
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the internal organization of the kidney. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the ureter. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the urinary bladder. **Correlate** its microstructure with its function.
- **Describe** the layers of the glomerular filtration membrane. **Discuss** its function.
- **Compare** the histological structures found in the renal cortex vs. structures found in the renal medulla.
- **Describe** how the blood circulates through the renal cortex and renal medulla, including the microvasculature.
- **Discuss** the impact of vasoconstriction or vasodilation of afferent and efferent glomerular arteries on filtration pressure.
- **Compare** the histological structure and function of proximal vs. distal kidney tubules.
- **Describe** the cells of origin, stimulus for secretion, and site and mechanism of action for aldosterone and antidiuretic hormone.
- **Name** the histological structures found in kidney and involved in regulation of blood pressure.
- **Describe** the monitoring of the filtrate in the juxtaglomerular apparatus.
- **Compare** the histological structure of the female vs. male urethra.
- **Predict** the impact of an annual 1% loss in the number of nephrons as the individual ages.
- **Predict** the impact of kidney damage on formation of red blood cells.

Goals and outcomes – Male reproductive system. (Histology chapter 14)

Be able to:

- **Define and use:** scrotum, testes, tunica vaginalis, dartos muscle, cremaster muscle, tunica albuginea, mediastinum of testis, lobule testis, septum of testis, seminiferous tubules, adluminal compartment, tight junction (zonula occludens), basal compartment, blood-testis barrier, interstitial connective tissue, interstitial cells of Leydig, straight tubules (tubuli recti), rete testis, myoid cells, Sertoli cells, spermatogenesis, type A and type B spermatogonium, primary spermatocyte, secondary spermatocyte, spermatid, spermiogenesis, acrosome formation, capacitation, acrosomal reaction, acrosin, hyaluronidase, middle piece, mitochondrial sheath, centriole, flagellum, residual body, sperm cell, male gamete; epididymis, efferent ductules of testis (ductuli efferentes), duct of epididymis, pseudostratified columnar epithelium, stereociliated cell, basal cell, spermatic cord, testicular artery, pampiniform plexus of veins, ductus deferens, internal longitudinal muscular layer, middle circular muscular layer, external longitudinal muscular layer, ejaculatory duct; seminal gland (vesicle), prostate gland, prostatic capsule, fibromuscular stroma, prostatic glandular parenchyma, prostatic concretion (corpus amylaceum), bulbourethral glands, ejaculate, semen, penis, prepuce, preputial glands, corpus cavernosum of penis, corpus spongiosum of penis, tunica albuginea, trabecula, cavernous spaces, helicine artery, cavernous vein, male urethra, internal urethral sphincter, prostatic urethra, membranous urethra, spongy urethra, navicular fossa, urethral gland; semen analysis, sperm count, erection, ejaculation, nitric oxide, cGMP, phosphodiesterase
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the organization of the testis. **Correlate** it with its function.
- **Describe** the internal organization of the epididymis. **Correlate** its microstructure with its function.
- **Describe** the internal organization of the spermatic cord. **Discuss** the functions of the structures visible on its histological section.
- **Describe** the internal organization of the penis. **Correlate** this with its functions.
- **Explain** how the histological structure and blood supply of the erectile bodies contribute to the erection.
- **Compare** the structure and functions of Sertoli cells vs. Leydig cells. **Name** the hypophyseal hormones binding to either of these cells.
- **Describe** the differentiation of spermatogonia into primary spermatocytes.
- **Describe** the meiotic division during formation of spermatids.
- **Explain** how the spermatids are transformed into spermatozoa (sperm cells).
- **Describe** the structure of spermatozoa.
- **Explain** the formation of acrosome and its role in the acrosomal reaction.
- **Compare** the histological structure of the efferent ductules of testis vs. the duct of epididymis.
- **Compare** the structure of the seminal glands vs. the prostate. **Explain** how these glands contribute to the seminal fluid.
- **List** the reference values of the semen analysis, such as sperm count, volume, sperm motility and morphology.
- **Predict** the consequences of a damaged blood-testis barrier on male fertility.
- **Predict** which syndromes might occur due to nondisjunction of the paternally or maternally derived chromosomes during spermatogenesis or oogenesis.
- **Predict** how an enlargement of the prostatic stroma affects the urination in men.

Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Female reproductive system. (Histology chapter 15)

Be able to:

- **Define and use:** ovarian surface mesothelium, tunica albuginea, ovarian cortex, ovarian stroma, ovarian medulla, folliculogenesis, primordial ovarian follicle, primary ovarian follicle, zona pellucida, secondary ovarian follicle, follicular basement membrane, follicular theca, tertiary ovarian follicle, follicular antrum, follicular fluid, granulosa cells, theca interna, theca externa, cumulus oophorus, corona radiata, mature (preovulatory, Graafian) follicle, luteogenesis, corpus rubrum (hemorrhagicum), corpus luteum of menstruation, corpus luteum of pregnancy, granulosa lutein cell, theca lutein cell, corpus albicans, follicular atresia, atretic follicle, oogenesis, oogonium, primary oocyte, first polar body, secondary oocyte, ovum, second polar body; ovulation, uterine tube, infundibulum, ampulla, isthmus, mucosal folds, uterus, endometrium, endometrial stroma, uterine glands, functional and basal layers of endometrium, compact and spongy layers of endometrium, spiral artery, menstrual (endometrial) cycle, menstrual phase, proliferative phase, secretory phase, gestatory phase, decidua, myometrium, hypertrophy and hyperplasia of myometrium, perimetrium, cervix of uterus, endocervical mucosa, cervical gland, exocervical mucosa, vagina, labium majus, labium minus, greater vestibular gland, clitoris, corpus cavernosum and corpus spongiosum of clitoris, cavernous space; menopause; follicle-stimulating hormone (FSH), luteinizing hormone (LH), estradiol, progesterone, human chorionic gonadotropin (hCG), oxytocin; aromatase; implantation; placenta, syncytiotrophoblast, chorion; cervical carcinoma
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the internal organization of the ovary. **Correlate** its microstructure with its functions.
- **Compare** the structure and functions of primordial, primary, secondary, and mature follicles.
- **Explain** the effect of gonadotropins on maturation of ovarian follicles and on ovulation.
- **Compare** the production of ovarian hormones before and after luteinization.
- **Describe** the differentiation of oogonia into mature oocyte.
- **Describe** the meiotic division during oogenesis.
- **Compare** the organization and function of corpus luteum of menstruation vs. corpus luteum of pregnancy.
- **Compare** the histological structure and functions of endometrium during all phases of the menstrual cycle.
- **Correlate** the events in follicular development, endometrial changes, and levels of hormones (LH, FSH, estrogen, progesterone) during the ovarian and menstrual cycles.
- **Name** the cells and tissues responding to oxytocin in female.
- **Explain** the conditions under which does the corpus luteum of menstruation or the corpus luteum of pregnancy differentiate.
- **Name** the tissue the presence of which results in a positive pregnancy test.
- **Compare** the epithelia lining the endocervical mucosa vs. exocervical mucosa.
- **Describe** the internal organization of the vagina and **correlate** it with its function.
- **Compare** the histological structure of the labium majus vs. labium minus.
- **Discuss** the role of herpes simplex virus in the risk of cervical carcinoma.
- **Predict** how vaginal delivery is endangered by implantation of the blastocyst near the cervix.
- **Predict** how infection and inflammation of the uterine tubes could affect further pregnancies.

Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Cardiovascular system. (Histology chapter 16)

Be able to:

- **Define and use:** artery, arteriole, metarteriole, precapillary sphincter, continuous capillary, fenestreated capillary, fenestrae, sinusoidal capillary, microcirculation, venule, vein, tunica intima, endothelium, basal lamina, subendothelial connective tissue, tunica media, vascular smooth muscle cells, type III collagen, elastin, internal elastic lamina, external elastic lamina, tunica adventitia, type I collagen, vasa vasorum, nervi vasorum, elastic (conducting) artery, elastic lamellar unit, muscular (distributing) artery, pericyte, vasoconstriction, vasodilation, nitric oxide, arteriovenous anastomoses, capillary bed, high-endothelial venules, epicardium, myocardium, endocardium, systole, diastole, atrium, ventricle, atrioventricular valve, semilunar valve, subendocardial layer, cardiac myocyte, sinu-atrial node, atrioventricular node, atrioventricular bundle (of His), Purkinje fibers, atrial natriuretic peptide, mesothelium, pericardium, cardiac skeleton
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the microstructure of an elastic artery. **Correlate** this with its functions.
- **Describe** the microstructure of a muscular artery. **Correlate** this with its functions.
- **Describe** the microstructure of large and medium veins, and venules. **Correlate** this with its functions.
- **Describe** the microstructure of heart wall. **Correlate** this with its functions.
- **Describe** the organization of microcirculation and the composition of vessels involved in microcirculation.
- **Compare** the histological structure, distribution, and functions of elastic arteries vs. muscular arteries. **Give** examples for each type.
- **Compare** the histological structure and function of arteries vs. veins.
- **Compare** the histological structure, permeability, occurrence, and function of continuous capillaries, fenestrated capillaries, and sinusoidal capillaries. **Give** examples for each type.
- **Identify** the types of capillaries that are part of the blood-brain barrier and part of the blood-air barrier.
- **Describe** the role of high-endothelial venules in lymphocyte recognition and migration.
- **Discuss** the role of endothelium in regulation of blood pressure and in preventing thrombosis.
- **Predict** which alterations of cardiovascular system are to be expected in an individual suffering from mutation in the gene coding fibrillin-1.
- **Predict** how impaired blood flow through vasa vasorum affects the structure and function of vascular wall.
- **Predict** how arteries would adapt on chronically elevated blood pressure.

Department of Histology and Embryology, Faculty of Medicine in Pilsen, Charles University, Czech Republic;

Goals and outcomes – Lymphoid and immune system. (Histology chapter 17)

Be able to:

- **Define and use:** lymphatic capillary, lymphatic endothelium, lymph, lymphatic vessels, lymphatic ducts, cisterna chyli, thoracic duct; primary lymphoid organs, secondary lymphoid organs, stroma, reticular connective tissue, primary and secondary lymphoid nodules, germinal center, mantle layer, marginal zone, follicular dendritic cell, centroblast, centrocyte, plasmoblast, plasmocyte; bone marrow, sinusoidal capillaries, thymus, fibrous capsule, connective tissue septa, cortex, Hassal's corpuscles, medulla, epithelial reticular cells, blood-thymus barrier, positive and negative selection of T-lymphocytes, cytotoxic T-lymphocytes, helper T-lymphocytes, regulatory T-lymphocytes, B-lymphocytes, plasma cell, antibody, antigen-binding region, light and heavy chains, isotypes of immunoglobulins, antigen, antigen-presenting cell, clonal expansion, effector immune cells, memory cell, immunological tolerance, complement system; lymph node, fibrous capsule and trabeculae, afferent lymph vessels, hilum, efferent lymph vessels, cortex, subcapsular (marginal) sinus, cortical sinuses, paracortex, medullary sinuses, high endothelial venules; spleen, connective tissue capsule, reticular fibers, reticular cells, red pulp, white pulp, trabecular arteries, central arteriole, periarterial lymphatic sheath, penicillar arterioles, closed and open system of circulation, splenic sinuses, splenic cords; palatine tonsil, crypts, pharyngeal tonsil, lingual tonsil; mucosa-associated lymphoid tissue (MALT), gut associated lymphoid tissue (GALT), Peyer patches, microfold (M) cells, bronchus-associated lymphoid tissue (BALT); non-specific immunity, phagocytosis, immune barriers, specific immunity, acquired (adaptive) immunity, humoral and cell-mediated immunity
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the microstructure of bone marrow. **Correlate** this with its functions.
- **Describe** the microstructure of thymus. **Correlate** this with its functions.
- **Describe** the microstructure of lymph node. **Correlate** this with its functions.
- **Describe** the microstructure of spleen. **Compare** the red pulp with the white pulp. **Correlate** this with their functions.
- **Describe** the microstructure of palatine tonsil. **Correlate** this with its functions.
- **Compare** the histological structure and permeability of lymphatic capillaries vs. blood capillaries.
- **Discuss** the age related changes in histological structure of thymus.
- **Name** the cells responsible for effector mechanisms of humoral vs. cell-mediated immunity.
- **Compare** the five isotypes (classes) of immunoglobulins. **Name** those which cross the placenta barrier.
- **Explain** how the NK cells may identify and eliminate tumor cells and cells infected by viruses.
- **Explain** how the blood circulates through the spleen (including the splenic microcirculation).
- **Compare** the structure of primary vs. secondary lymphoid follicles. **Correlate** it with their functions.
- **Name** an example of an autoimmune disease.
- **Predict** which immune cells reach the site of infection or injury as first.
- **Predict** which immune mechanisms would be impaired in patients with congenital failure of the thymus.
- **Predict** the virulence in microorganisms that could escape lysosomal destruction and survive within the macrophages.

Goals and outcomes – Nervous system. (Histology chapter 18)

Be able to:

- **Define and use**: gray matter, white matter, cerebral cortex, gyri, sulci, neocortex, molecular layer, external granular layer, external pyramidal layer, internal granular layer, internal pyramidal layer, multiform layer, paleocortex, cerebellar cortex, molecular layer, Purkinje cell layer, granular layer, cerebellar nuclei, blood brain barrier, continuous capillaries, perivascular feet of astrocytes, meninges, dura mater, subdural space, arachnoid, subarachnoid space, arachnoid villi, pia mater, choroid plexus, cerebrospinal fluid, blood-cerebrospinal fluid barrier, brain-cerebrospinal fluid barrier, spinal cord, central canal, anterior and posterior horns, somatic afferent and efferent fibers, visceral afferent fibers, visceral preganglionic and postganglionic efferent fibers, peripheral nerves, epineurium, perineurium, endoneurium, vasa nervorum, Schwann cell (neurolemmocyte), myelin sheath, Schwann sheath, nodes of Ranvier, myelin clefts (Schmidt-Lantermann clefts), nerve fascicles, spinal ganglia, satellite cells, autonomic ganglia, intramural ganglia, preganglionic neurons, postganglionic neurons, sympathetic and parasympathetic division, enteric nervous system, norepinephrine and epinephrine, acetylcholine, Meissner submucosal plexus, Auerbach myenteric plexus, neural plasticity, glial scar, regeneration in peripheral nerves
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Name** the six layers of the neocortex. **Compare** the shape and density of neurons among these layers. **Correlate** this with its function.
- **Name** the layers of cerebellar cortex. **Compare** the shape and density of neurons among these layers.
- **Compare** the histological structure of grey matter and white matter using a microscope.
- **Compare** the shape and size of neurons vs. neuroglia. **Differentiate** these cells using a microscope.
- **Describe** the internal organization of peripheral nerve and **identify** its components.
- **Describe** the organization of autonomic and spinal ganglia. **Correlate** this with their function.
- **Describe** the internal organization of spinal cord. **Identify** its components including motor neurons.
- **Compare** the sensitivity to hypoxia in and regeneration potential of neurons of cerebral cortex vs. glia cells.
- **Compare** the content of proteins and ions in cerebrospinal fluid vs. blood plasma.
- **Compare** the type of myelin and internal organization of the first two cranial nerves with peripheral nerves.
- **Describe** the internal organization and function of the blood-brain barrier.
- **Explain** why the brain in prematurely born infants is more prone to bilirubin-induced damage.
- **Compare** the histological structure of brain-cerebrospinal fluid barrier vs. the blood-cerebrospinal barrier.
- **Predict** which cells mostly proliferate during the process of repair of neuronal damage in the central nervous system.
- **Predict** the impact of impaired blood flow in vasa nervorum on structure and function of a peripheral nerve.

Goals and outcomes – Special senses. (Histology chapter 19)

Be able to:

- **Define and use:** fibrous layer of eyeball, vascular layer of eyeball (uvea), internal layer of eyeball (retina), sclera, cornea, choroid, ciliary body, iris, pupil, lens, zonular fibres, anterior and posterior chambers of eye, aquaeous humor, vitreous body, anterior limiting (Bowman's) membrane, corneal stroma, posterior limiting (Descemet's) membrane, corneal keratocytes, corneoscleral junction, limbus, scleral venous sinus (canal of Schlemm), Bruch's membrane, ciliary muscle, myoepithelial cells, dilator and sphincter pupillae muscles, lens epithelium, lens fibers, crystallins, accomodation, cataract, neural retina, ora serrata, pigmented layer of retina, optic nerve disc, fovea centralis, macula lutea, rod and cone cells, bipolar neurons of retina, ganglion cells of retina, optic nerve, phototransduction, macular degeneration, eyelids, conjunctiva, tarsus, tarsal (Meibomian) glands, lacrimal gland; external acoustic meatus, ceruminous glands, tympanic membrane, tensor tympani muscle, stapedial muscle, auditory tube, malleus, incus, stapes, bony labyrinth, vestibular and cochlear portions of membranous labyrinth, utricle, saccule, semicircular ducts, cochlea, modiolus, perilymph, endolymph, otolithic membrane, crista ampullaris, ampullary cupula, scala vestibuli, cochlear duct (scala media), scala tympani, helicotrema, round window, oval window, vestibular membrane, stria vascularis, spiral organ (of Corti), tectorial membrane, basilar membrane, outer and inner hair cells, pillar cells; mechanoreceptors, thermoreceptors, proprioceptors, nociceptors, free nerve endings, peritrichial nerve endings, Merkel disks, Meissner corpuscles, Pacinian corpuscles, Ruffini endings, Krause end bulbs, muscle spindles, Golgi tendon organs,
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the microstructure of palpebra. **Correlate** this with its functions.
- **Describe** the internal organization of all layers and parts of the eye and **correlate** it to their functions related to vision.
- **Name** the neuronal layers of the retina.
- **Compare** the epithelia lining the external vs. the internal surface of the tympanic membrane.
- **Describe** the internal organization and functions of the middle and the inner ear.
- **Name** the structures (in their specific order) through which the sound waves are transmitted within the ear.
- **Name** the structures where sound waves are converted to electric signals sent via the eight cranial nerve.
- **Compare** the histological structure of structures responsible for sensing linear vs. circular movements.
- **Give** at least three examples of mechanoreceptors. **Describe** their internal organization, occurrence, and function.
- **Explain** the impact of the secretion of Meibomian glands on the stability of the tear film.
- **Predict** the changes in hearing following the damage in hair cells of the spiral organ.
- **Predict** the changes in vision after the lens crystallins denaturate during ageing**.**
- **Predict** the changes in vision when excessive new blood vessels are growing between the retina and the choroid.

Goals and outcomes – Endocrine system. (Histology chapter 20)

Be able to:

- **Define and use:** hormone, signal molecule, membrane receptor, nuclear receptor, feedback mechanism, second messenger, fibrous capsule, sinusoidal capillary, fenestrated endothelium, endocrine signaling, paracrine signaling, autocrine signaling; hypothalamus, liberin, statin, hypothalamo-pituitary tract, supraoptic and paraventricular nuclei, pituitary gland (hypophysis), Rathke's pouch, adenohypophysis, superior and inferior hypophyseal arteries, hypophysial portal circulation, chromophilic cell, chromophobic cell, basophilic cell, corticotropic cell, thyrotropic cell, gonadotropic cell, acidophilic cell, somatotropic cell, lactotropic cell, adrenocorticotropic hormone, thyroid stimulating hormone, gonadotropins, follicle stimulating hormone, luteinizing hormone, growth hormone (somatotropin), prolactin, neurohypophysis, pituicyte, Herring neurosecretory bodies, antidiuretic hormone (vasopressin), oxytocin, pineal gland, pinealocyte, acervulus (brain sand, corpora arenacea), melatonin; thyroid gland, right and left lobes, isthmus, pyramidal lobe, thyroid follicle, thyroglobin, colloid, follicular cell, parafollicular (C-) cell, triiodthyronine, thyroxin, calcitonin; parathyroid gland, principal (chief) cell, oxyphil cell, parathormone, calcitriol; cortex and medulla of suprarenal (adrenal) gland, zona glomerulosa, zona fasciculata, zona reticularis, chromaffin cells, mineralocorticoids, glucocorticoids, androgens, catecholamines, adrenalin, noradrenalin; pancreatic (Langerhans') islet, A-cells, B-cells, D-cells, F-cells, insulin, glucagon, somatostatin, pancreatic polypeptide; ovary, ovarian follicles, follicular cells, membrana granulosa, theca folliculi interna and externa, estrogens, gestagen; testis, Leydig cell, testosteron; diffuse endocrine system (DES).
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the microstructure of the pituitary gland. **Correlate** it with its functions.
- **Describe** the microstructure of the thyroid gland. **Correlate** it with its functions.
- **Describe** the microstructure of the cortex and medulla of the adrenal gland. **Correlate** these with their functions.
- **Describe** the microstructure of the pancreatic islets. **Correlate** it with their functions.
- **Describe** the microstructure of the endocrine portions of ovary and testis. **Correlate** it with their functions.
- **Describe** the microstructure of the parathyroid gland. **Correlate** it with its functions.
- **Describe** the microstructure of the epiphysis. **Correlate** it with its functions.
- **Name** the source cells, target cells (or organs), and main effect of the following hormones: ACTH, FSH, LH, GH, PRL, antidiuretic hormone, oxytocin, thyroxin, calcitonin, parathormone, mineralocorticoids, glucocorticoids, catecholamines, insulin, glucagon, somatostatin, melatonin, cholecystokinin, gastrin.
- **Name** two types of cells that produce hormones affecting the metabolism of calcium.
- **Describe** the anatomical connection through which hypothalamic hormones reach the neurohypophysis.
- **Describe** the blood supply to the pituitary gland and its connection with the hypothalamus.
- **Compare** the histological structure, function, and embryological origin of adenohypophysis vs. neurohypophysis.
- **Compare** the endocrine, paracrine, and autocrine signaling. **Give** example for each type.
- **Compare** the microscopic structure of cells that produce either peptidic (or protein) hormones vs. cells producing steroid hormones. **Give** one example for each type.
- **Compare** the target cells and effects of gonadotropins in female vs. in male.

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Goals and outcomes – Integumentary system. (Histology chapter 21)

Be able to:

- **Define and use:** skin, epidermis, stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum, stratum disjunctum, keratinocytes, keratohyalin granules, keratinization, keratin intermediate filaments, melanocytes, melanin, melanosomes, dendritic (Langerhans) cell, Merkel cell, epidermal ridge, papillary dermis, dermal papilla, dermatoglyphs, free nerve ending, Meissner's corpuscle, Krause's corpuscle, reticular dermis, Pacini's corpuscle, Ruffini's corpuscle; eccrine sweat glands, myoepithelial cell, apocrine sweat gland, holocrine sebaceous gland, pilosebaceous unit, nail bed, hair follicle, hair shaft, hair root, arrector pili muscle, primary hair (lanugo), secondary hair, vellus hair, scalp hair, eyelashes, eyebrows, tertiary hair, hirci, pubes, beard, tragi, hairs of vestibule of nose, sinus hairs; thick skin, thin skin, mammary gland, nipple, mammary gland lobules and alveoli, galactocytes, intralobular ducts, interlobular ducts, lactiferous duct, lactiferous sinuses, colostrum, milk, interlobular septa, suspensory ligaments of breast; hypodermis
- **Identify** structures in histological slides that are described in detail in a separately provided document. **Draw** and **label** simplified schemes of these structures.
- **Describe** the microstructure of epidermis. **Correlate** this with its functions.
- **Describe** the microstructure of dermis. **Correlate** this with its functions.
- **Describe** the microstructure of auricle. **Correlate** this with its functions.
- **Describe** the microstructure of skin in planta pedis. **Correlate** this with its functions.
- **Compare** the internal organization, layers, and occurrence of thin skin vs. thick skin. **Name** the skin appendages present in both types.
- **Compare** the histological structure and mechanical properties of the papillary dermis vs. reticular dermis.
- **Explain** the role of Langerhans cells in the epidermis.
- **Explain** the embryological origin of melanocytes.
- **Compare** the shape, occurrence and distribution, secretion patterns, and function of sweat glands, apocrine glands, and sebaceous glands.
- **Compare** the position of openings of the sweat glands, apocrine glands, and sebaceous glands.
- **Compare** the structure, location, and function of free nerve endings, Meissner's corpuscles, and Pacini's corpuscles. **Give examples** of stimuli to which stimuli these receptors respond.
- **Discuss** the impact of a genetic defect in tyrosinase synthesis on skin pigmentation.
- **Predict** the impact of accelerated cell cycle and cell turnover of keratinocytes.
- **Predict** the impact of obstruction of sebaceous glands and hair follicles caused by bacteria or keratinous debris.
- **Predict** the impact of autoimmune destruction of transmembrane desmosomal glycoproteins in epidermis.

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