DONETSK STATE MEDICAL UNIVERSITY
named after M. GORKY

DEPARTMENT OF HISTOLOGY,
CYTOLOGY AND EMBRYOLOGY

SPECIAL HISTOLOGY
Part 2

Methodological instructions
for the 2nd year students

Donetsk
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SPECIAL HISTOLOGY

Part 2

METHODOLOGICAL INSTRUCTIONS TO LESSON 45 FOR STUDENTS

THEME: DIGESTIVE SYSTEM. ORAL CAVITY. TONGUE. TONSILS.

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know general structure of the oral cavity organs. To know the structure of the tongue and histophysiology of the taste buds and to be able to identify them in specimens. To know microscopic structure, chemical compounds and physical properties of soft and dark tissues of the tooth. To be able to identify structural compounds of the tooth and main stages of its development in the specimens.

Final aims. Students should be able to:

1. Indicate the general features of digestive system.
2. Recognise lips, cheeks, soft and dark palatine, their structure and functions.
3. Interpret the structure and functions of the tongue, tissues compounds, structural peculiarities of the upper, lower and back surfaces.
4. Characterise of the tongue papillae.
5. Explain the taste bud structure and functions.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department.
2. Epithelial, muscular and connective tissues – general hystology.
3. Exocrine glands – general hystology.

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. General features of digestive system.
2. Oral cavity. Lips, cheeks, soft and dark palatine, their structure and functions.
3. The tongue, tissues compounds, structural peculiarities of the upper, lower and back surfaces.
4. Morphofunctional characteristic of the tongue papillae.

Taste bud structure and functions.**Key words and phrases**: oral cavity, lips, cheeks, soft and dark palatine, tongue, tongue papillae (filiform, fungiform, foliate, circumvallate), taste bud, tooth, incisors, canines, premolars, molars, crown, root, neck, pulp cavity, enamel, enameloblast, enamel rods (prism), dentin, odontoblast, dentinal tubules, cementum, cementocyte, palp, periodontal ligament, epithelial tooth bud, cap stage, bell stage, permanent teeth, deciduous teeth.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 283-289.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 217-225.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 191-200.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 153-165.

II. For self-training students should fill in these tables:

Characteristic of the tongue papillae

Type of papillae	Morphology	Function

Characteristic of tonsils

Structure in tonsil	Tissue content	Functional significance

III. Visual Aids and Material Tools:

Charts No:
45-1. Papillae of the tongue.
45-2. General structure of the tongue.
45-3. Tooth development.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:
Specimen 1. Human tongue. Filiform and fungiform papillae.
Stained with haematoxylin and eosin

At a low magnification watch the mucous membrane of the tongue, this has special structures -papillae on the upper and lateral surfaces. All the papillae are cowered by the stratified squamous epithelium, which rests on the mucosa lamina propria. Filiform papillae are the most numerous and despite of others are cowered by the stratified squamous keratinized epithelium. Fungifirm papillae are cowered by the stratified squamous nonkeratinized epithelium. Loose connective tissue of the papillae border with muscles of the tongue. Bundles of striated muscular fibers are disposed in three different turns and are separated by the loose connective tissue.

Illustrate and indicate: 1. Filiform papilla. 2. Fungiform papilla: a) stratified squamous epithelium; b) lamina propria. 3. Tongue muscles. 4. Glands of the tongue.

What are the differences between filiform and fungiform papillae of the tongue?

What muscular tissue does tongue consists of?

What peculiarities salivary glands may be recognized and assigned by in the specimen?

Specimen 2. Human tongue. Foliate papilla.

Stained with haematoxylin and eosin

At a low magnification of microscope find the foliate papillae on the lateral surface of the tongue. At a high magnification light oval-shaped structures – taste buds (receptors of taste) – may be observed in the epithelium, which covers the lateral surface of the foliate papillae.

Illustrate and indicate: 1. Foliate papilla :a) stratified sqamous epithelium; b) lamina propria. 2.Taste buds.

Name, please, the papillae, which contain the taste buds.

Indicate the disposition of the taste buds on the foliate papillae.

Specimen 3.Pharyngeal tonsil.

Stained with haematoxylin and eosin

At a low magnification of microscope watch the structure, which looks like a glass with two walls. This is tooth bud (enamel organ), which is connected with tooth lamina by the cord of cells – the neck. Mesenchime introducing into the enamel organ is called dental papilla, that one which surrounds it is dental sac. Epithelial cells of the enamel organ boarding with dental sac are the outer cells of enamel organ. Prismatic shaped cells, which touch in contact with dental papilla are the inner epithelial cells of the enamel organ. Pulp is disposed inside in the tooth bud.

Illustrate and indicate 1. Enamel organ: a) external epithelium; b) pulp; c) internal epithelium. 3. Dental papilla. 4. Dental sac. 5. Neck of the enamel organ.

Name the tooth structures, which give the origin to the soft and dark tissues of the tooth.

Development of the deciduous teeth is continued in postembryonic period. What portion of the tooth appears at that time?

Three types of cells are seen in the specimen of enamel organ: inner, outer and intermediate. What are the producers of the enamel? What are their names?

V. Real – life situations to be solved

1. In the histological specimen you can see a muscular organ covered by mucosa on the dorsal surface, which forms numerous papillae. What type of epithelium lines the mucosa of ventral surface of this organ?

*A. Stratified squamous.
B. Simple columnar.
C. Simple ciliated.
D. Stratified cuboidal.
E. Transitional.

2. In the histological specimen you can see a muscular organ covered by mucosa on the dorsal surface and mucosa with submucosa on the ventral surface. Mucosa on the dorsal surface forms numerous papillae. Which organ is this?

A. Stomach.
B. Esophagus.
C. Small intestine.

D. Large intestine
*E. Tongue.

3. In the histological specimen of tongue you can see the most numerous papillae. They have conical elongated shape and are covered with stratified squamous keratinized epithelium. Which type of papillae is described/found?
A. Foliate .
B. Primary.
C. Fungiform.
*D. Filiform.
E. Circumvallate.

4. In the histological specimen of tongue the filiform papillae are found. Which type of epithelium lines these papillae?
*A. Stratified squamous keratinized.
B. Stratified squamous nonkeratinized
C. Simple columnar.
D. Stratified cuboidal.
E. Transitional.

5. In the histological specimen of tongue you can see papillae. They are located between filiform papillae, have mushroom shape, and their covering epithelium has taste buds. Which type of papillae is described?
A. Foliate .
B. Primary.
*C. Fungiform.
D. Filiform.
E. Circumvallate

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 46 FOR STUDENTS

THEME: DIGESTIVE SYSTEM. ORAL CAVITY. TOOTH STRUCTURE AND ORIGIN.

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know general structure of the oral cavity organs. To know the structure of the tongue and histophysiology of the taste buds and to be able to identify them in specimens. To know microscopic structure, chemical compounds and physical properties of soft and dark tissues of the tooth. To be able to identify structural compounds of the tooth and main stages of its development in the specimens.

Final aims. Students should be able to:

6. Interpret the sources of origin, structure and tissues compounds of the tooth.
7. Enamel, dentin and cementum hystologic structure and composition.
8. Palp and periodontal ligament structure and functions.
9. Tooth development. Permanent and deciduous teeth.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department.
2. Epithelial, muscular and connective tissues – general hystology.
3. Exocrine glands – general hystology.

Students' independent study program

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

10.

11. Sources of origin, structure and tissues compounds of the tooth.
12. Enamel, dentin and cementum hystologic structure and composition.
13. Palp and periodontal ligament structure and functions.
14. Tooth development. Permanent and deciduous teeth.

Key words and phrases: oral cavity, lips, cheeks, soft and dark palatine, tongue, tongue papillae (filiform, fungiform, foliate, circumvallate), taste bud, tooth, incisors, canines, premolars, molars, crown, root, neck, pulp cavity, enamel, enameloblast, enamel rods (prism), dentin, odontoblast, dentinal tubules, cementum, cementocyte, palp, periodontal ligament, epithelial tooth bud, cap stage, bell stage, permanent teeth, deciduous teeth.

References:

5. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 283-289.
6. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 217-225.
7. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 191-200.
8. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 153-165.

II. For self-training students should fill in the table:

Characteristic of the tooth

Anatomical Parts	Dental tissues	Functional significance

Origin of the dental tissues

Parts of dental germ	Cells	Detnal tissues

III. Visual Aids and Material Tools:

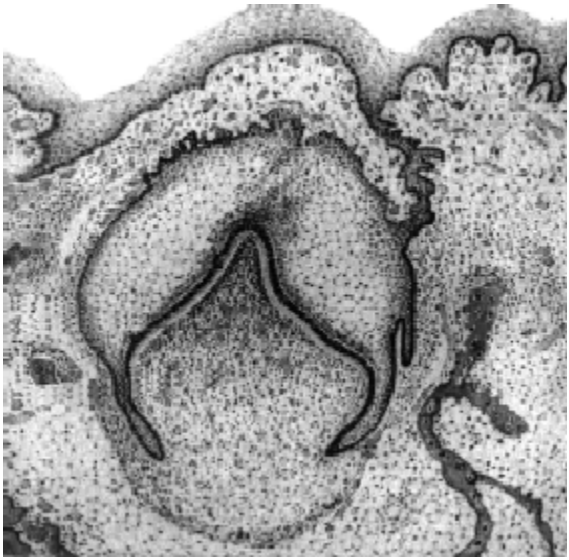
Charts No:
45-1. Papillae of the tongue.
45-2. General structure of the tongue.
45-3. Tooth development.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 3. Tooth development early stage.

Stained with haematoxylin and eosin



At a low magnification of microscope watch the structure, which looks like a glass with two walls. This is tooth bud (enamel organ), which is connected with tooth lamina by the cord of cells – the neck. Mesenchime introducing into the enamel organ is called dental papilla, that one which surrounds it is dental sac. Epithelial cells of the enamel organ boarding with dental sac are the outer cells of enamel organ. Prismatic shaped cells, which touch in contact with dental papilla are the inner epithelial cells of the enamel organ. Pulp is disposed inside in the tooth bud.

Illustrate and indicate 1. Enamel organ: a) external epithelium; b) pulp; c) internal epithelium. 3. Dental papilla. 4. Dental sac. 5. Neck of the enamel organ.

Name the tooth structures, which give the origin to the soft and dark tissues of the tooth.

Development of the deciduous teeth is continued in postembryonic period. What portion of the tooth appears at that time?

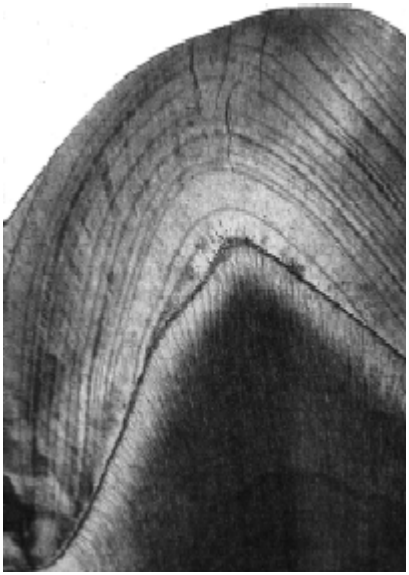
Three types of cells are seen in the specimen of enamel organ: inner, outer and intermediate. What are the producers of the enamel? What are their names?

Specimen 4. Tooth structure

Stained with haematoxylin and eosin

At a low magnification of microscope find the enamel organ at the later stage of development. Spindle-like cells are differentiated at the top of dental papilla. These are the odontoblasts. Dentin is disposed up to them. It consists of

two layers – lighter – predentin and darker (pink) layer rich with lime salt – dentin. Enough thick layer of enamel is seen above the dentin. Alveolar bone formation occurs in the surrounding connective tissue.



Illustrate and indicate: 1. Internal epithelium of the enamel organ (enameloblasts).2. Enamelum. 3. Mature dentin. 4. Predentin. 5. Odontoblastic layer.

Name, please, the cells, which participate in dentin and enamel formation. What are their embryonic origins?

Cementum is seen in the specimen of the tooth. What cells it is produced by?

Two specimens are made of the crown and the root of the tooth. How does it possible to recognize them?

Tooth pulp is extracted. How does it influence on the dentin and enamel metabolism?

V. Real life situations to be solved:

1. Decalcificated tooth is determined in the histological specimen. Which tissues of this organ are referred to hard tissues?

A. Enamel and dentine

B. Pulp and periodontal ligament.

*C. Enamel, dentine and cementum.

D. Cementum, pulp and dentine.
E. Cementum, enamel and pulp.

2. Decalcificated tooth is determined in the histological specimen. Which tissue covers the crown of this organ?
A. Dentine
B. Pulp.
*C. Enamel.
D. Cementum.
E. Bone.

3. An organ presented in the histological specimen is parenchymatous lobulated. Its parenchyma is glandular epithelium, which consists of numerous secretory acini and branching duct system. All secretory acini are serous. Which salivary gland is described?
*A. Parotid.
B. Sublingual.
C. Submandibular.
D. Lingual.
E. Mixed.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 47 FOR STUDENTS

THEME: LARGE SALIVARY GLANDS

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know the salivary glands morphofunctional characteristic and to be able to identify them in specimens.

Final aims. Students should be able to:

1. Interpret the general morphofunctional characteristic of large salivary glands and their classification.
2. Recognise structural peculiarities of the parotid, submandibular and sublingual glands secretory portions (acini).
3. Identify the main microscopic and ultrastructural signs of muco- and serocytes.
4. Identify large salivary glands excretory ducts.
5. Explane salivary glands excretory products and hormones.
6. Interpret the morphogenesis and regeneration of the salivary glands.
7. Identify salivary glands aging.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. General morphofunctional characteristic of large salivary glands and their classification.
2. Structural peculiarities of the parotid, submandibular and sublingual glands secretory portions (acini).
3. Main microscopic and ultrastructural signs of muco- and serocytes.

4. Large salivary glands excretory ducts.
5. Salivary glands excretory products and hormones.
6. Morphogenesis and regeneration of the salivary glands.
7. Salivary glands aging.

Key words and phrases: salivary glands, capsule, lobules, septa, parotid gland, submandibular gland, sublingual gland, acini, secretory portion, excretory duct, intercalative duct, striated duct, serocyte, mucocyte, myoepithelial cell, mucus, serum, alveolar acinus, tubular acinus, mixed acinus, serous semilunes.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp.312-317
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 225-230
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 200-203.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp.169-179.

II. For self-training students should fill in this table:

Characteristic of the salivary glands

Salivary gland	Location	Main morphological feature

III. Visual aids and material tools:

Charts No:

46-1. General structure of the salivary glands.
46-2. Parotid gland.
46-3. Submandibular gland.
46-4. Sublingual gland.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Parotid gland

Stained with haematoxylin and eosin

At a low magnification there seen a lobular structure of the gland. There are vessels, interlobular excretory ducts and nerves in the connective tissue layers. At a high magnification thin intercalated ducts consisting of dark small cells are well observed in the lobules. Striated ducts are larger and consist of tall epithelial cells with basal striations (cell membrane folds). They continue into interlobular

ones, whose wall consists of bilayer epithelium and common duct – of stratified epithelium. Secretory portions are round-shaped and consist of serocyte and myoepithelial (basket) cells, which surround the first ones.

Illustrate and indicate: 1. Lobules. 2. Interlobular connective tissue septa. 3. Vessels. 4. Excretory ducts: a) interlobular; b) striated; c) intercalative. 5. Secretory portion: a) serocytes; b) myoepithelial cells.

What are the typical secretory portions of the parotid gland?

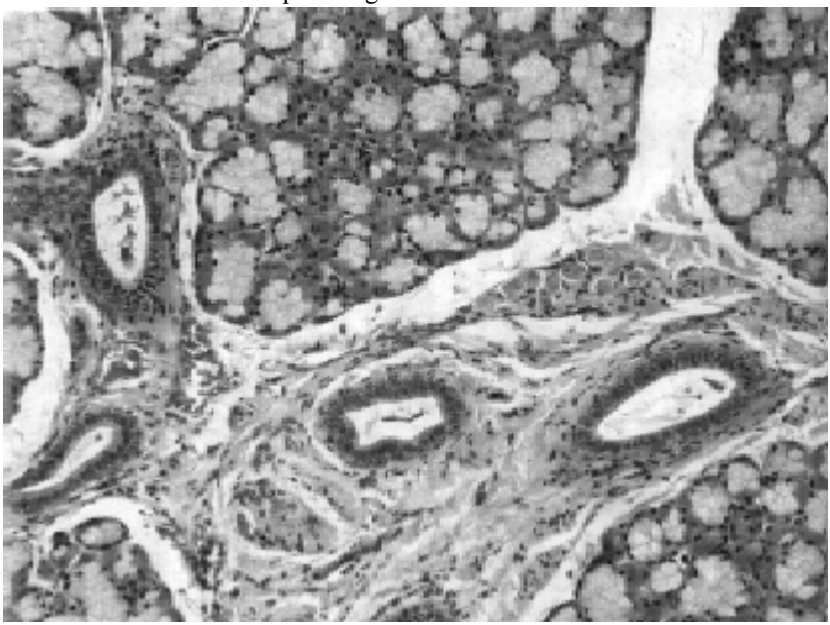
Which excretory ducts epitheliocytes are darker and why?

Specimen 2. Submundibular gland

Stained with haematoxylin and eosin

At a high magnification two types of secretory portions are seen: serous and mixed. The serous ones are round-shaped and consist of 12-18 serocytes inside and peripherally disposed myoepithelial cells and then – basement membrane. Mixed acini are larger and have two types of cells: serocytes and mucocytes. Mucous cells are conical with wide basal part and light cytoplasm. Serocytes lie near the basal portion of mucocytes thus producing so called serous semilunes or caps of Djianutsi. Serocytes have basophilic cytoplasm and centrally disposed

nuclei. Outside they are surrounded with myoepithelial cells layer. Excretory ducts are similar to that ones in the parotid glands.



Illustrate and indicate: 1. Mucous acini. 2. Mixed acini: a) mucocytes; b) serocytes; c) myoepithelial cells.

What kinds of cells do you see in the mixed acini?

What kind of cells serous semilunes are composed of?

V. Real – life situations to be solved

1. An organ presented in the histological specimen is parenchymatous lobulated. Its parenchyma is glandular epithelium, which consists of numerous secretory acini and branching duct system. There are many serous acini and mixed secretory acini in lobules. Which salivary gland is described?

A. Parotid.
B. Sublingual.
*C. Submandibular.
D. Lingual.
E. Mixed.

2. An organ presented in the histological specimen is parenchymatous lobulated. Its parenchyma is glandular epithelium, which consists of numerous secretory acini and branching duct system. There are many mucous and mixed secretory acini and few serous acini. Which salivary gland is described?

A. Parotid.
*B. Sublingual.
C. Submandibular.
D. Lingual.
E. Mixed.

3. In the histological specimen of parotid gland an excretory duct is found in lobule. It is small structure lined by a simple cuboidal epithelium with basophilic cytoplasm, surrounded by myoepithelal cells. Which duct is described?

A. Interlobular.
B. Striated.
*C. Intercalated.
D. Interacinous.
E. General.

4. In the histological specimen of parotid gland an excretory duct is found in lobule. It is large structure lined by simple columnar epithelium with the basal striation and oxyphilic cytoplasm, surrounded by myoepithelal cells. Which duct is described?

A. Interlobular.
*B. Striated.
C. Intercalated.
D. Interacinous.
E. General.

5. In the histological specimen of parotid gland an excretory duct is found in interlobular connective tissue septa. It is large structure lined by a stratified cuboidal epithelium, surrounded by myoepithelal cells. Which duct is found?

*A. Interlobular.
B. Striated.
C. Intercalated.
D. Interacinous.
E. General.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 48 FOR STUDENTS

THEME: PHARYNX. OESOPHAGUS

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know the histophysiology of the pharynx, oesophagus and tonsils, to be able to identify their structural components in specimens.

Final aims. Students should be able to:

1. Interpret the general structure of the digestive tube. Pharynx wall histologic structure.
2. Recognise oesophageal mucosa and submucosa structure.
3. Identify the oesophageal glands disposition, structure and functions.
4. Find the peculiarities of the muscular tunica in the different part of oesophagus.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department.

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. General structure of the digestive tube. Pharynx wall histologic structure.
2. Oesophageal mucosa and submucosa structure.
3. Oesophageal glands disposition, structure and functions.
4. Peculiarities of the muscular tunica in the different part of oesophagus.
5. Lymph-epithelial rink of Pirogov-Valdaer compounds and functions.
6. Structure and functions of the palatine tonsil.

Key words and phrases: pharynx, oesophagus, palatine, tonsil, mucosa, submucosa, muscular tunica, adventitia, serosa, peritoneum, stratified squamous epithelium, lamina propria, papilla, muscularis mucosa, infiltrated epithelium,

neutrophils, crypt, papilla, mucous gland, excretory duct, oesophageal gland, cardial gland.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 284-285, 289.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 222-225, 230-234.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 203-208.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 179-185.

II. For self-training students should fill in this table:

Characteristic of the different layers of the esophagus wall

Layers	Tissues	Function

III. Visual aids and material tools:

Charts No:

47-1. General structure of the digestive tube.

47-2. Oesophagus cross section.

47-3. Oesophageal-gastric junction.

IV. Students' practical activities:

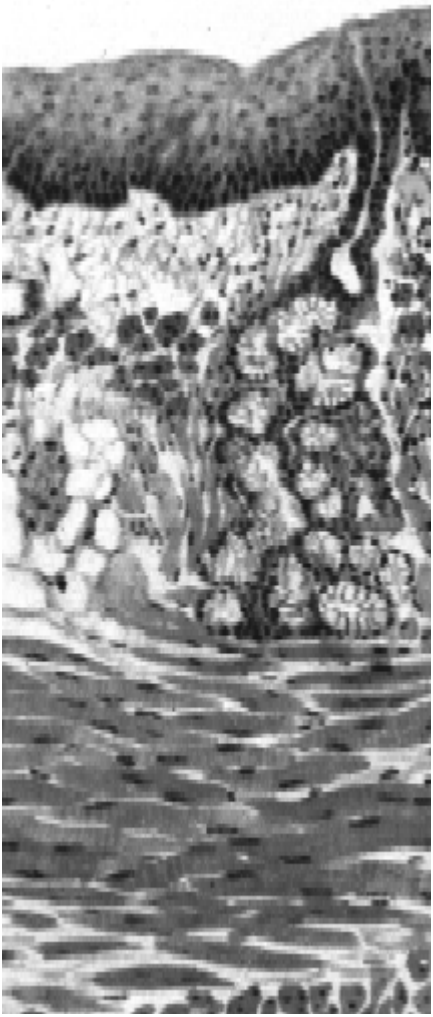
Students must know and illustrate such histologic specimens:

Specimen 1. Cross section of the upper third of oesophagus.

Stained with haematoxylin and eosin.

At a low magnification 4 tunics of the oesophageal wall are seen: mucosa, submucosa, muscular and adventitia. Mucosa consists of three layers: stratified squamous nonkeratinized epithelium under which lamina propria with cardiac glands is disposed. Then muscularis mucosa is seen. Submucosa is well developed and consists of loose connective tissue with oesophageal glands secretory portions. Muscular tunica has inner circular and outer longitudinal layers of skeletal muscles. Adventitia- loose connective tissue with blood vessels. Watch the specimen at a high magnification.

Illustrate and indicate:I. Tunica mucosa: a) stratified squamous nonkeratinized epithelium; b) lamina propria; c) muscularis mucosa. II. Tunica submucosa: d) connective tissue; e) proper oesophageal glands. III. Tunica muscularis: f) internal circular layer; g) external longitudinal layer. IV. Adventitia: h) vessels.



What are the differences between cardiac and proper glands of oesophagus?

V. Real – life situations to be solved:

1. In the histological specimen you can see an organ of digestive tract. Its wall consists of mucosa, submucosa, muscularis externa and adventitia. Mucosa of the organ

is covered by stratified squamous nonkeratinized epithelium. Which organ is found in the specimen?

A. Stomach.
*B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

2. In the histological specimen you can see an organ of digestive tract. Its function is to transport foodstuffs from the mouth to the stomach. Which organ is found in the specimen?

A. Stomach.
*B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

3. In the histological specimen you can see esophagus. Which type of epithelium lines this organ?

A. Stratified squamous keratinized.
*B. Stratified squamous nonkeratinized
C. Simple columnar.
D. Stratified cuboidal.
E. Transitional.

4. In the histological specimen you can see an organ of digestive tract, which lined by stratified squamous nonkeratinized epithelium and has mucous glands in submucosa. Its muscularis externa is formed by skeletal and smooth muscles. Which organ is found in the specimen?

A. Stomach.
*B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

5. In the histological specimen you can see esophagus. Which tissues form muscularis externa of this organ?

A. Smooth muscle and epithelium.
B. Loose connected and epithelial.
*C. Skeletal and smooth muscle.
D. Hyaline cartilage and bone.
E. Cardiac muscle and loose connective.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 49 FOR STUDENTS

THEME: STOMACH

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: know the structure and functions of the stomach, to know histophysiology of the glands. To be able to identify stomach structural components in the specimens and electronograms.

Final aims. Students should be able to:

1. Interpret the general features of stomach structure: portions and layers.
2. Recognise the stomach mucosa peculiaruties.
3. Identify the stomach glands types,disposition and cell compounds.
4. Recognise the proper glands of the stomach: cells, functions.
5. Identify the cardial and pyloric glands of the stomach: cells, functions.
6. Recognise the stomach muscular and serous tunics.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department.

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. General features of stomach structure: portions and layers.
2. Stomach mucosa peculiaruties.
3. Stomach glands types,disposition and cell compounds.
4. Proper glands of the stomach: cells, functions.
5. Cardial and pyloric glands of the stomach: cells, functions.
6. Stomach muscular and serous tunics.

Key words and phrases: stomach, cardia, fundus, body, pyloric portion, mucosa, simple columnar, glandular epithelium, lamina propria, muscularis mucosa, submucosa, muscular tunic, serosa, peritoneum, visceral layer, nerve plexus, proper gastric gland, pyloric gland, cardial gland, mucous cell, neck cell, chief cell, parietal cell, endocrine cell.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 289-297.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 234-238.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp.208-214.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 185-201.

II. For self-training students should fill in this table:

Characteristic of the stomach mucosa in different parts of organ

Parts of the stomach	Pits	Glands	Cellular content

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

1. Simple columnar glandular epithelium. Epithelial layer of gastric mucosa
2. Chief cells. Proper gland of gastric mucosa
3. Parietal cell. Proper gland of gastric mucosa
4. Accessory mycocytes. Proper gland of gastric mucosa
5. Neck cell. Proper gland of gastric mucosa
6. Endocrine cell. Proper gland of gastric mucosa

Chartrs No:

48-1. Oesophageal-gastric junction.
48-2. Stomach (scheme).
48-3. Fundus of the stomach.
48-4. Pyloric stomach.
48-5. Ultrastructure of the gastric gland cells.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Oesophageo-gastric junction.

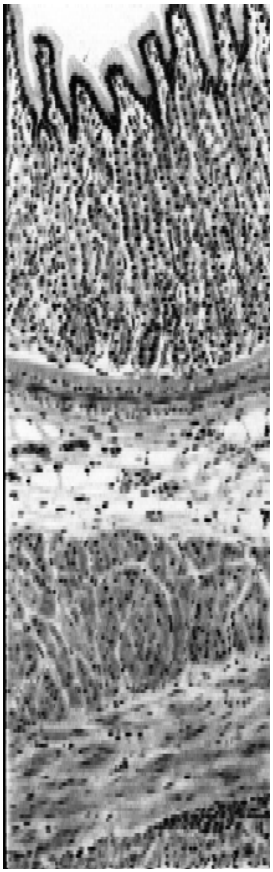
Stained with haematoxylin and eosin

At a low magnification watch the specimen, special attention should be paid to the mucosa, in which transition of the oesophageal stratified squamous epithelium into simple columnar gastric epithelium is well seen. In gastric mucosa gastric pits are observed. There are groups of light cells in the gastric lamina propria – cardial glands secretory portions. Muscularis mucosa has two layers (like

in the oesophagus). Submucosa consists of loose connective tissue. Muscular tunic contain three layers of smooth muscles. Serosa is the outer tunic.

Illustrate and indicate: I. Oesophageal mucosa: a) stratified squamous epithelium. II. Gastric wall: b) simple columnar glandular epithelium; c) gastric pits; d) lamina propria; e) cardial glands, f) muscularis mucosae. III. Submucosa. IV. Muscular tunic. V. Serosa.

Specimen 2. Fundus of the stomach.
Stained with haematoxylin and eosin

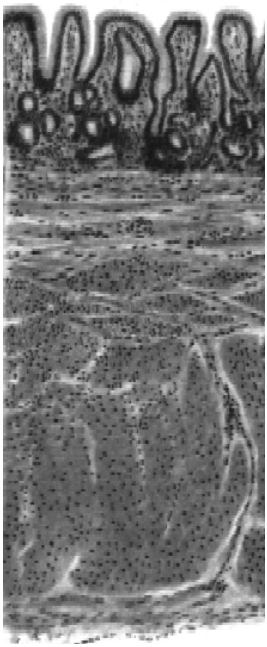


Watch the specimen at a low magnification; find the stomach inner surface, which is cowered by the simple columnar epithelium. Mucosa surface has small gastric pits. Enough thick layer of lamina propria connective underlies the

epithelium. A lot of tubular glands are disposed there. These are the proper gastric glands. Predominantly they are long sected and lie very closely one to each other. Then muscularis mucosa is seen. Submucosa lies outside to mucosa, and then there is well developed muscular tunic, which consists of three layers with nerve plexus disposed between them. Serosa is the outer tunic of the stomach wall. At a high magnification watch the structure of the glands, which are disposed in the mucosal lamina propria. Special attention should be paid to the worse seen lumen of the glands, which is boarded by the cells with light cytoplasm – mucocytes. There are some round-shaped parietal cells with pink cytoplasm outside to these parietal cells.

Illustrate and indicate: I. Tunica mucosa. 1. Gastric pits. 2. Simple columnar glandular epithelium. 3. Lamina propria: a) mucocytes, b) chief cells, c) parietal cells. 4. Muscularis mucosa. II. Submucosa. III. Tunica muscularis. IV. Intermuscular nervous plexus. V. Tunica serosa.

Specimen 3. Pyloric stomach.
Stained with haematoxylin and eosin



Watch the specimen at a low magnification, special attention should be paid to the presence of the deep gastric pits, less amount of gastric glands in the

lamina propria and their structure: their secretory portions are branched very much and predominantly consist of one type of cells in opposite to the fundal glands. In this portion of stomach muscular tunic is developed most of all.the other tunics of pyloric stomach are similar tocardial and fundul ones.

Illustrate and indicate: 1. Tunica mucosa: a) gastric pits. 2. Simple columnar glandular epithelium. 3. Lamina propria: a) pyloric glands. 4. Muscularis mucosa. II. Tunica submucosa. III. Tunica muscularis. IV. Serosa.

What is the best-developed tunic of the pyloric stomach?

What portion of gastric mucosa do gastric pits occupy?

V. Real – life situations to be solved:

1. In the histological specimen you can see an organ of digestive tract. Its mucosa forms longitudinal folds (rugae), areas and pits. Which organ is described?

*A. Stomach.
B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

2. In the histological specimen you can see an organ of digestive tract. Its mucosa is covered with simple columnar glandular epithelium. Lamina propria has numerous closely packed glands. Which organ is described?

*A. Stomach.
B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

3. In the histological specimen you can see an organ of digestive tract. Its mucosa has numerous closely packed glands produced juice with pepsin and HCl. Which organ is described?

*A. Stomach.
B. Esophagus.
C. Larynx.
D. Trachea.
E. Small intestine.

4. In the histological specimen you can see an organ of digestive tract. Its mucosa has numerous closely packed glands produced juice with pepsin and HCl. Which epithelium covers the mucosa of this organ?

A. Stratified squamous keratinized.
B. Stratified sqamous .

*C. Simple columnar glandular.
D. Transitional.
E. Simple cuboidal.

5. In the histological specimen you can see the stomach. Its mucosa has numerous simple tubular gland in lamina propria. These glands include chief, oxyntic (parietal), enteroendocrine, mucous neck and stem cells. Which type of glands are found in the specimen?

*A. Fundic.
B. Cardial
C. Pyloric.
D. Duodenal.
E. Sebaceous.

6. In the histological specimen you can see the stomach. Its mucosa has numerous tubular gland in lamina propria. These glands include chief, parietal, enteroendocrine, mucous neck and undifferentiated (stem) cells. Which of them produce pepsinogen?

A. Enteroendocrine.
B. Mucous.
C. Parietal.
D. Stem.
*E. Chief.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 50 FOR STUDENTS

THEME: SMALL INTESTINE

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know the small intestine histophysiology. To be able to identify structural components of the organ in the specimens and electron micrographs.

Final aims. Students should be able to:

1. Identify the sources of development and tissues compounds of the small intestine wall.
2. Recognise the peculiarities of the small intestine relief. System villus-crypt.
3. Interpret morphofunctional characteristic of the simple columnar brushed epithelium of the villi and crypts.
4. Recognise ultrastructure and functions of different enterocytes.
5. Identify the small intestine submucosa. Duodenal glands structure and functions.
6. Recognise lymphoid follicles in small intestine, disposition and functions.
7. Identify muscular and external tunics of the small intestine.
8. Explain absorption histophysiology in small intestine.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department.

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

9. Development and tissues compounds of the small intestine wall.
10. Peculiarities of the small intestine relief. System villus-crypt.

11. Morphofunctional characteristic of the simple columnar brushed epithelium of the villi and crypts.
12. Ultrastructure and functions of different enterocytes.
13. Small intestine submucosa. Duodenal glands structure and functions.
14. Lymphoid follicles in small intestine, disposition and functions.
15. Muscular and external tunics of the small intestine.
16. Absorption histophysiology in small intestine.

Key words and phrases: intestine, relief, semilunar folds, villus, crypt, Libercune glands microvillus, simple columnar brushed epithelium, enterocyte, brushed cell, nonbrushed cell, goblet cell, endocrine cell, Paneth cell, Brunner's gland, digestion, intracellular digestion.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 297-306.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 238-247.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 214-222.

Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 201-207

III. Visual aids and material tools:

Charts No:

49-1. General structure of the digestive tube.

49-2. Duodenum.

49-3. Jejunum.

49-4. System villus-crypt.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Duodenum.

Stained with haematoxylin and eosin

At a low magnification watch the specimen and find four tunics in the intestinal wall: mucosa, submucosa, muscularis and serosa. Pay attention on its surface – there are villi with disposed crypts in between them. At a high magnification it is seen that both are cowered by simple columnar brushed epithelium. Loose connective tissue of the lamina propria underlies this epithelium. Then muscularis mucosa is disposed. Submucosa consists of loose connective tissue with secretory portions of duodenal glands and nerve plexus of Meissner. Muscular tunic contains two layers of smooth muscles and myenteric plexus (Awerbach's). serosa has typical structure.

Illustrate and indicate: I. Tunica mucosa. 1. Villi. 2. Crypts. 3. Simple columnar brushed epithelium. 4. Lamina propria. 5 Muscularis mucosae. II. Tunica submucosa.1. Connective tissue. 2. Duodenal glands. III. Tunica muscularis; 1. Inner circular layer. 2. Outer longitudinal layer. IV. Tunica serosa.

What structure do you see in the duodenal submucosa?

What are the peculiarities of epithelial cells, which allow naming this organ «abdominal hypophysis»?

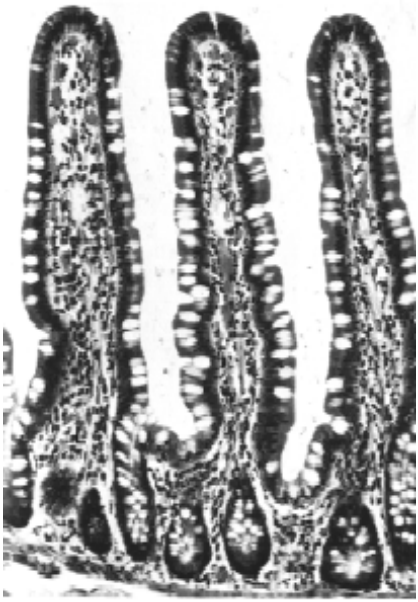
Specimen 2. Jejunum

Stained with haematoxylin and eosin

Principal difference of jejunum wall structure compare to the duodenum is thicker and taller villi and deeper crypts. Submucosa has no glands. All these peculiarities are well seen at a low magnification. All the others tunics and layers are similar to those in duodenum.

Illustrate and indicate: I Tunica mucosa. 1. Villi.2. Crypts. 3. Simple columnar brushed epithelium. II. Tunica submucosa. 1. Connective tissue. III. Tunica muscularis. IV. Tunica serosa.

What is the difference between relief of duodenum and jejunum?



Real – life situations to be solved

1. In the histological specimen you can see an organ of digestive tract. Its mucosa forms folds, villi and crypts. Which organ is described?

A. Stomach.
B. Esophagus.
C. Larynx.
D. Large intestine.
*E. Small intestine.

2. In the histological specimen you can see an organ. Its wall consists of mucosa, submucosa, muscularis externa and serosa/adventitia. Mucosa forms villi and crypts. Which epithelium lines mucosa of this organ?

A. Stratified squamous.
*B. Simple columnar.
C. Simple ciliated.
D. Stratified cuboidal.
E. Transitional.

3. In the histological specimen you can see an organ of digestive tract. Its mucosa forms villi and crypts and submucosa contains the numerous mucous glands, which empty into crypts bottom. Which part of organ is found?

*A. Duodenum.
B. Ileum.
C. Jejunum.
D. Cecum.
E. Pylorus.

4. In the histological specimen you can see small intestine. In which part of this organ the mucous gland are located/situated in submucosa?

*A. Duodenum.
B. Ileum.
C. Jejunum.
D. Cecum.
E. Pylorus.

5. In electron microphotograph of intestinal epithelium you can see a columnar cell with brush border and numerous vesicles in the apical part and mitochondia between the folds of the plasma membrane. Which type of cells is found?

A. Goblet cell.
*B. Absorbtive cell.
C. Chief cell.
D. Paneth`s cell.
E. Endocrine cell.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 51 FOR STUDENTS

THEME: LARGE INTESTINE

PROFESSIONAL MOTIVATION

Digestive system is the only way for nutritive substances introducing into human body from outside. It is opened from both sides that's why its wall is a border between environment and internal medium of human body. Morphologically digestive tube is a hollow structure, which promote gradual and successive mechanical and chemical processing of the food for its further absorption. It has some general features of the wall structure but at the same time there are some morphofunctional peculiarities in different parts of digestive system. Deep knowledge of the digestive system organs histophysiologies is necessary to future doctor for the creation of the clinical mentality, correct analyses of the modern investigation results (biopsy, endoscopy), choice of better way of medicines introduce and treatment and prophylaxis of digestive system diseases.

GENERAL AIM: Know microscopic and ultrastructure of large intestine. To be able to identify its wall structural components in light microscope.

Final aims: Students should be able to:

1. Interpret the sources of the digestive tube middle and posterior portion embryonic development.
2. Recognise large intestine anatomical portion and wall tunics structure.
3. Identify appendix structure and functions.
4. Recognise rectum portions and functional peculiarities.
5. Explain histophysiology of the large intestine.

BASIC LEVEL

1. Splanchnology. Digestive system – human anatomy department

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. The sources of the digestive tube middle and posterior portion embryonic development.
2. Large intestine anatomical portion and wall tunics structure.
3. Appendix structure and functions.
4. Rectum portions and functional peculiarities.
5. Histophysiology of the large intestine.

Key words and phrases: intestine, relief, semilunar folds, villus, crypt, Libercune glands microvillus, simple columnar brushed epithelium, enterocyte,

brushed cell, nonbrushed cell, goblet cell, endocrine cell, Paneth cell, cellulose digestion, Payer's patch , appendix, lymph nodule.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 306-312.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 247-248.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 222-225.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 207-221.

II. For self-training students should fill in this table:

Characteristic of the large intestine

Layers	Tissues	Function

Crypt cells

Type of cell	Morphology	Function

III. Visual aids and material tools:

Charts No:

50-1. General structure of the digestive tube.

50-2. Large intestine (Colon).

50-3. Appendix.

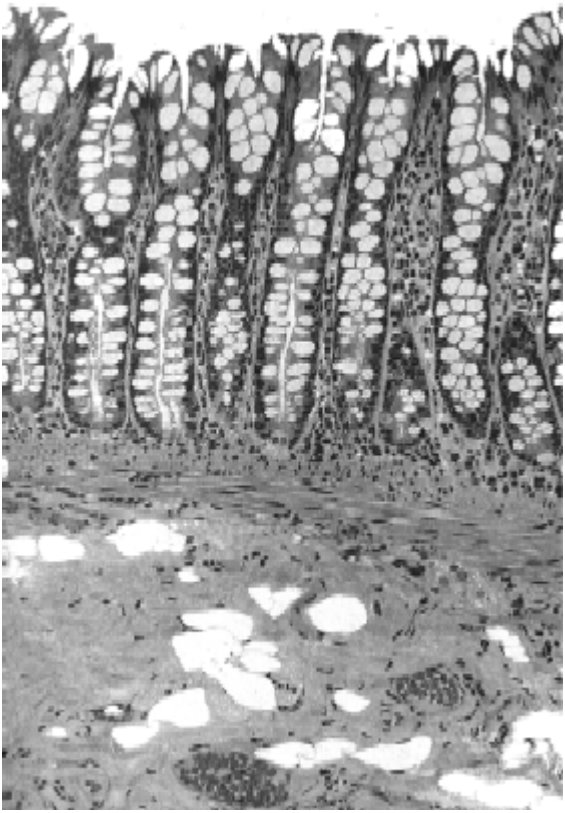
IV. Students' practical activities

Students must know and illustrate such histologic specimens:

Specimen 1. Large intestine. Cross section of the colon.

Stained with haematoxylin and eosin

Watch the specimen at a low magnification. Special attention should be paid on the differences in the mucosa structure. It has no villi but contains a lot of deep crypts large aggregations of lymphocytes are disposed in the mucosal lamina propria and submucosa. Outer layer of muscular tunic is discontinuous. Serosa has typical structure.



Illustrate and indicate: I. Tunica mucosa. 1. Crypts. 2. Simple columnar brushed epithelium.3. Goblet cells. II. Tunica submucosa. III. Tunica muscularis; 4. Inner circular layer. 5. Outer longitudinal layer. IV. Tunica serosa.

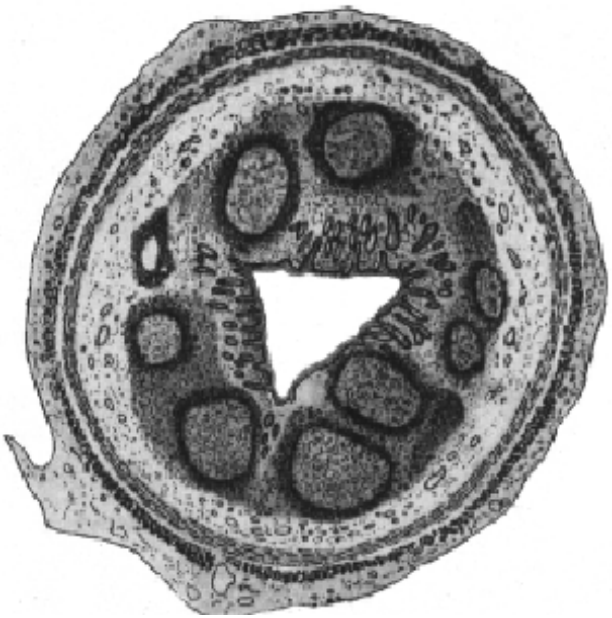
What are the relief compounds in the large intestine?

What is the predominant type of cells in large intestine mucosa epithelium?

Specimen 2. Appendix.

Stained with haematoxylin and eosin

Lumen of the appendix looks like a wide fissure. Mucosal crypts are small, they are cowered by the simple columnar epithelium with a few endocrine cells. Mucosa is continued into submucosa, which contains a lot of lymph follicles (nodules) with light centers. Muscular tunic and serosa have typical structure.



Illustrate and indicate: I. Tunica mucosa: a) simple columnar epithelium, b) crypts. II. Tunica submucosa.: a) lymph nodules. III. Tunica muscularis. IV. Tunica serosa.

Name the peculiarities of appendix mucosa and submucosa.

Why does appendix is named «abdominal tonsil»?

V. Real – life situations to be solved:

1. In the histological specimen you can see an organ of digestive tract. Its mucosa is covered by simple columnar epithelium and forms only crypts with numerous goblet cells. Which organ is described?

A. Stomach.
B. Esophagus.
*C. Large intestine.
D. Trachea.
E. Small intestine.

2. In the histological specimen you can see an organ. Its wall consists of mucosa, submucosa, muscularis externa and serosa/adventitia. Mucosa forms folds and crypts. Which epithelium lines mucosa of this organ?

A. Stratified squamous.
*B. Simple columnar.

C. Simple ciliated.
D. Stratified cuboidal.
E. Transitional.

3. In the histological specimen you can see large intestine. Its mucosa and submucosa include a lot of lymphoid tissue, which forms numerous follicles and diffuse clasters. Which function of this tissue.
A. Sensitive.
B. Secretion of mucus.
C. Regeneration.
*D. Immune defense.
E. Absorption.

4. In the histological specimen you can see an organ of large intestine. Its mucosa forms folds and crypts. Which type of cells predominates in the crypts epithelium of this organ?
*A. Goblet cell.
B. Absorbtive cell.
C. Chief cell.
D. Paneth`s cell.
E. Endocrine cell.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 52 FOR STUDENTS

THEME: LIVER. GALL BLADDER.

PROFESSIONAL MOTIVATION

The liver is one of the most frequently damaged organs in the body, and it is indeed fortunate that it has an enormous functional reserve. The extrahepatic biliary system – the gall bladder and the extrahepatic bile ducts – maintains a direct connection between the liver and the gastrointestinal tract and thus serves as an essential link in the enterohepatic circulation. Diseases of these organs loom large in clinical practice and in pathologic specimens. The list of diseases, which affect the liver, spans a wide range of vascular, metabolic, toxic, obstructive and neoplastic involvements. Inflammation of the gallbladder comprises the second most common cause (next to appendicitis) of abdominal pain and abdominal surgery. Extrahepatic biliary ducts are relatively common and are invariably extremely serious, because most are malignant.

GENERAL AIM: To study hystiophisiology of liver and can identify the gall bladder in speciment or photomicrograph and distinguish it from a similar section of small intestine. Be able named all substructures and different types of ducts and cells.

Final aims. Students should be able to:

1. Describe the liver's double blood supply.
2. Interpret the complex structure of a hepatocyte and relation of its structure to its main functions.
3. Recognise the classic liver lobule, the portal lobule, and the hepatic acinus (of Rappaport).
4. Identify the principal components of a portal triad.
5. Characterise the major cell types that border the hepatic sinusoids and cells that border the space of Disse.
6. Describe of the composition and production of bile.
7. Explain the functions of the gall bladders.

BASIC LEVEL

1. Structural peculiarities of the liver and gallbladder (department of anatomy).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Describtion of the liver's double blood supply.

2. Describtion of the complex structure of a hepatocyte and relation of its structure to its main functions.
3. Describtion of the classic liver lobule, the portal lobule, and the hepatic acinus (of Rappaport).
4. Principal components of a portal triad.
5. Characteristic of the major cell types that border the hepatic sinusoids and cells that border the space of Disse.
6. Describtion of the composition and production of bile.
7. Functions of the gall bladders.
8. Comparison of the wall of the gall bladders with that of the small intestine.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 320-336.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 248-254.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 224-233.

   Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 221-229.

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

1. Sinusoid lining cells
2. Liver parenchymal cells
3. Portal tract
4. Bile canaliculi

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

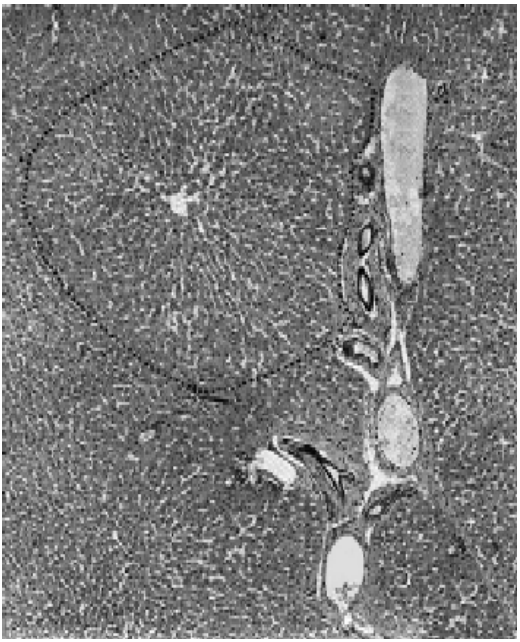
Specimen 1. Liver.

Haematoxylin and Eosin.

The principal cells of the liver, the hepatocytes, are arranged into structures called lobules, the structure of which maximises contact of hepatocytes with blood flowing through the liver. In pigs, the 'classical' liver lobule is particularly well delineated by connective tissue boundaries. The liver lobules are roughly hexagonal in shape,when seen in any section reflecting their regular, polyhedral three – dimensional shape.

The human liver has a similar lobular pattern to that of the pig but the boundaries of the lobules are not defined by distinct connective tissue. Portal tracts define the angles of the lobule margins and a central vein defines the centre of each

lobule. Note that each portal tract and its branches supplies more than one lobule whereas each central vein drains only a single lobule.



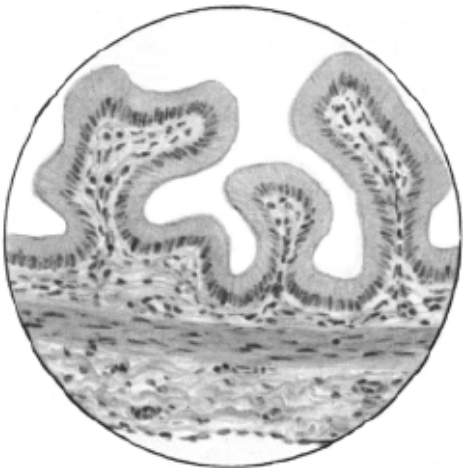
The plates of hepatocytes are usually only one cell thick and each hepatocyte is thus bathed by blood on at least two sides giving a huge surface area for exchange of metabolites.

You can focuse on a portal tract between three adjacent liver lobules. Each portal tract contains vessels of three main types. Firstly, the largest diameter vessels are branches of the hepatic portal vein which have the typical, thin-walled structure and irregular outline of all veins. Secondly, the smaller diameter, thick-walled vessels, with the typical structure of arterioles and arteries, are branches of the hepatic artery which supplies oxygenated blood to the liver. Thirdly, ducts of variable size lined by simple cuboidal or columnar epithelium are the bile-collecting ducts which ultimately drain into the common bile duct. Because vessels of these three types are always found in the portal tracts, the tracts are often referred to as portal triads. A fourth type of vessel, lymphatics, are also present in the portal tracts, but since their walls are delicate and often collapsed they are not readily seen.

Blood from the portal tracts percolates towards a central vein V of each lobule via sinusoids which pass between plates of hepatocytes. The central vein drains into the hepatic vein.

Illustrate and indicate: I. Classic liver lobule: 1.Hepatocyte plates: a) hepatocytes; 2.Hepatic sinusoids: a) nuclei of Kupffer cells; 3.Central vein; II. Portal space: 4.Portal tract: a) interlobular vein;b) interlobular atrery; c) interlobular bile duct.

Specimen 2. Gall bladder.
Haematoxylin and Eosin.



The gall bladder is a muscular sac lined by a simple columnar epithelium. In speciment you can see the wall of a gall bladder in the non-distended state in which the lining mucosa is thrown up into many folds. The relatively loose submucosal connective tissue is rich in elastic fibers and contains many blood and lymphatic vessels, which drain water reabsorbed from bile during the concentration process. The muscle layer is seen to separate the submucosa from the outer adventitial connective tissue. In the neck of the gall bladder, mucous glands are often found in the submucosa; this mucus may provide a protective surface film for the biliary tract.

The simple epithelial lining of the gall bladder consists of very tall columnar cells with basally located nuclei. Although not usually evident with light microscopy, the luminal surface of the cells is formed into very numerous, short irregular microvilli. Bile is concentrated 5- to 10-fold by an active process, mediated by the lining cells, which involves absorption of water into the vessels of the lamina propria.

Illustrate and indicate: 1.Mucosa: a) simple columnar epithelium; b) lamina propria of the mucosa; 2.Muscle layer; 3.Adventitia.

V. Real – life situations to be solved:

1. In the histological specimen you can see a gland associated with digestive system. Its function is methabolism and storation of nutrient, detoxication, production of plasma proteins and bile secretion in digestive tract. Which gland is found in the specimen?

A. Submandibular.
B. Parotid.
C. Pancreas.
*D. Liver.
E. Thyroid.

2. In the histological specimen you can see a gland associated with digestive system. Its function is methabolism and storation of nutrient, detoxication, production of plasma proteins and bile secretion in digestive tract. Which tissue forms the parenchyma of this organ?

A. Smooth muscle.
B. Lymphoid
C. Loose connective
D. Nervous.
*E. Epithelial.

3. In the histological specimen you can see a gland associated with digestive system. Its function is bile synthesis and secretion in the digestive tract. Which is the name of parenchymal cells?

*A. Hepatocytes.
B. Acinocites.
C. Serous cells.
D. Lymphocytes.
E. Mucocytes.

4. In the histological specimen of liver you can see a lobule. Which vessel is situated in the center of this structure?

A. Interlobular artery.
B. Interlobular vein.
*C. Central vein.
D. Sublobular vein.
E. Hepatic vein.

5. In the histological specimen of liver you can see a lobule. Which organisation has the epithelium of this structure?

A. Acini.
B. Islands
C. Follicles.
*D. Plates.
E. Tubules.

6. In the histological specimen you can see the liver. Lobule is polygonal mass, arranged by radially directed epithelial plates. At the corners of lobules there are portal space of connective tissue, which includes triads. Which structures are found in this region?

*A. Interlobular artery, interlobular vein and bile duct.
B. Interlobular artery, interlobular vein, sublobular vein.
C. Interlobular artery, central vein and bile duct
D. Central artery, central vein and bile duct
E. Interlobular artery, interlobular vein and sinusois.

7. In the electron microphotograph of liver plate you can see a bile canaliculus. Which structures forms the wall of this portion of bile duct system?

A. Simple cuboidal epithelium.
*B. Plasma membranes of adjacent hepatocytes.
C. Endotheliocytes.
D. Liver plates.
E. Basal membrane.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 53 FOR STUDENTS

THEME: PANCREAS.

PROFESSIONAL MOTIVATION

The most significant disorders of the pancreas consist of diabetes mellitus, fibrocystic disease of the pancreas, inflammations and tumors, benign and malignant. It should be emphasized that, from the standpoints of both morbility and mortality, diabetes mellitus alone overshadows all the other pancreatic disorders now to be considered. However, a knowledgeable altertness to all the pancreatic diseases is most necessary, since almost all these disorders are difficult to diagnose because of the hidden position and large reserve function of this organ and because of its structure. An elegent level of correlation of structure with function has been achieved in the pancreas.

GENERAL AIM: Be able to identify the islets of Langerhans and pancreatic acinar cells in a spesimens or electron micrographs of a section of the pancreas.

Final aims. Students should be able to:

1. Describe of the size, staining properties, and distribution of the islets of Langerhans in the pancreas.
2. Recognise the A (alpha), B (beta), D (delta), and F (PP) cells of the islets of Langerhans in terms of the hormones they secrete, their location in the islets, their relative numbers, the appearance of their granules, and any special staining properties.
3. Explain the role of the cells of the islets of Langerhans in regulating blood glucose levels.
4. Identify cytochemical pecularities of pancreas acinar cells.
5. Interpret the main enzymes secreted by the exocrine pancreas.

BASIC LEVEL

1. Development, structure and topography of the pancreas (department of anatomy).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Describtion of the size, staining properties, and distribution of the islets of Langerhans in the pancreas.
2. Distinguishing of the A (alpha), B (beta), D (delta), and F (PP) cells of the islets of Langerhans in terms of the hormones they secrete, their location in the

islets, their relative numbers, the appearance of their granules, and any special staining properties.
3. Role of the cells of the islets of Langerhans in regulating blood glucose levels.
4. Cytochemical pecularities of pancreas acinar cells.
5. Description of two types of pancreatic exocrine secretions in term of their composition, role in the digestion, cells primarily responsible for their secretion, and the enteroendocrinal hormone that stimulates their release.
6. Main enzymes secreted by the exocrine pancreas.

Key words and phrases: pancreas, exocrine pancreas, connective tissue septa, acinus, intralobular ducts, simple cuboidal epithelium, pancreatic acinar cells, zymogen granules, islets of Langerhans, A- (alpha) cells, B-(beta) cells, D-(delta) cells, F-cells, PP-cells, glucagons, insulin, somatostatin, pancreatic polypeptide, enzyme – secreting cells, diabetes mellitus, hyperglycemia, centroacinar cells.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 317-320.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 254-258.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 233-236.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 229-237.

II. For self-training students should fill in this table:

Characteristic of the island cells

Type of cell	Structure	Produced hormone

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:
Pancreatic acinar cells (apical portion).

1. Nucleus
2. Mitochondrion
3. Zymogen granules
4. Microvilli in the pancreatic duct lumen
5. Centroacinar cell

Pancreatic acinar cells (basal portion)

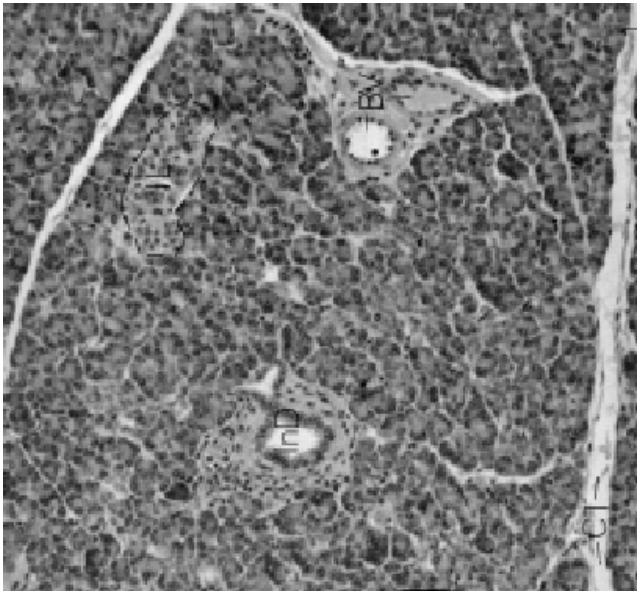
1. Nucleus

2. Rough endoplasmic reticulum
3. Mitochondrion

Insulocytes in the islets of Langerhans
1. B – cell: a) nucleus
b)cytoplasm
c)hormone granules
2. A – cell: a) nucleus
b)cytoplasm
c)hormone granules
3. Capillary: a) endothelium
b) basement membrane
Charts No:
52-1. General features of the glands associated with the digestive tract
52-2. Exocrine pancreas (pancreatic acinus)
52-3. Cells types of endocrine pancreas
52-4. Pancreatic duct system

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:
Specimen 1. Pancreas.
Haematoxylin and Eosin.
The pancreas is a highly lobulated gland invested by a loose connective

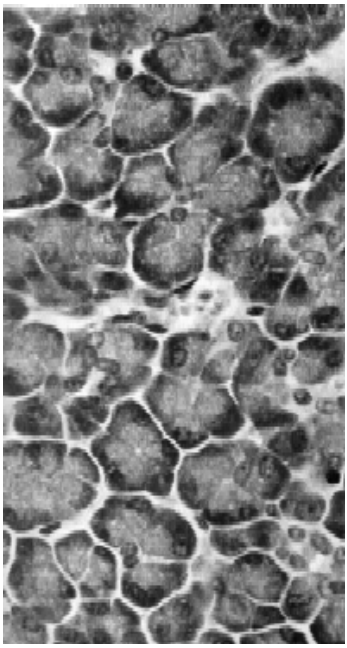


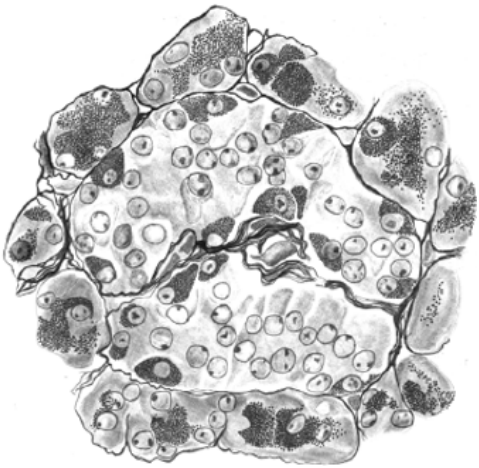
tissue capsule which extends as delicate septa between the lobules. The exocrine

component of the pancreas consists of closely packed, secretory acini which drain into a highly branched duct system.

The endocrine tissues of the pancreas form islets of various sizes, the islets of Langerhans, which are scattered throughout the exocrine tissue.

At higher magnification, details of the pancreatic acini and duct system can be seen. Each acinus is made up of an irregular cluster of secretory cells which drain into a minute, central duct. These minute ducts then drain into the system of ducts of progressively increasing size. The small ducts are lined by simple cuboidal epithelium which becomes stratified cuboidal in the larger ducts. With increasing size, the ducts are supported by a progressively thicker layer of dense connective tissue and the wall of the main pancreatic duct contains smooth muscle.





The pancreatic acini are seen to consist of roughly pyramidal-shaped cells with their apices projecting towards the lumen of a minute duct. The acinar cells are typical protein-secreting (zymogenic) cells. The nuclei are basally located and surrounded by basophilic cytoplasm rich in rough endoplasmic reticulum; the apices of the cells are packed with eosinophilic, zymogen secretory granules. The smallest excretory ducts merge with the lumina of the acini, and duct lining cells are often seen in the centre of secretory acini; these duct lining cells are thus described as centroacinar cells and are recognised by their pale-stained nuclei and

sparse, pale-stained cytoplasm. Cells of similar appearance can be seen between the acini. The cells lining the small ducts are responsible for elaborating the bicarbonate component of pancreatic secretion.

The islets of Langerhans contain six types of cells: A cells, B cells and D cells are the major endocrine cells; C cells, and PP cells are minor endocrine cells. A cells usually are located along the periphery of islets. A cells have an irregularly shaped nucleus and secretory granules that contain glucagon. B cells comprise about 70% of the islet endocrine cell population and are centrally located in islets. B cells have large, round nuclei. D-cells located at the islet periphery, close to A cells.

Illustrate and indicate: I.Lobule: 1.Pancreatic acini; 2.Pancreatic acinar cells: a) eosinophylic, zymogen secretory granules; b) basophilic cytoplasm; c) basally located nuclei; II.Connective tissue between lobules: 3.Pancreatic ducts; 4.Blood vessels; III.Islet of Langerhans: 5.A-cells; 6.B-cells; 7.Sinusoidal capillaries.

V. Real – life situations to be solved:

1. In the histological specimen you can see a gland associated with digestive system. Its parenchyma is divided into two parts. Exocrine part consists of acini and duct system. Endocrine part is organized in islets of Langerhance. Which gland is described?

A. Parotid.
B. Liver.
C. Submandibular.
D. Thyroid.
*E. Pancreas.

2. In the histological specimen you can see pancreas. Which is the structural unit of exocrine part of this organ?

A. Lobe.
B. Follicle
*C. Acini.
D. Mucus unit.
E. Islet.

3. In the histological specimen you can see pancreas. Which is the structural unit of endocrine part of this organ?

A. Lobe.
B. Follicle
C. Acini.
D. Plate.
*E. Islet.

4. In the histological specimen of pancreas you can see light stained cluster of epithelial cells with fenestrated capillaries located in lobule. Which structure of pancreas is described?

A. Acini.
B. Interlobular duct.
*C. Endocrine islet.
D. Mucous unit.
E. Interlobular connective tissue septa.

5. In the histological specimen you can see a gland associated with digestive system, which has exocrine and endocrine parts. Endocrine part forms islets, which viewed as pale stained cells clusters in lobules. Which substances are secreted by these structures?

A. Digestive enzymes: trypsinogen, amylase, lipases.
*B. Hormones: insulin, glucagon, somatostatine, VIP and PP.
C. Mucus.
D. Immunoglobulins.
E. Lysozim.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 54 FOR STUDENTS

THEME: RESPIRATORY SYSTEM. CONDUCTING PORTION

PROFESSIONAL MOTIVATION

It is impossible to overemphasize the importance of lung disease in the overall perspective of pathology and clinical medicine. Primary respiratory infections, such as bronchitis, bronchopneumonia and other forms of pneumonia, are commonplace in clinical and pathologic practice. In this day of cigarette smoking and air pollution, emphysema has become rampant, affecting large segments of the total population. Malignancy of the lungs has risen steadily in incidence, until it is now the most common form of visceral malignancy in the male.

GENERAL AIM: To study the development and peculiarities of the microscopic structure of the various air-ways departments. To be able to differentiate several bronchi samples according to their wall structure and to identify the ultrastructural features of the lung's respiratory portion by observing them on the electron micrographs.

Final aims. Students should be able to:

1. Divide the respiratory system and the components of each division.
2. Recognise important tissues and layers of the wall of the respiratory tract and function of each.
3. Compare the structure of the wall of the various components of the respiratory tract.
4. Recognise important cell types of the wall of the respiratory tract, structure and function of each.

BASIC LEVEL

1. Structure and topography of the respiratory system (department of anatomy).
2. The gas exchange in the lungs (course of biology, school).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Divisions of the respiratory system and the components of each division.
2. Important tissues and layers of the wall of the respiratory tract and function of each.
3. Comparison of the structure of the wall of the various components of the respiratory tract.

4. Important cell types of the wall of the respiratory tract, structure and function of each.

Key words and phrases: ventilating mechanism, conducting portion, nasal cavity, nasopharynx and larynx, trachea, bronchi and bronchioles, primary bronchi, secondary bronchi, tertiary bronchi, terminal bronchioles, respiratory bronchioles, respiratory portion of the lungs, pulmonary acinus, alveolar ducts, alveolar sacs, alveoli, alveolar epithelium, respiratory epithelium, pseudostratified columnar ciliated epithelium, respiratory mucosa, lamina propria of the mucosa, submucosa, elastic and hyaline cartilages, adventitia, ciliated columnar cells, goblet cells, brush-border cells, basal cells, small granule cells, non-ciliary cells, blood-air barrier, pulmonary surfactant, pleura.

II. For self-training students should fill the table:

General characteristic of the organs of respiratory tract

Layers	Tissue content	Function

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

I. Apical pole of the ciliated columnar cells. Mucosa epithelium of the nasal cavity respiratory region

Charts No:

54-1. Structure of the respiratory system

54-2. Cell types of respiratory epithelium

54-3. Components of the blood-air barrier

54-4. The respiratory portion of the respiratory tract

54-5. Distinguishing features of respiratory tract components

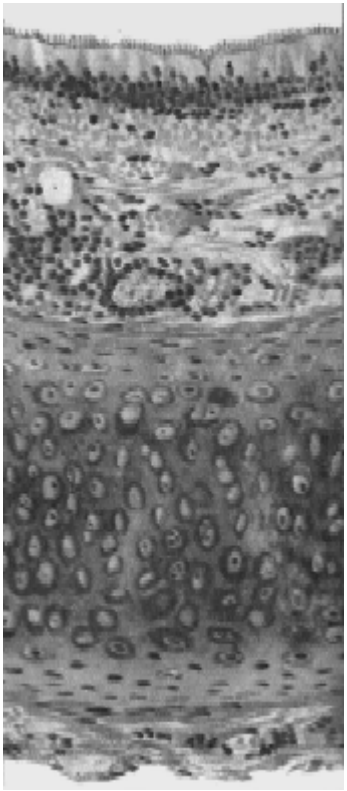
IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Trachea.

Haematoxylin and Eosin.

The respiratory epithelium of the trachea is tall, pseudostratified and ciliated and contains goblet cells. The tracheal epithelium is supported by a thick basement membrane. Beneath the basement membrane, the lamina propria consists of loose, highly vascular, connective tissue which becomes more condensed at its deeper aspect to form a band of fibro-elastic tissue. Underlining the lamina propria is the loose submucosa containing numerous mixed sero-mucous glands which decrease in number in the lower parts of the trachea. The submucosa merges with the perichondrium in the underlining hyaline cartilage rings or with the external adventitial layer between the rings.



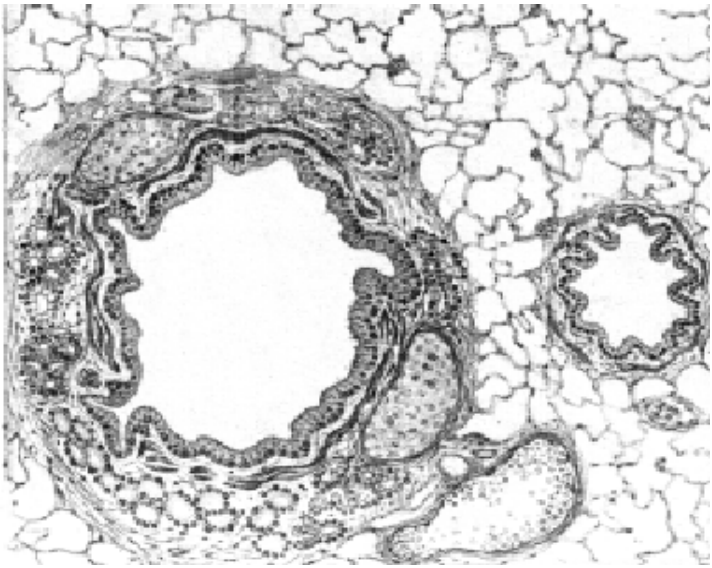
Illustrate and indicate: 1. Respiratory mucosa: a) pseudostratified columnar ciliated epithelium; b) lamina propria of the mucosa; 2. Submucosa; 3. Hyaline cartilage: a) C-shaped rings; 4. Adventitia.

Specimen 2. Tertiary bronchus.

Haematoxylin and Eosin.

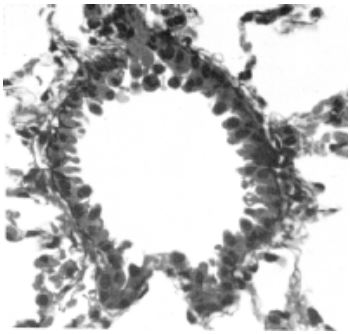
As the bronchi diminish in diameter the structure progressively changes to more closely resemble that of large bronchioles. The respiratory epithelium is tall columnar but not pseudostratified, and goblet cells have diminished in number. The lamina propria is thin and completely encircled by smooth muscle which is disposed in a spiral manner. This arrangement of smooth muscle permits contraction of the bronchi in both length and diameter during expiration. Sero-mucous glands are sparse in the submucosa and are rarely found in smaller airways. The framework is reduced to a few irregular plates; cartilage also does not usually extend beyong the tertiary bronchi. Note that the submucosa merges with

the surrounding adventitia and thence with the lung parenchyma. A small lymphoid aggregation is seen in the adventitia.



Illustrate and indicate: 1. respiratory mucosa: a) respiratory epithelium; b) lamina propria of the mucosa; c) smooth muscle layer; 2. Submucosa; 3. Islands of elastic cartilages; 4. Adventitia.

Specimen 3. Bronchiole.
Haematoxylin and Eosin.



Bronchioles are airways of less than one millimeter in diameter and have no cartilaginous support. The respiratory epithelium is simple, columnar and

ciliated and contains few goblet cells, these being completely absent beyong the terminal bronchioles. The smooth muscle layer is the most prominent feature of the bronchiole and is disposed in a spiral manner like that of the bronchi. Adventitia is the external layer.

Illustrate and indicate: 1. Respiratory mucosa: a) simple columnar ciliated epithelium; b) lamina propria of the mucosa; c) smooth muscle layer; 2. Adventitia.

V. Real situations to be dissolved:

1.An organ presented in the histological specimen is hollow tube, which wall includes four layers. They are: mucosa, submucosa, cartilaginous and adventitia. Organ of which system is presented in the histological specimen?

A. Digestive.
B. Reproductive.
*C. Respiratory.
D. Endocrine.
E. Circulatory/Cardiovascular.

2. An organ presented in the histological specimen is referred to the respiratory tract. Which layers does its wall include?/ Which layers compose the wall of this organ?

A. Tunica intima, tunica media and tunica adventitia.
B. Mucosa, muscularis and serosa.
C. Mucosa, submucosa, muscularis externa and adventitia
*D. Mucosa, submucosa, cartilaginous and adventitia.
E. Mucosa, submucosa and adventitia.

3. In the histological specimen of larynx you can see the true vocal folds. Which epithelium covers this structures?.

*A. Stratified squamous nonkeratinized.
B. Simple columnar.
C. Pseudostratified ciliated.
D. Stratified cuboidal.
E. Transitional.

4. In the histological specimen you can see a hollow tube, which wall includes four layers. They are: 1) mucosa, which includes pseudostratified ciliated epithelium and lamina propria; 2) submucosa with the mixed glands, 3) C-shaped rings of hyaline cartilage and 4) adventitia. Which organ is found in the histological specimen?

A. Esophagus.
B. Larynx.
C. Bronchus.
*D. Trachea.

E. Artery.

5. In the histological specimen you can see trachea. Which epithelium lines the mucosa of this organ.

A. Stratified squamous.
B. Simple columnar.
*C. Pseudostratified ciliated.
D. Stratified cuboidal.
E. Transitional.

6. In the histological specimen you can see a large bronchus. Which epithelium lines the mucosa of this organ.

A. Stratified squamous.
B. Simple columnar.
*C. Pseudostratified ciliated.
D. Stratified cuboidal.
E. Transitional.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 336-357.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 207-217.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 178-191.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 235-251.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 55 FOR STUDENTS

THEME: RESPIRATORY SYSTEM. LUNG.

PROFESSIONAL MOTIVATION

It is impossible to overemphasize the importance of lung disease in the overall perspective of pathology and clinical medicine. Primary respiratory infections, such as bronchitis, bronchopneumonia and other forms of pneumonia, are commonplace in clinical and pathologic practice. In this day of cigarette smoking and air pollution, emphysema has become rampant, affecting large segments of the total population. Malignancy of the lungs has risen steadily in incidence, until it is now the most common form of visceral malignancy in the male.

GENERAL AIM: To study the development and peculiarities of the microscopic structure of the various air-ways departments. To be able to differentiate several bronchi samples according to their wall structure and to identify the ultrastructural features of the lung's respiratory portion by observing them on the electron micrographs.

Final aims. Students should be able to:

1. Compare of the terminal and respiratory bronchioles.
2. Identify Components of the blood-air barrier.
3. Describe the pleura in terms of structure, function, and location.

BASIC LEVEL

3. Structure and topography of the respiratory system (department of anatomy).
4. The gas exchange in the lungs (course of biology, school).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Divisions of the respiratory system and the components of each division.
2. Comparison of the terminal and respiratory bronchioles.
3. Components of the blood-air barrier.
4. Description of the pleura in terms of structure, function, and location.

Key words and phrases: ventilating mechanism, conducting portion, nasal cavity, nasopharynx and larynx, trachea, bronchi and bronchioles, primary bronchi, secondary bronchi, tertiary bronchi, terminal bronchioles, respiratory bronchioles, respiratory portion of the lungs, pulmonary acinus, alveolar ducts, alveolar sacs, alveoli, alveolar epithelium, respiratory epithelium, pseudostratified columnar ciliated epithelium, respiratory mucosa, lamina propria of the mucosa,

submucosa, elastic and hyaline cartilages, adventitia, ciliated columnar cells, goblet cells, brush-border cells, basal cells, small granule cells, non-ciliary cells, blood-air barrier, pulmonary surfactant, pleura.

References:

5. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 336-357.
6. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 207-217.
7. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 178-191.
8. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 235-251.

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

I. Alveolar sac's alveoli. Respiratory portion of the lung
II. Type I alveolar cells
III. Blood – air barrier

Charts No:

54-3. Components of the blood-air barrier
54-4. The respiratory portion of the respiratory tract
54-5. Distinguishing features of respiratory tract components

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Terminal portion of the respiratory tree.

Haematoxylin and Eosin.

Terminal bronchioles are the smallest diameter passages of the purely conducting portion of the respiratory tree and beyong this, further branches become increasingly involved in gaseous exchange. Each terminal bronchiole divides to form shot, thinner-walled branches called respiratory bronchioles, so named because their walls contain a small number of single alveoli. The epithelium of the respiratory bronchioles is devoid of goblet cells and largely consists of ciliated, cuboidal cells and smaller number of non-ciliated cells. Each respiratory bronchiole divides further into several long, winding passages called alveolar ducts which open along their lenght into numerous alveolar sacs and alveoli. Surrounding each alveolus is a rich network of pulmonary capillaries supplied by pulmonary vessels which follow the general course of the airways.

Illustrate and indicate: 1. Terminal bronchiole; 2. Respiratory bronchioles; 3. Alveolar ducts; 4. Alveolar sacs; 5. Alveoli; 6. Pulmonary vessels.

V. Real life situations to be dissolved:

1. In the histological specimen you can see a lung. Which is the structural unit of this organ?

A. Small bronchus.
B. Glands.
C. Nephron.
D. Lobule.
*E. Acinus.

2. In the histological specimen of lung you can see a small sack-like structure, lined by alveolocytes. In this structure gas exchange takes place. Which structure is found?

A. Terminal bronchiole.
B. Serous endpiece .
C. Mucous endpiece.
D. Large bronchus.
*E. Alveola

3. In the histological specimen you can see an organ, which function is gas exchange. Which organ is found in the specimen?

A. Bronchus.
B. Trachea.
C. Kidney.
*D. Lung
E. Liver.

4. In the histological specimen of lung you can see alveoli. Which cells lines this structures?

*A. Type I and type II alveolocytes
B. Alveolocytes and lymphocytes.
C. Cilialed cells and goblet cells
D. Ciliated cells and macrophags.
E. Endotheliocytes.

5. In the electron microphotograph of lung you can see a complex of structures, which includes: surfactant, cytoplasm of squamous (type I) alveolar cell, basal membrane and cytoplasm of endothelial cell. Which barrier is found?

A. Filtration barrier
B. Blood-encephalic barrier
C. Blood-thymus barrier
D. Blood-testis barrier
*E. Air-blood barrier.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 56 FOR STUDENTS

THEME: SUMMARY LESSON ON THE TOPICS 45 – 55

AIM: To generalise and fasten the aquired knowledge in histophysiology of digestive and respiratory system by means of a test control using specimens diagnosis and electron micrographs

Programm questions to the test

1. Digestive tube general structure. Digestive tube subdivision into portions due to the origin, structure and functions.
2. Oral cavity organs. Mucosa peculiarities in accordance with functions. Lips, cheeks, hard and soft palatine, tongue.
3. Pirogov's laringeal lymphoepithelial rink. Tonsilles origin, structure and functions.
4. Large salivary glands. Classification, structure, histophysiology, exo- and endocrine functions.
5. Teeth. Origin, structure and teeth changes. Thin structure and functions of tooth periodontum and pulp.
6. Tooth dentine, enamelum and cementum microscopic and chemical compounds. Aging and regeneration.
7. Pharynx andd esophagus. General structure and microscopic peculiarities different portions of the esophageal wall.
8. Stomach. Sources of origin, wall structure and tissues compounds. Stomach glands disposition, structure and cell compounds (exo- and endocrine cells types). Secretory cells histophysiology.
9. Small intestine. Structure and functions. "Cript-villus" sytem histophysiology and their participation in the parietal and intracavitary digestion.
10. Large intestine. Structure and functions. Appendage structure and function.
11. Rectum. Portions and their peculiarities.
12. Liver. Morphofunctional characteristic. Pecupiarities of the blood supply.
13. Classic hepatic lobule structure. Intralobular hemocapillary. Hepatic cords. Hepatocytes structure and functions.
14. The term hepatic acinus and portal lobule. Bile ducts. Gallbladder structure and functions.
15. Pancreas. Origin, structure and functions of the exo- and endocrine portions.
16. Pancreatic acinocytes structural peculiarities. Excretory ducts structure.
17. Cell types of the pancreatic islands, their morphofunctional characteristic.
18. Respiratory system general morphofunctional characteristic.
19. Conducting system. Nasal cavity, larinx and trachea structure and functions.
20. Lungs. Bronchial tree. Peculiarities of the bronchial wall due to the calibre. Characteristic features of the conducting system epithelium.

21. Lungs respiratory portion. Lung morphofunctional unite acinus structure and functions.
22. Microscopic structure of the lung's alveola wall. Aero-hematic barrier ultrastructure. Alveolar surfactant complex conception.
23. Lungs blood suppluing and aging

The list of specimens

1. Human tongue. Filiform and fungiform papilla.
2. Human tongue. Foliate papilla.Stained with haematoxylin and eosin
3. Tooth development early stage. Stained with haematoxylin and eosin.
4. Tooth development early stage. .Stained with haematoxylin and eosin.
5. Parotid gland. Stained with haematoxylin and eosin.
6. Submandibular gland. Stained with haematoxylin and eosin.
7. Sublingual gland. Stained with haematoxylin and eosin.
8. Esophagus. Stained with haematoxylin and eosin.
9. Palatine tonsil. Stained with haematoxylin and eosin.
10. Esophageo-gastric junction. Stained with haematoxylin and eosin.
11. Fundus of the stomach. Stained with Congo red.
12. Pyloric stomach. Stained with haematoxylin and eosin.
13. Duodenum. Stained with haematoxylin and eosin.
14. Small intestine (jejunum). Stained with haematoxylin and eosin.
15. Large intestine. Stained with haematoxylin and eosin.
16. Appendix. Stained with haematoxylin and eosin.
17. Human liver. Stained with haematoxylin and eosin.
18. Pancreas. Stained with haematoxylin and eosin.
19. Lungs. Stained with haematoxylin and eosin.
20. Trachea. Stained with haematoxylin and eosin.

The list of electron micrographs

1. Chief cell of the proper stomach gland. Fig. 44.
2. Parietal cell of the proper stomach gland. Fig. 45.
3. Accessory mucocyte. Fig. 46.
4. Columnar brushed cells. Fig. 49.
5. Columnar nonbrushed cells. Fig. 51.
6. Intestinal goblet cell. Fig.
7. Intestinal endocrine cell. Fig. 53.
8. Hepatocyte. Fig. 57.
9. Bile capillary. Fig. 60.
10. Exocrine pancreatocyte. Fig. 62, 63.
11. Insulocytes of pancreatic island. Fig. 64.
12. Apical portion of the ciliated epithelial cells. Epithelial layer of the nasal cavity respiratory mucosa. Fig. 65.

13. Alveolar sac alveoles. Respiratory portion of the lungs. Fig. 66.
14. Respiratory epithelial cell (alveolar cell of the I type). Fig. 67.
15. Large secretory epithelial cell - alveolar cell of the II type. Fig. 68
16. Air-hematic barrier. Fig. 69

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 216-232, 394-422.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 168-178, 299-313.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 118-130, 258-277.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 111-123, 267-283.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	20 min	Tests	Computers	Computer class
2.	Discussion of the main points	40 min	Slides, Tables	Projector	Class room
3.	Independent students activity	15 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 57 FOR STUDENTS

THEME: SKIN AND ITS DERIVATIVES.

PROFESSIONAL MOTIVATION

Skin is the largest single organ in the body. Its chief functions are concerned with sensation, protection, temperature regulation and control of water output. It is closely associated with the underlying structures, from which and through which it receives its nutrition, and because of its location it is in intimate relation with the external environment. Therefore, its status is readily affected by general or local diseases of the body as well as external factors. More often, it is a combination of systemic and local factors which produces visible skin lesions. It must be remembered that because the skin can be directly observed, many of the clinical objective findings actually represent the gross pathology of the various dermatologic diseases. Clinical description ussually includes the macroscopic and microscopic pathology.

GENERAL AIM: To be able to to identify the type of skin, the named layers, keratinocytes, melanocytes, hair follicles and their layers, and types of glands present in a specimen or electron micrographs of a section of skin.

Final aims: Students shoul be able to:

1. Interpret the important skin's functions and relation of them to its structure.
2. Identify the major layers of skin and the basic tissue type that predominates in each.
3. Recognise cell types commonly found in the epidermis and describtion of their structure, function, and location.
4. Identify the layers of the epidermis of thick skin and description of the distinguishing structural features of each.
5. Explain steps in the processes of epidermal cell renewal and keratinization in relation to the epidermal layers.
6. Compare of the 2 layers of the dermis.
7. Describe the important components of the skin derivatives.
8. Compare the 3 types of glands associated with the skin.

BASIC LEVEL

1. Basic anatomical structures of the skin (department of anatomy).

STUDENTS' INDEPENDENT STUDY PROGRAM

I.Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Important skin's functions and relation of them to its structure.

2. Major layers of skin and the basic tissue type that predominates in each.
3. Cell types commonly found in the epidermis and describtion of their structure, function, and location.
4. Layers of the epidermis of thick skin and description of the distinguishing structural features of each.
5. Steps in the processes of epidermal cell renewal and keratinization in relation to the epidermal layers.
6. Comparison of the 2 layers of the dermis.
7. Describtion of the important components of the skin derivatives.
8. Comparison of the 3 types of glands associated with the skin.

Key words and phrases: skin, stratified sguamous keratinized epithelium, dense irregular connective tissue, epidermis, derma, hypodermis, stratum germinativum (stratum basale), keratinocytes, stratum spinosum, stratum granulosum, keratohyalin granules, stratum lucidum, stratum corneum, keratinization process, papillary layer, reticular layer, sweat glands, sebaceous glands, hair, hair follicles, bulbous cores, connective tissue papillae, germinal matrix, external root sheath, proliferative cells, melanocytes, nails.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 357-371.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 193-207.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 130-142.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 137-151.

II. For self training students should fill in these tables:

Characteristic of skin layers

Layer	Tissues	Functional significance

Characteristic of skin derivates

Structure	Location	Function

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

I. Cells of the stratum basale and stratum spinosum.

1. Cell of the stratum basale

a) nucleus
b) cytoplasm
c) keratin filaments
d) desmosomes
2. Cell of the stratum spinosum
a) nucleus
b) cytoplasm
II. Epidermocytes of stratum spinosum.
1. Cell of the stratum spinosum
a) nucleus
b) cytoplasm
c) spine
d) desmosomes
e) osmiofilic granules
f) tonofibrils
III. Dermis: papillary layer.
1. Fibroblast
a) nucleus
b) cytoplasm
2. Intracellular substance
a) fibers
b) ground substance
IV. Reticular layer of dermis.
1. Collagen fibers
2. Capillary
3. Fibrocyte
Charts No:
56-1. Generel organization of the skin.
56-2. Outer (superficial) layer of skin.
56-3. The keratinizing system of the epidermis
56-4. Regional variation of skin structure.
56-5. Hair and follicle structure.
56-6. Structure of sebaceous and sweat glands.

IV. Students' practical activities:

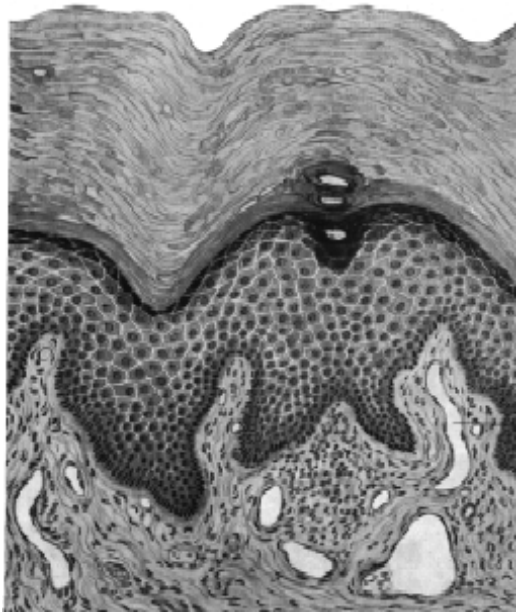
Students must know and illustrate such histological specimens:

Specimen 1. Skin (fingertip).

Haematoxylin and Eosin.

The general structure of skin is illustrated in this preparation of thick skin from the fingertip. The epidermis consists of a stratified squamous keratinising epithelium which, in this site, has an extremely thick keratinised surface layer. A prominent feature of the skin of the fingertips, palms and soles of the feet is a

pattern of surface ridges formed by the epidermis; this pattern is unique to each individual. Epidermis is represented of five morphological layers:



1. Stratum basale: the cells of this layer are cuboidal and form a single layer separated from the dermis by a basement membrane too thin to be resolved by light microscopy. The basal aspect of each germinal cell is highly irregular and bound to the basement membrane by numerous hemi-desmosomes. Mitotic figures are most frequently observed in this layer but cell division also occurs to a lesser extent in the stratum spinosum.

2. Stratum spinosum: the so-called 'prickle cells' of this zone are relatively large and polyhedral in shape and have extremely numerous cytoplasmic 'prickles' bound by desmosomes to adjacent cells. Prominent nucleoli and cytoplasmic basophilia indicate active protein synthesis. A fibrillar protein, the predominant synthetic product of these cells, aggregates to form intracellular fibrils known as tonofibrils which converge upon the desmosomes of the cytoplasmic 'prickles'.

3. Stratum granulosum: the cells of this layer are characterised by numerous, dense basophilic granules which crowd the cytoplasm and tend to obscure the tonofibrils. The chemical nature of these so-called keratohyalin granules is distinct from that of the fibrous protein of the tonofibrils. The process of keratinisation is thought to involve the combination of tonofibril and keratohyalin elements to form the mature keratin complex. In addition, the cells of

the stratum granulosum also synthesise glycoprotein granules which are believed to form an intercellular cementing substance. In the outermost aspect of the stratum granulosum, cell death occurs due to rupture of lysosomal membranes; released lysosomal enzymes may play an important role in the final process of keratinisation.

4. Stratum lucidum: is only present in extremely thick skin, and appears as a homogeneous layer between the stratum granulosum and the keratinised layer.

5. Stratum corneum: the morphology and staining characteristics of this layer are strikingly different from that of the underlying layers. The stratum corneum consists of layers of fused, flattened cells devoid of organelles and filled with mature keratin. In the deeper aspect of this layer the cornified cells retain their desmosomal junctions and the intracellular keratin has an ordered pattern. Towards the surface, the desmosomes and internal structure of the cells become disrupted, a process which precedes desquamation.

In addition to the keratinocytes, which form the bulk of the epidermis, three other cell types, all poorly stained, are found in the epidermis. The most common of these are the melanocytes responsible for skin pigmentation which are usually confined to the basal layer.

The second of these cells, known as Merkel cells, are associated with free nerve endings and are presumed to serve as sensory receptors. Langerhan's cells are the other cell type found in the epidermis.

The epidermis is supported by the dermis, a layer of dense fibro-elastic tissue. The dermis merges with the loose connective tissue of the hypodermis which consists largely of adipose tissue; in this site, adipose tissue acts as a soft, shock-absorbing layer.Numerous sweat glands arc located in the dermis and hypoderms and discharge their secretions on to the skin surface via long excretory ducts.

Illustrate and indicate: 1. Epidermis: a) stratum basale; b) gstratum spinosum; c) stratum granulosum; d) stratum lucidum; e) stratum corneum; 2. Dermis: a) papillary layer; b) reticular layer; 3. Sweat glands: a) secretory portion; b) duct.

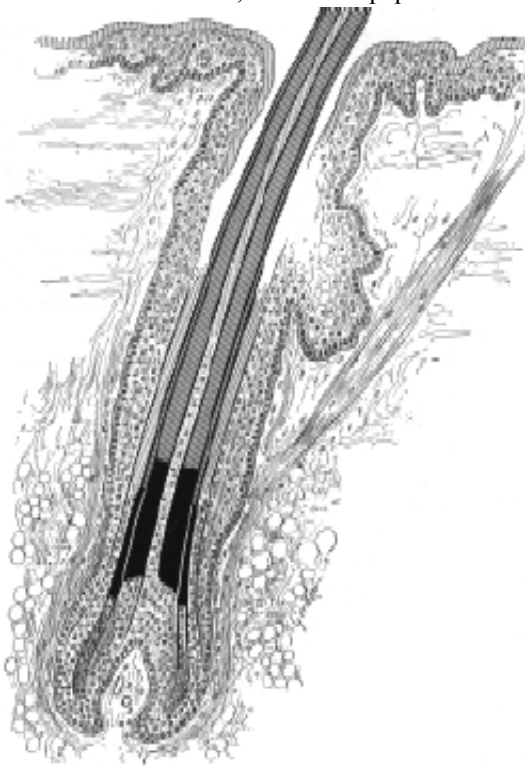
Specimen 2. Scalp skin.

Haematoxylin and Eosin.

The structure of the skin differs considerably from one part of the body to another, the principal differences being in epidermal thickness, the size, density and state of activity of the hair follicles, and the nature and density of sweat glands and sensory receptors.

As seen in specimen, the skin of the sclap is robust due to a thick, densely collagenous dermis, and the hair follicles which are essentially cylindrical downgrowths of the surface epithelium ensheated by connective tissue, they are numerous and closely parked. Hair growth takes place within a terminal expansion

of the follicle, the hair bulb, which consists of actively dividing epithelial cells surrounding a papilla of connective tissue, the dermal papilla.



The follicles of the scalp are particularly long and have more numerous sebaceous glands than those of other areas. Note the arrector pili muscles extending from the base of the follicles towards the upper dermis. Merocrine sweat glands are numerous though less prominent than in the skin of the trunk and limbs due to the profusion of other appendages.

Illustrate and indicate: 1. Epidermis; 2. Papillary layer; 3. Reticular layer; 4. Hair root: a) hair bulb; b) dermal papillae; c) external epithelial radicular vagina; d) hair bursa; 5. Sebaceous gland; 6. Arrector pili muscle; 7. Hypodermis: a) adipocytes.

V. Real life situations to be dissolved:

1. In the histological specimen you can see a skin. Which layers does this organ include?/ Which layers compose this organ?

*A. Epidermis, dermis and hypoderma.

B. Simple columnar epithelim and derma.

C. Mucosa, submucosa and muscularis externa.
D. Tunica inima, tunica media and tunica adventitia.
E. Mucosa, muscularis externa and serosa.

2. An organ presented in the histological specimen consists of epidermis and derma. Which organ is found in the specimen?
A. Liver.
B. Esophagus.
*C. Skin
D. Tongue.
E. Stomach.

3. In the histological specimen of skin you can see epidermis. Which tissue forms this layer of the organ?
A. Stratified squamous nonkeratinised.
B. Simple columnar.
C. Simple ciliated.
*D. Stratified squamous keratinised.
E. Transitional epithelium.

4. In the histological specimen of skin you can see dermis. Which tissues form this layer of the organ?
A. Stratified squamous epithelium and loose connective tissue
B. Smooth muscles and connective tissue.
C. Loose connective tissue and cartilage.
D. Loose connective and adipose tissue.
*E. Loose and dense connective tissues.

5. In the histological specimen of skin you can see a layer which includes four types of cells. They are: keratinocytes, melanocytes, Langerhans cells and Mercel`s cells. In which layer are they found?
*A. Epidermis.
B. Dermis.
C. Hypodermis.
D. Tunica inima.
E. Mucosa.

6. Under the action of solar radiation (the sun UV-rays) the protective reaction is activated in epidermis. It is related with increase of pigment production. Which cells type of epidermis is responsible for this process?
A. Keratinocytes.
B. Fibroblasts.

*C. Melanocyte.
D. Mercel`s cells.
E. Macrophages.

7. In the histological specimen of skin you can see the papillary layer of dermis. Which tissue forms this layer?
A. Simple epithelium.
B. Stratified squamous keratinized epithelium.
C. Stratified squamous nonkeratinized epithelium
*D. Loose connective system.
E. Dense connective tissue.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 58 FOR STUDENTS

THEME: URINARY SYSTEM. KIDNEY.

PROFESSIONAL MOTIVATION

Few organs of the body are as clever and can simultaneously carry out as many complex and diverse functions as the kidney. Involved as it is in filtration, concentration and secretion, it is not suprising that it has a complex structure. An understanding of diseases of the kidney requires a thorough knowledge of its structure and the intimate interrelationships and interdependence of the four basic morphologic components: glomeruli, tubules, blood vessels and interstitium. Because all forms of serious renal disease may ultimately lead to renal failure, it is appropriate first to present this pathologic process in kidney with special techniques.

GENERAL AIM: To be able to diffirentiate cortex and medulla and identify all the vascular and tubular components as well as the components of the renal corpuscles is the specimens; juxtaglomerular apparatus, components of the glomerular filtration barrier in a electron micrographs of a renal corpuscle.

Final aims. Stubents shoul be able to:

1. Recognise the parts and functions of the urinary system and description of the roles of each organ.
2. Identify and description of the substructures of the kidney.
3. Compare the kidney cortex and medulla in terms of structure and function.
4. Recognise ultrastructure of the filtration barrier of the renal corpuscle.
5. Describe of the structure and function of each component of a nephron.
6. Identify the components and description of the function of the juxtaglomerular apparatus.
7. Interpret the circulation of blood through the kidney.
8. Explain the flow of fluid from Bowman's space to a minor calyx, naming, in order, the tubules through which it flows and describing any changes in fluid composition that occur in each tubule segment.

BASIC LEVEL

1. Urinary system. Structure and topography of kidney (department of anatomy).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Parts and functions of the urinary system and description of the roles of each organ.

2. Identity and description of the substructures of the kidney.
3. Comparison of the kidney cortex and medulla in terms of structure and function.
4. Ultrastructure of the filtration barrier of the renal corpuscle.
5. Description of the structure and function of each component of a nephron.
6. Components and description of the function of the juxtaglomerular apparatus.
7. Circulation of blood through the kidney.
8. Trace the flow of fluid from Bowman's space to a minor calyx, naming, in order, the tubules through which it flows and describing any changes in fluid composition that occur in each tubule segment.

Key words and phrases: kidney, cortex, medulla, nephron, cortex and juxtamedullary nephrons, glomerulus, peritubular capillaries, renal corpuscles, Bowman's capsule, collecting tubules and ducts, proximal and distal convoluted tubules, loop of Henle (U-shaped epithelial tube), medullary rays, renal columns of Bertin, filtration barrier, podocytes, pedicels, fused capillary podocyte basal lamina, diaphragm – covered capillary fenestrations, afferent arteriole, efferent arteriole, juxtaglomerular apparatus, juxtaglomerular cells, macula dense, extraglomerular mesangial cells, filtration mechanism, countercurrent exchange mechanism, renin secretion, antidiuretic hormone (ADH or vasopressin), aldosterone, renal artery and vein, arcuata artery and vein, stellate vein.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 371-394.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 258-273.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 236-258.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 251-267.

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:

1. Fractures renal glomerulus.

1. Outer epithelium of the capsule
2. Basement membrane
3. Inner epithelium of the capsule (podocytes)

a) nucleus

b) cytoplasm

4. Bowman's space
5. Capillary

1. Ultrastructure of a limited region of the glomerular filtration barriers.

1. Trilaminar basement membrane
a) light layers
b) dark layer
2. Endothelium
a) fenestrations
3. Lumen of the capillary
4. Pedicels
1. Epithelial cell of the distal convoluted tube.
1. Epithelial cell
a) nucleus
b) cytoplasm
c) microvilli
d) invagination of the plasmolemma
2. Lumen of the capillary
3. Basement membrane
1. Epithelial cell of the proximal convoluted tube.
1. Basement membrane
2. Plicae of the plasmolemma
3. Mitochondria
Charts No:
57-1. The general organization of the kidney
57-2. Diagram of two nephrons and their blood supply
57-3. Basic functional subunit of the kidney-nephron
57-4. The major components of the uriniferous tubule
57-5. Structures that compose the filtration bavrier
57-6. Cells of juxtaglomerulas apparatus
57-7. Wall of the ureter
57-8. General structure of the bladder wall
57-9. Structural features of the walls of the renal calyces, and renal pelvis

IV. Students' practical activities:

Students must know and illustrate such histological specimens:

Specimen 1. Kidney.

Haematoxylin and Eosin.

This specimen of a kidney illustrates the gross features of the kidney. The substance of the kidney may be divided into an outer cortex and an inner medulla. The darker-stained cortex can be clearly differentiated from the paler-stained medulla. A portion of each nephron is located in both the cortex and the medulla, although the major part of each nephron is found in the cortex. The medulla is arranged into pyramid-shaped units called medullary pyramids which are separated by extensions of cortical tissue. The medullary pyramids convay ducts which

converge to discharge urine at their apiced; the apiced of the pyramids are known as renal papillae.

Capsule of the kidney is continuous, at the hilum, with connective tissue which packs the spaces between the hilar structures. In later life, the hilum often contains significant quantities of adipose tissue. The kidney is cushioned by a thick pad of adipose tissue, not seen in this preparation.

In histological section of the cortex, numerous renal corpuscles are just visible. The corpuscles tend to be arranged in parallel rows at right angles to the capsule, corresponding to the course of the interlobular arteries from which they

derive their blood supply. Most of the tissue mass surrounding the renal corpuscles in the cortex consists of proximal and distal convoluted tubules. Renal corpuscles appear as dense, rounded structures, the glomeruli, surrounded by narrow spaces, Bowman's spaces. From the cortex, pale-stained lines appear to radiate towards the medulla and thence to the tip of the renal papilla. These lines, which are called medullary rays, are bundles of collecting tubules and ducts derived from nephrons located high in the cortex. The collecting ducts merge to form the larger ducts of Bellini which drain urine into the pelvicalyceal space through the renal papilla. The limbs of the loops of Henle dip into the medulla between, and parallel with, the collecting tubules and ducts. The vasa recta, the long, straight vessels into which water is absorbed from the collecting tubules and ducts, also dip down into the medulla alongside the loops of Henle. At the cortico-medullary junction, several arcuate arteries can be seen in transverse section.

The simple, tall cuboidal epithelium of a proximal convoluted tubule (PCT) has a prominent brush border which almost completely fills the lumen. The cytoplasm of PCT epithelial cells stains intensely due to a high content of organelles, principally mitochondria.

The thin descending limbs loop of Henle have a simple squamous epithelium but may be differentiated from the vasa recta by their regular, rounded shape, when seen in transverse section, and the abscence of erythrocytes. The thick ascending limbs are lined by low cuboidal epithelium and are also round in cross-section. Neither limb of the loop of Hense has a brush border.

As seen in this speciment of the renal cortex, distal convoluted tubules (DCT) may be differentiated from surrounding PCT on the basis of the following characteristic features: absence of a brush border; a larger, more clearly defined lumen; more nuclei are seen in transverse section (since DCT cells are smaller than those of the PCT); less affinity for cytoplasmic stains (due to a smaller content of organelles). In addition, sections of the DCT are seen much less frequently than sections of the PCT since the DCT is a much shorter segment of the renal tubule than the PCT.

Collecting tubules (CT) have a similar epithelial lining to the ascending limbs but are of wider and less regular diameter. The collecting ducts are easily recognised by their large diameter and columnar, pale-stained epithelial lining.

Illustrate and indicate: 1. Capsule of the kidney; 2. Cortex: a) renal corpuscle; b) glomerulus; c) Bowman's capsule; d) Bowman's space; 3. Proximal convoluted tubule; 4. Renar medulla: a) loop of Henle; b) medullary rays; 5. Arcuate artery.

V. Real life situations to be dissolved:

1. In the histological specimen you can see an organ, which function is excretion and maintenance of water and salt homeostasis, and blood pressure. Which organ is found in the specimen?

A. Stomach.
*B. Kidney.
C. Pancreas
D. Testis
E. Thyroid

2. In the histological specimen you can see the kidney. Which tissue forms the parenchyma of this organ?
A. Loose connective.
B. Lymphoid.
*C. Epithelial.
D. Nervous.
E. Bone.

3. In the histological specimen you can see the kidney. Which is structural unit of this organ?
A. Acini.
B. Lobule.
C. Plate.
*D. Nephron.
E. Alveoli.

4. In the specimen of kidney you can see a renal corpuscle. Which components does this structure consist of?
A. A tuft of capillaries and tubules.
B. Convoluted and straight tubules.
*C. A tuft of capillaries and double walled capsule.
D. Alveoli and capillaries.
E. Capillaries and epithelial plates.

5. In the specimen of kidney you can see a renal corpuscle. For which process is this structure responsible?
*A. Filtration.
B. Reabsorbrion.
C. Secretion.
D. Mucus production.
E. Gas exchange.

6. In electron microphotograph of renal cortex you can see a renal tubule, lined by simple cuboidal (low columnar) epithelium. The cells of this tubule have numerous microvilli at the apical surface, which form the brush border, and a lot of

mitochondria between plasma membrane folds in basal part. Which tubule is found?

A. Collecting duct.
B. Henle`s loop.
C. Epithelial capsule.
*D. Proximal convoluted.
E. Distal convoluted.

7. In electron microphotograph of renal cortex you can see a renal tubule, lined by simple cuboidal epithelium. The cells of this tubule have the apical surface without brush border. There are a lot of mitochondria between plasma membrane folds in basal part of these cells. Which tubule is found?

A. Collecting duct.
B. Henle`s loop.
C. Epithelial capsule.
D. Proximal convoluted.
*E. Distal convoluted.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 59 FOR STUDENTS

THEME: URINARY SYSTEM. URINARY TRACT.

PROFESSIONAL MOTIVATION

Few organs of the body are as clever and can simultaneously carry out as many complex and diverse functions as the kidney. Involved as it is in filtration, concentration and secretion, it is not suprising that it has a complex structure. An understanding of diseases of the kidney requires a thorough knowledge of its structure and the intimate interrelationships and interdependence of the four basic morphologic components: glomeruli, tubules, blood vessels and interstitium. Because all forms of serious renal disease may ultimately lead to renal failure, it is appropriate first to present this pathologic process in kidney with special techniques.

GENERAL AIM: To be able to diffirentiate cortex and medulla and identify all the vascular and tubular components as well as the components of the renal corpuscles is the specimens; juxtaglomerular apparatus, components of the glomerular filtration barrier in a electron micrographs of a renal corpuscle.

Final aims. Stubents shoul be able to:

1. Recognise the parts and functions of the urinary system and description of the roles of each organ.
2. Identify the endocrin apparatus of the kidney.
3. Describe the smooth muscle fibers in the muscularis of urinary bladder.
4. Interpret the general functions of the urinary system. Theory of urine formation.
5. Compare the urethras of males and females in terms of length, function, and epithelial lining.
6. Compare the internal and external urinary sphincters in term of their location, muscle type and fiber orientation.

BASIC LEVEL

1. Urinary system. Structure and topography of kidney (department of anatomy).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

1. Parts and functions of the urinary system and description of the roles of each organ.
2. Juxtaglomerular apparatus.
3. Describtion of the smooth muscle fibers in the muscularis of urinary bladder.
4. General functions of the urinary system. Theory of urine formation.

5. Comparison of the urethras of males and females in terms of length, function, and epithelial lining.
6. Comparison of the internal and external urinary sphincters in term of their location, muscle type and fiber orientation.

Key words and phrases: kidney, cortex, nephron, glomerulus, renal corpuscles, Bowman's capsule, collecting tubules and ducts, afferent arteriole, efferent arteriole, juxtaglomerular apparatus, juxtaglomerular cells, macula dense, extraglomerular mesangial cells, filtration mechanism, countercurrent exchange mechanism, renin secretion, antidiuretic hormone (ADH or vasopressin), aldosterone, renal artery and vein, arcuata artery and vein, stellate vein.

References:

5. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 371-394.
6. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 258-273.
7. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. - pp. 236-258.
8. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. – pp. 251-267.

II. For self-training students shoul dill in these tables:

Characteristic of the juxtaglomerular apparatus:

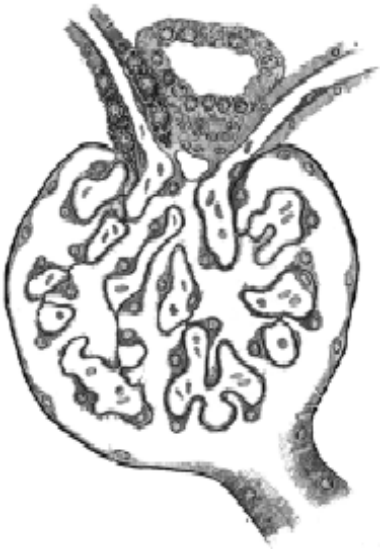
Structural component	Location	Morphology	Functional significance

III. Visual aids and material tools:

Students should be able to indicate elements in the electron micrographs:
Charts No:
58-6. Cells of juxtaglomerulas apparatus
58-7. Wall of the ureter
58-8. General structure of the bladder wall
58-9. Structural features of the walls of the renal calyces, and renal pelvis

IV. Students' practical activities:

Students must know and illustrate such histological specimens:
Specimen 1. Juxtraglomerular apparatus.



Illustrate and indicate: 1. renal corpuscle; a) glomerulus; b) Bowman's capsule; c) Bowman's space; 2. Afferent arteriola; 4. Efferent arteriola, juztoglomerular cells; 5. Macula densa; 6. Juxtavascular cells; 7. Mesangial cells.

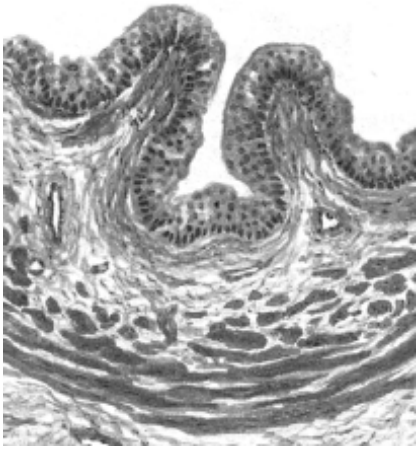
Specimen 2. Ureter.

Haematoxylin and Eosin.

The ureters are muscular tubes which conduct urine from the kidneys to the bladder. Urine is conducted from the pelvi-calyceal system as a bolus which is propelled by peristaltic action of the ureteric wall. Thus the wall of the ureter contains two layers of smooth muscle arranged into an inner longitudinal layer and an outer circular layer. Another outer longitudinal layer is present in the lower third of the ureter. The lumen of the ureter is lined by urinary epithelium (also called transitional epithelium) which is thrown up into folds in the relaxed state allowing the ureter to dilate during the passage of a bolus of urine. Surrounding the muscular wall is a loose connective tissue adventitia containing blood vessels, lymphatics and nerves.

Urinary epithelium (also called transitional epithelium or urothelium), is found only within the conducting passages of the urinary system for wgich it is especially adapted. The plasma membranes of the superficial cells are much thicker than most cell membranes and have a highly ordered substructure, thus rendering urinary epithelium impermeable to urine which is potentially toxic. This permeability barrier also prevents water from being drawn through the epithelium

into hypertonic urine. The cells of urinary epithelium have highly interdigitating cell junctions which permit great distension of the epithelium without damage to the surface integrity.



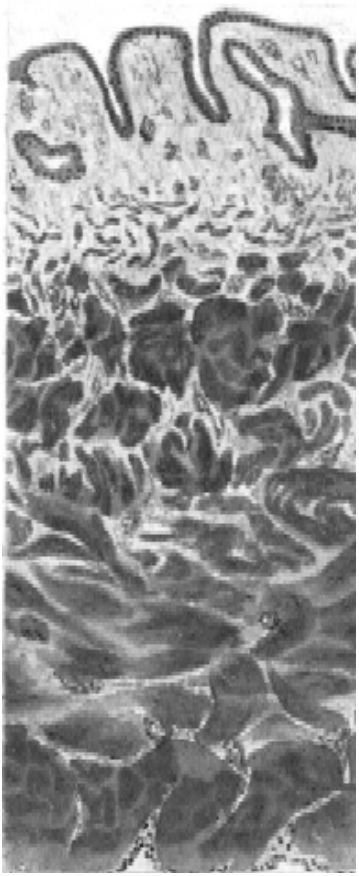
Urinary epithelium rests on a basement membrane which is often too thin to be resolved by light microscopy and was formely thought to be absent. The basal layer is irregular and may be deeply indented by strands of underlying connective tissue containing capillaries.

Illustrate and indicate: 1.Mucosa: a) transitional epithelium; b) lamina propria of the mucosa; 2.Submucosa; 3.Smooth muscle layers: a) inner longitudinal layer; b) outer circular layer; 4.Adventitia.

Specimen 3. Urinary bladder.

Haematoxylin and Eosin.

The general structure of the bladder wall resembles that of the lower third of the ureters. The wall of the bladder consists of three loosely arranged layers of smooth muscle and elastic fibres which contract during micturition. Note the inner longitudinal, outer circular and outermost longitudial layers of smooth muscle. The urinary epithelium lining the bladder is thrown into many folds in the relaxed state. The outer adventitial coat contains arteries, veins and lymphatics.



Illustrate and indicate: 1.Mucosa: a) transitional epithelium; b) lamina propria of the mucosa; 2.Submucosa; 3.Smooth muscle layer; 4.Adventitia.

V. Real-life situations to be solved:

1. In electron microphotograph of renal cortex you can see juxtaglomerular cells, macula densa, juxtavascular cells. Which endocrine apparatus do they form?

A. Prostaglandin.
B. Bradikinin.
*C. Juxtaglomerular.
D. Insular.
E. Diffuse.

2. In electron microphotograph of renal cortex you can see the components of juxtaglomerular apparatus. Which of them secrete the renin?
*A. Juxtaglomerular cells.
B. Juxtavascular cells
C. Macula densa,..
D. Mesangial cells.
E. Podocytes.

3. In electron microphotograph of renal cortex you can see the components of juxtaglomerular apparatus. Which of them is chemoreceptor?
A. Interstitial cells.
B. Juxtavascular cells
*C. Macula densa.
D. Mesangial cells.
E. Podocytes.

4. In electron microphotograph of renal corpuscle you can see the juxtaglomerular cells with renin granules. Where are they located?
A. In capillaries.
*B. In wall of afferent arteriole.
C. In wall of proximal tubule.
D. In mesangium.
E. Between podocytes.

5. In the electron microphotograph you can see an interstitial cell of renal medulla. Which substances does this cell produce?
A. Renin.
B. Testosterone.
C. Estrogen.
D. Angiotensin II.
*E. Prostaglandin.

6. In the electron microphotograph you can see a cell of renal medulla, which produce prostaglandines. Which is the name of this cell?
A. Juxtaglomerular.
B. Follicular.
C. Juxtavascular.
*D. Interstitial.
E. A-cell.

7. In the histological specimen you can see a hollow tube. Its wall consists of mucosa, submucosa, muscular layer, adventitia or serosa. The mucosa is lined by

transitional epithelium. Muscular layer consists of 3 distinct layers. Which organ is found in the specimen?

A. Stomach.
B. Esophagus.
*C. Bladder.
D. Trachea.
E. Small intestine.

8. In the histological specimen you can see a hollow tube. Its wall consists of mucosa, submucosa, muscular layer and adventitia or serosa. The mucosa is lined by transitional epithelium. Which system is this organ referred to?

A. Digestive.
B. Male reproductive.
C. Respiratory.
*D. Urinary
E. Circulatory.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 60 FOR STUDENTS

THEME: MALE REPRODUCTIVE SYSTEM. TESTIS

PROFESSIONAL MOTIVATION

Knowledge of the histophysiology of the reproductive system is a necessity for many medical specialists: endocrinologists, urologists who diagnosing testis diseases, must search for changes in both functions of male sexual glands. Only such an approach will provide making a correct diagnosis and proper treatment of patients.

GENERAL AIM: Know the development, microscopic structure and function of the male reproductive glands, stages and biologic essence of spermatogenesis, to be able to identify the structural portions of the testis on the specimens.

Final aims. Students should be able to:

1. Describe the general structure and function of the testis.
2. Interpret the spermatogenesis and structural peculiarities of the spermatogenetic cells at different stages of their development.
3. Recognise structure and function of the testis seminiferous tubules, microscopic and ultramicroscopic structure of the Sertoli cells.
4. Identify structure and significance of the haemotesticular barrier.
5. Explain morphofunctional characteristic of Leyding cells.

BASIC LEVEL

1. Male genital organs – department of human anatomy.
2. From the previous themes: a) glandular epithelium; b) proper connective tissue; c) male germ cells; d) blood capillaries.

Students' independent study program

I. Objectives for students' independent studies

You should prepare for the practical class using your textbooks and lectures. Special attention should be paid to the following:

1. General structure and function of the testis.
2. Description of the spermatogenesis and structural peculiarities of the spermatogenetic cells at different stages of their development.
3. Structure and function of the testis seminiferous tubules, microscopic and ultramicroscopic structure of the Sertoli cells.
4. Structure and significance of the haemotesticular barrier.
5. Morphofunctional characteristic of Leyding cells.

Key words and phrases: tunica albuginea, testicular lobule, seminiferous tubules, rete testis, Sertoli cells, spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, spermatozoa, Leydig cells.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992. pp. 423-436.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 273-281.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987. pp. 277-286.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000. pp. 285-289.

II. For self-training students should fill in the table

Characteristic of the spermatogenesis:

Phases of the spermatogenesis	Essence	Result (cells)	Location

III. Visual aids and material tools:

Students should be able to indicate definite elements in the electron micrographs:

1. Fragment of seminiferous tubules.
2. Electronmicrophoto of spermatozoon.

Charts:

58-1. Strucrure of testis.

58-2. Scheme of spermatogenesis.

IV. Students' practical activities:

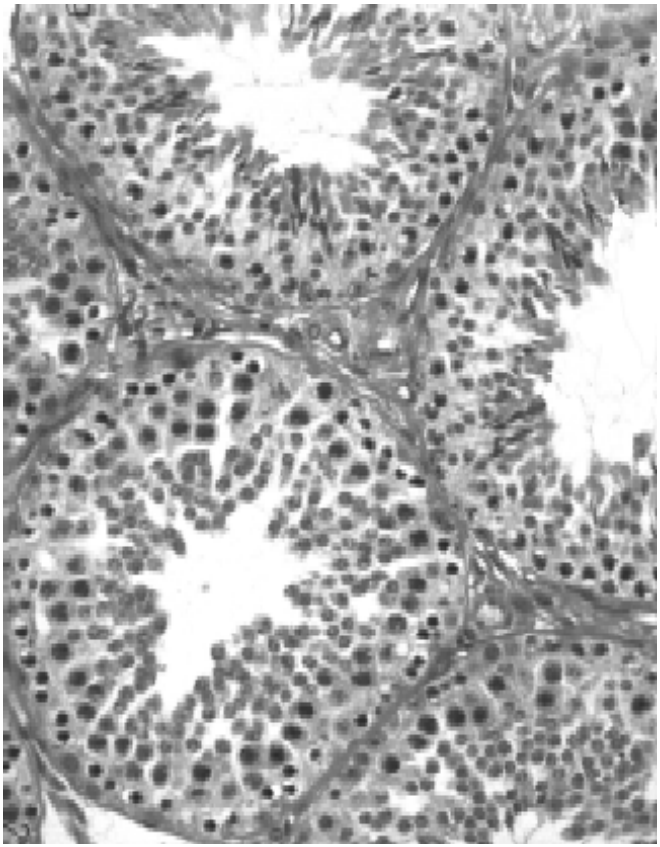
Students must know and illustrate such histologic specimens:

Specimen 1. Testis.

Haematoxylin and Eosin.

At low magnification the testis is encapsulated by a dense, fibrous, connective tissue layer, the tunica albuginea, from which, at the posterior aspect, numerous ill-defined connective tissue septa divide the testis into about 250 testicular lobules. Within each lobule there are from one to four highly convoluted loops, the seminiferous tubules, in which spermatozoa are produced. The seminiferous tubules converge upon a plexus of spaces, the rete testis. The testis is packed with numerous, coiled, seminiferous tubules that can be clearly seen. Groups of about four seminiferous tubules are segregated into testicular lobules;

the connective tissue septa are so delicate to be distinctly seen at low magnification. The dense fibrous capsule which invests the testis, and that is continuous with many of the interlobular septa, is called the tunica albuginea. At high magnification spermatozoa pass from the seminiferous tubules into the rete testis that is connected with the epididymis via the ductuli efferentes at the upper posterior pole of the testis.



The seminiferous tubules are highly convoluted tubules lined by a stratified epithelium, which consists of two distinct cellular populations: 1. Cells in various stages of spermatogenesis and spermiogenesis, collectively referred to as the spermatogenic series; 2. Non-spermatogenic cells, called Sertoli cells, that support and nourish developing spermatozoa.

In the interstitial spaces between the tubules, cells with an endocrine function, called Leyding cells, are found either singly or in clumps in the supporting connective tissue.

What cells does thehaemotesticus barrier form?

Where does Sertoli cells lie?

Illustrate and indicate: I. Tunica albuginea. II. Testicular lobule. 1. Seminiferous tubules: a) Sertoli cells; b) spermatogonia; c) primary spermatocytes; d) secondary spermatocytes; e) spermatids; f) spermatozoa. 2. Leyding cells. 3. Capillaries.

Slide 2. Blood-testis barrier.

Draw this scheme in the album and identify all structures.

V. Real-life situations to be solved

1. On the specimen you can see an organ, which function is to produce spermatozoa and hormones (testosterone). Which organ is in the specimen?

*A. Testis.
B. Ovary.
C. Thyroid gland.
D. Adrenal gland.
E. Kidney.

2. In the specimen you can see the testis. Which functions does this organ perform?

A. Hormone production.
B. Immune defence.

*C. Spermatozoa and testosterone production
D. Spermatozoa and estrogens production.
E. Methabolism regulation.

3. In the specimen you can see the testis. Which structures form the parenchyma of this organ?
A. Nephrones.
B. Acini and duct system.
C. Follicles.
D. Tubules and collecting ducts.
*E. Seminiferous tubules.

4. In the specimen you can see the testis. Each lobe is occupied by 1-4 seminiferous tubules. Which process does take place in these structures?
A. Ovogenesis.
*B. Spermatogenesis.
C. Testosterone production.
D. Spermatozoa transport.
E. Oocyte transport.

5. In the specimen of testis you can see the seminiferous tubule. It lined by epithelial cells, which have basal and adluminal compartments, which contain different spermatogenic cells. Which cells can be found in basal compartment?
A. Spermatozoa, spermatids, primary spermatocytes.
B. Spermatids, primary and secondary spermatocytes
C. Spermatids adn spermatozoa.
D. Primary and secondary spermatocytes, spermatids and spermatozoa.
*E. Spermatogonia.

6. In the specimen of testis you can see the seminiferous tubule. It lined by epithelial cells, which have basal and adluminal compartments, which contain different spermatogenic cells. Which cells can be found in adluminal compartment?
A. Spermatozoa, spermatids, primary spermatocytes.
B. Spermatids, primary and secondary spermatocytes
C. Spermatids adn spermatozoa.
*D. Primary and secondary spermatocytes, spermatids and spermatozoa.
E. Spermatogonia.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 61 FOR STUDENTS

THEME: SPERMATIC EXCRETORY DUCTS OF MALE REPRODUCTIVE SYSTEM

PROFESSIONAL MOTIVATION

Spermatic excretory ducts are represented by the system of ducts, though which spermogenic cells move up into the uterine. The epithelium of the mucous tunic of the spermatic excretory ducts produces fluid that dilutes sperm and promotes saving and motulating spermatozoa. The epididymis is a reservoir that accumulates sperm. The prostate gland produces ekzo- and endocrine secrets that stimulate the motion of spermatozoa, give alkalin reaction to sperm. Elderly men often suffer from the diseases of prostate (adenoma, cancer etc).

GENERAL AIM: Know features of the wall structure of different portions of the spermatic excretory ducts and prostate gland, to be able to recognize them.

Final aims: Students should be able to:

1. Recognise the structure of the wall of the tubuli recti, the rete testis and the mediastinum testis.
2. Interpret the structure of the wall of the ductus efferents and the ductus epididimus.
3. Identify the morphology of the ductus deferents, the ductus ejaculatorius and the urine.
4. Recognise the general structure and function of the prostate gland.
5. Recognise the structure of the paraurethral gland of the prostate.
6. Identify the seminal vesicles and bulbourethral glands, their fine structure.
7. Explain the hormonal interaction of the hypophysis and the male reproductive system.

BASIC LEVEL

1. Male genital organs – Human anatomy department.
2. From previous theme: a) glandular epithelium; b) proper connective tissue; c) male genital cells; d) haemocapillaries.

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical classes using the existing textbooks and your lectures. Special attention should be paid to the following:

1. Structure of the wall of the tubuli recti, the rete testis and the mediastinum testis.
2. Structure of the wall of the ductus efferents and the ductus epididimus.

3. Morphology of the ductus deferents, the ductus ejaculatorius and the urine.
4. General structure and function of the prostate gland.
5. Structure of the paraurethral gland of the prostate.
6. Seminal vesicles and bulbourethral glands, their fine structure.
7. Hormonal interaction of the hypophysis and the male reproductive system.

Key words and phrases: tubuli recti, rete testis, mediastinum, ductus efferents, epididimus, ductus deferents, ductus ejaculatorius, urine, prostate gland, paraurethral gland, seminal vesicle, bulbourethral glands.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 436-441.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 281-286.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987, pp. 285-289.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000, pp. 289-301.

III. Visual aids and material tools:

Students should be able to indicate the elements in the electron micrographs:

1. Fragment of the seminiferous tubules:
2. Electronmicrophoto of the spermatozoon:

Charts:

59-1. Structure of the testis and the epididymis.
59-2. Structure of the spermatic excretory ducts.
59-3. The prostate gland.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Epididymis.

Haematoxylin and Eosin.

The epididymis is a long, extremely convoluted duct extending down the posterior aspect of the testis to the lower pole where it becomes the ductus deferens. The major function of the epididymis is thought to be the accumulation and storage of spermatozoa when the spermatozoa develop motility. The epididymis is a tube of smooth muscle lined by a pseudostratified epithelium. From the proximal to the distal end of the epididymis, the muscular wall increases from a single, circular layer as in these micrographs to three layers organized in the same manner as in the ductus deferens. The smooth muscle at the proximal end exhibits slow, rhythmic contractility; this activity gently moves spermatozoa towards the

ductus deferens. Distally, the smooth muscle is richly innervated by the sympathetic nervous system which produces intense contractions of the lower part of the epididymis during ejaculation.

The epithelial lining of the epididymis shows a gradual transition from a tall, pseudostratified columnar form proximally to a shorter pseudostratified form distally. The principal cells of the epididymal epithelium bear tufts of very long microvilli, inappropriately called stereocilia; stereocilia are thought to be involved in absorption of a vast excess of fluid accompanying the spermatozoa from the testis.

Illustrate and indicate: I. Ductus of epididymis: 1. Two-layers columnar epithelium. 2. Spermatozoa. 3. Muscular-fibers tunica. II. Ductus defernts: 1. Epithelial columnar cells. 2. Cuboidal cells. 3. Muscular-fibers layer.

Specimen 2. Prostate gland.

Haematoxylin and Eosin.

The prostate gland consists of glandular lobules, up to 50 in all, which converge to open via about 20 separate ducts into irregular outpockets of the prostatic urethra throughout its length. In addition to prostatic glandular tissue proper, numerous, small paraurethral glands open into the prostatic urethra

throughout its length, and it is these glands and their supporting connective tissue that increase greatly in size as a normal part of the ageing process of human males; this process, known as benign prostatic hypertrophy, may cause obstruction of urinary outflow by occluding the prostatic urethra. Note in this micrograph, the ejaculatory ducts which join the prostatic urethra just before its exit from the prostate gland.

The supporting stroma and capsule of the prostate gland consists of dense fibro-elastic connective tissue which contains numerous smooth muscle fibres. The smooth muscle of the prostate, like that of the seminal vesicles and the rest of the tract, is innervated by the sympathetic nervous system, which stimulates powerful contractions during ejaculation.

Illustrate and indicate: 1. Strouma: a) smooth muscle cells; b) connective-tissue trabeculs. 2. Prostatic urethra: a) transitional epithelium. 3. Secretory portion of paraurethral glands: a) glandular epithelium; b) prostatic fluid. 4. Ducts of paraurethral glands.

V. Real-life situations to be solved:

1. In the specimen of epididymis you can see the tubules, which lined by two types of cells. They are: columnar cells with stereocilia and basal cells. Which tubule is present?

A. Seminiferous tubules.

B. Ductus epididimis.
C. Tubule of the rete testis.
D. Tubulus rectus.
*E. Tubulus efferentis.

2. In the specimen you can see an excretory genital duct. Its wall consists of three layers: mucosa, muscularis and adventitia. The mucosa forms longitudinal folds and is lined by pseudostratified epithelium with ctereocilia. The muscular layer is thick and includes longitudinal and circular bundles of smooth muscle cells. Which duct is described?
A. Seminiferous tubule.
B. Ductus epididimis.
*C. Ductus deference.
D. Uretra.
E. Tubulus efferentis.

3. In the specimen you can see the testis. There are interstitial cells in its intralobulated loose connective tissue. Which function of these cells?
A. Supporting.
B. Transporting.
C. Receptor.
*D. Endocrine.
E. Protective.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 62 FOR STUDENTS

THEME: FEMALE REPRODUCTIVE SYSTEM. OVARIUM.

PROFESSIONAL MOTIVATION

In addition to the reproduction function of the ovaries, the production of oocytes capable of fertilization, the ovaries play a great part in the endocrine system. The sexual hormones are produced in the ovaries, growth and differentiation of the sexual system depending from it, and normal birth of children becoming possible. However, many experimental and clinical investigations proved, that the ovaries can not be studied separately, taking only their importance in the sexual system into consideration. Their normal anatomic and morphologic development and physiology state have influence on the development of the somatic sexual signs. It promotes the transformation of the organism into specific woman organism with its peculiar morphological signs and features as for the substance exchange the tissue tonus. The disease of the ovaries is usually accompanied by violations of their inner secretory function resulting to the marked endocrine disorders.

GENERAL AIM: Know the histophysiology of the ovary and to be able to identify the structural portions in the specimen.

Final aims: Students should be able to:

1. Interpret the development and general structure of the ovary. The role of the interstitium.
2. Explain the incretory function of the ovary and correlation with the other endocrine glands.
3. Recognise the cortex of the ovary.
4. Explain the ovogenesis (main stages and their morphofunctional characteristics). Comparison of the stages of the ovogenesis and spermatogenesis.
5. Interpret the dynamics of the development of the follicles of the ovary.
6. Explain the mechanisms of ovulation, its biological essence and hormonal regulation of this process.
7. Identify the stages of the formation of the Corpus luteum, its endocrine function.
8. Interpret the artesia of the folliculi. Atretic body, its main differences from Corpus albicans and Corpus luteum.

BASIC LEVEL

1. Female reproductive organs. Ovary of woman (Anatomy department).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical classes using the existing textbooks and lectures. Special attention should be paid to the following:

1. Development and general structure of the ovary. The role of the interstitium.
2. Incretory function of the ovary and correlation with the other endocrine glands.
3. Thin structure of the cortex of the ovary.
4. Ovogenesis (main stages and their morphofunctional characteristics). Comparison of the stages of the ovogenesis and spermatogenesis.
5. Dynamics of the development of the follicles of the ovary. (Structure of the primordial, primary, secondary and mature folliculi).
6. Ovulation, its biological essence and hormonal regulation of this process.
7. Stages of the formation of the Corpus luteum, its endocrine function.
8. Artesia of the folliculi. Atretic body, its main differences from Corpus albicans and Corpus luteum.

Key words and phrases: ovaries, ovogenesis, primordial follicle, primary follicle, secondary follicle, atretic follicle, Graafian follicle, oocyte., zona pellucida, corona radiata, corpus albicans, corpus luteum, lutein cells.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 441-448.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 286-292.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987, pp. 289-296.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000, pp. 301-311.

III. Visual aids and material tools:

Students should be able to indicate definite elements in the electron micrographs:

1. Oocyte. Fragment of the ovary follicle.

1 – oocyte:
a) nucleus, b) nucleolus, c) cytoplasm, d) yolk inclusions, e) oolemma.
2 – zone pellucid,
3 – follicular cells,
4 –crown radiant,
5 – basement membrane.
Charts No:
60-1.Structure of the ovarium.

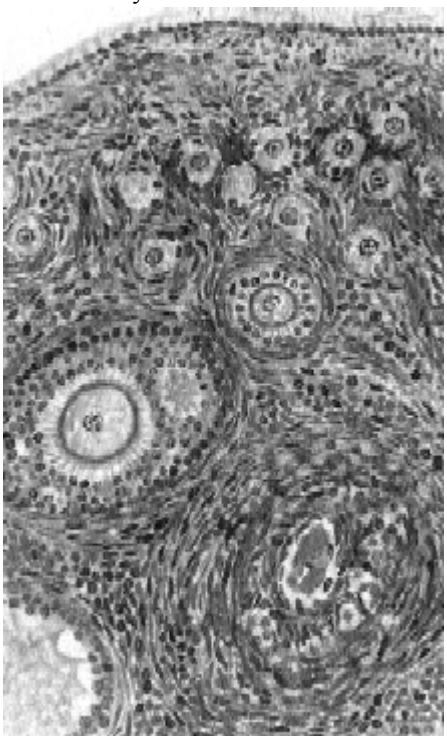
60-2. Scheme of the ovaryo-menstrual cycle.
60-3. Scheme of the regulation of the ovaryo-menstrual cycle.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens as:

Specimen 1. Ovarium of the cat

Stained with haematoxylin and eosin



The ovaries are flattened, oval organs encapsulated in a fibrous connective tissue layer called the tunica albuginea, named for its white appearance at gross examination.

The body of the ovary consists of spindle-shaped cells, reticular fibres and ground substance which together constitute the ovarian stroma. In the peripheral zone of the stroma, known as the cortex, are numerous follicles which contain female gametes in various stages of development. In addition, there may also be postovulatory follicles of various kinds, i.e. corpora lutea or degenerative follicles i.e. corpora albicantes and atretic follicles.

The central zone of the ovarian stroma, the medulla is highly vascular. The blood vessels of the ovary, together with autonomic nerves and lymphatics, pass in the broad ligament into the ovary at the hilum.

During early fetal development, primordial germ cells called oogonia migrate into the ovarian cortex where they multiply by mitosis. By the fourth and fifth months of fetal development in the human, some oogonia enlarge and assume the potential for development into mature gametes. At this stage they become known as primary oocytes and commence the first stage of meiotic division. By the seventh month of fetal development, the primary oocytes become encapsulated by a single layer of flattened follicular cells, of epithelial origin, to form primordial follicles. This encapsulation arrests the first meiotic division and no further development of the primordial follicle then occurs until after the female reaches sexual maturity. The remaining phases of meiotic division occur during a final phase of follicular maturation leading to ovulation and fertilization. Thus all the female germ cells are present at birth and the process of meiotic division is completed between 15 and 50 years later. In contrast, in males, meiotic division of germ cells commences only after sexual maturity and sperm formation is accomplished within about 2 months.

During each ovarian cycle, up to 20 primordial follicles are in some way activated to undergo the maturation process; nevertheless, usually only one follicle reaches full maturity and is ovulated whilst the remainder undergo atresia before the point of ovulation. The reason for this apparent wastage is unclear; during maturation, however, the follicles have an endocrine function which may be far beyond the capacity of a single follicle and the primary purpose of the other follicles may be to act as an endocrine gland.

Approaching maturity, further growth of the oocyte ceases and the first meiotic division is completed just before ovulation. At this stage the oocyte becomes known as the secondary oocyte and commences the second meiotic division. The first polar body, containing very little cytoplasm, remains inconspicuously within the zona pellucida. The follicular antrum enlarges markedly and the zona granulosa forms a layer of even thickness around the periphery of the follicle. The cumulus oophorus diminishes leaving the oocyte surrounded by a layer several cells thick, the corona radiata, which remains attached to the zona granulosa by thin bridges of cells. Before ovulation these bridges break down and the oocyte, surrounded by the corona radiata, floats free inside the follicle.

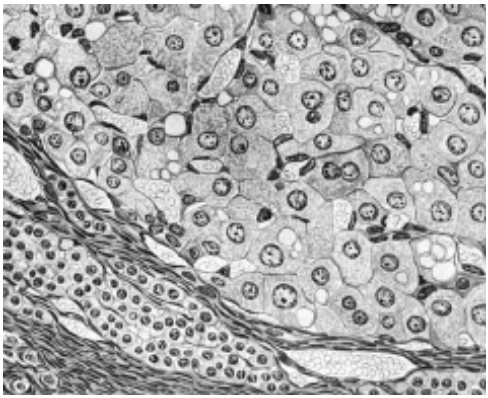
At ovulation, the mature follicle ruptures and the ovum, comprising the secondary oocyte, zona pellucida and corona radiata, is expelled into the peritoneal cavity near the entrance to the uterine tube. The second meiotic division of the oocyte is not completed until after penetration of the ovum by a spermatozoon.

During the process of follicular maturation the amount of estrogen-secreting tissue, the theca interna, increases progressively and there is a

corresponding rise in the level of circulating estrogens. Atresia of all but the follicle destined to ovulate probably accounts for the fall in circulating estrogens which occurs just prior to ovulation.

Illustrate and indicate: 1. Superfitial epithelium. 2. Tunica albuginea. 3. Ovarian cortex. 4. Primordial follicle. 5. Primary follicle. 6. Secondary follicle. 7. Atretic follicle. 8. Graafian follicle. 9. Cumulus oophorus. 10.Oocyte. 11.Zona pellucida. 12.Corona radiata. 13.Liquor folliculi. 14.Granular layer. 15.Connective tissue tunica.

Specimen 2. Corpus luteum
Stained with haematoxylin and eosin



Following ovulation the ruptured follicle collapses and fills with a blood clot and the three layers of the follicular wall become re-organized to form a temporary endocrine gland, the corpus luteum. Under the influence of luteinising hormone secreted by the anterior pituitary, the cells of the former zona granulose increase greatly in size and begin secretion of the steroid hormone progesterone. The cytoplasm of these cells contains a bright yellow pigment which gives rise to the name granulose luteal cells and the name corpus luteum to the whole structure. Progesterone promotes exocrine secretion by glands in the mucous lining of the uterus, which are now greatly proliferated under the influence of the estrogens secreted by the theca interna cells of the follicle before ovulation. This provides a suitable environment for the implantation of a fertilized ovum.

The cells of the former theca interna also increase in size but to a lesser extent. Although interrupted by ovulation, these cells continue to secrete estrogens, which are necessary to maintain the proliferated uterine mucous. These cells become known as theca luteal cells or paraluteal cells.

The blood clot, granulose luteal and theca luteal layers are invaded by capillaries from the former theca externa to form a rich vascular network characteristic of endocrine glands.

Without the continuing stimulus of luteinising hormone, the corpus luteum cannot be maintained and 12-14 days after ovulation it regresses to form the functionless corpus albicans. Once the corpus luteum regresses, secretion of both estrogens and progesterone ceases. Without these hormones the mucous lining of the uterus collapses with the onset of menstruation.

At low magnification, the remnant of the blood clot is seen in the centre of the corpus luteum, surrounded by a broad zone of granulose luteal cells. Peripherally, a thin zone of theca luteal (paraluteal) cells T can be seen. The corpus luteum is bounded by a connective tissue zone representing the theca externa of the antecedent Graafian follicle.

At higher magnification, granulose luteal cells may be compared with theca luteal (paraluteal) cells T. Granulose luteal cells have a relatively large amount of pale-stained cytoplasm containing numerous lipid droplets which give rise to the vacuolated appearance seen in this preparation; lipid is utilized in the synthesis of the steroid hormone, progesterone.

Theca luteal (paraluteal) cells form a thin zone around the periphery of the granulose luteal layer with finger-like extensions of the theca luteal layer extending into the granulose luteal layer. Theca luteal cells are smaller, with a more densely staining, less vacuolated cytoplasm; these cells are responsible for the secretion of estrogens.

Illustrate and indicate: 1. Lutein cells. 2. Hemocapillaries.

Real-life situations to be solved

1. In the specimen you can see the ovary. Which functions does this organ perform?

A. Hormone production.
B. Immune defence.
*C. Oogenesis, estrogens and progesterone production
D. Spermatozoa and estrogens production.
E. Metabolism regulation.

2. In the specimen of ovary you can see the follicle. Which cells are included in this structure?

*A. Follicular cells and primary oocyte.
B. Supporting and spermatogenic cells.
C. Interstitial cells and oocyte.
D. Follicular cells and egg cell.
E. Supporting cells and oocyte.

3. In the specimen of ovary you can see a rounded structure, which consists of oocyte and follicular cells, in cortical region. Which structure is found?
A. Nephron.
B. Blood vessel.
*C. Follicle.
D. Corpus luteum.
E. Seminiferous tubule.

4. In the specimen of ovary you can see a follicle in the superficial layer of cortical region. This follicle consists of primary oocyte enveloped by a single layer of flattened follicular cells. Which follicle is found?
*A. Primordial.
B. Unilaminar primary.
C. Secondary (antral).
D. Mature (preovulatory).
E. Multilaminar primary.

5. In the specimen of ovary you can see a follicle. It consists of primary oocyte surrounded by zona pellucida and a single layer of columnar follicular cells. Which follicle is found?
A. Primordial.
*B. Unilaminar primary.
C. Secondary (antral).
D. Mature (preovulatory).
E. Multilaminar primary.

6. In the specimen of ovary you can see various follicles. They are composed by oocyte and follicular cells, which produce hormone. Which hormone do they produce?
A. Testosterone.
*B. Estrogens.
C. Progesterone.
D. Insulin.
E. Glucocorticoids.

7. In the specimen of ovary you can see the corpus luteum. Which hormone does it produce?
A. Estrogens.
B. Follicle stimulating hormone.
C. Luteinizing hormone.
*D. Progesterone.
E. Testosterone.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 63 FOR STUDENTS

THEME: FEMALE REPRODUCTIVE SYSTEM. UTERUS. UTERINE TUBE. VAGINA

PROFESSIONAL MOTIVATION

The main function of the organs of the sexual system is a reproductive function. In addition, the sexual glands produce hormones, that stimulate ovogenesis, the development of the secondary sexual signs. As a result of the action of radiation, chemical, alcoholic, macrobiotic intoxication its structure changes that can cause gynecological, oncologic and endocrine diseases in women. Thus, knowledge of the histophysiology of the organs of the sexual system is necessary for doctors, and especially for gynecologists, endocrinologists. It will help them to make a diagnosis, to prevent diseases, as well as to choose the proper methods of treatment of the patients.

GENERAL AIM: Know the structure of the uterine tube and the vagina to be able to identify the tissue composition of the walls of the uterine tube and the uterus in the specimens.

Final aims: Students should be able to:

1. Recognise the general structure of the wall of the uterus.
2. Describe of the stratum basalis and stratum functionalis of the endometrium and their vessels.
3. Explain the histophysiology of the myometrium and perimetrium.
4. Recognise the structure of the wall of the uterine tube, the relief of the mucous tunic, the peculiarities of the epithelial cellular composition.
5. Identify the structure of the wall of the vagina and cyclic changes of the epithelium of the mucous tunic.

BASIC LEVEL

1. Female reproductive system. Uterine tube. Uterus. Vagina (Anatomy department).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical classes using the existing textbooks and lectures. Special attention should be paid to the following:

1. General structure of the wall of the uterus.
2. Description of the stratum basalis and stratum functionalis of the endometrium and their vessels.
3. Histophysiology of the myometrium and perimetrium.

4. Structure of the wall of the uterine tube, the relief of the mucous tunic, the peculiarities of the epithelial cellular composition.
5. Structure of the wall of the vagina and cyclic changes of the epithelium of the mucous tunic.

Key words and phrases: female reproductive system, uterine tube, vagina, uterus, stratum basalis, stratum functionalis, endometrium, myometrium, perimetrium, crypts (tubular glands).

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 448-460.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 292-296.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987, pp. 297-304.

Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000, pp. 311-325.

II. For self-training students should fill in these tables

General characteristic of the reproductive tract organs

Organ	Key morphological features	Function

Characteristic of the uterine wall during ovarial-menstrual cycle

Phases of the menstrual cycle	Morphological changes in the uterine wall	Hormones which control this phase

III. Visual aids and material tools:

Students should be able to indicate definite elements in the electron micrographs:

I. Electron micrographs of the epithelium layer of the mucous tunic of the uterus:

1. Epithelium cell:
1. Nucleus;
2. Cytoplasm;
3. Microvilli.

Charts No:

61-1. Structure of the uterus.

61-2. Scheme of the menstrual cycle.

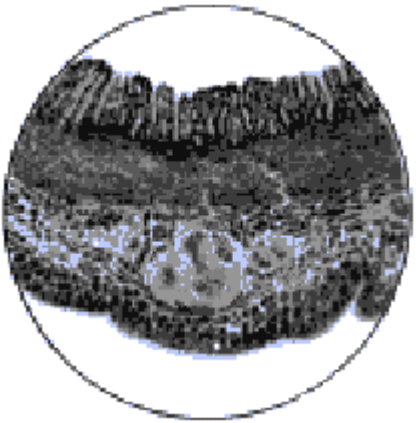
60-3. Scheme of the regulation of the ovaryo-menstrual cycle.

IV. Students' practical activities:

Students must know and illustrate such histologic specimens as:

Specimen 1. Uterus of the cat

Stained with haematoxylin and eosin



The low-magnification micrograph illustrates the myometrium and a relatively thin endometrium consisting of the stratum basalis , stratum spongiosum and stratum compactum. The stroma of the stratum functionalis (spongiosum plus compactum) is proliferated but simple tubular glands are proliferated directly into the stratum compactum. At a high magnification the proliferating glandular epithelium is seen to consist of low columnar cells. Occasional mitotic figures can be seen. Note the highly cellular connective tissue stroma almost free of collagen fibers that resembles the mesenchyme.

Illustrate and indicate:

1. Endometrium: a) endometrial epithelium; b) functionalis portion; c) basalis portion; d) crypts

(tubular glands). 2. Uterine myometrium: e) submucous layer; f) vascular layer; g) external layer.

3. Uterine perimetrium.

Specimen 2. Uterine tube

Stained with haematoxylin and eosin

The oviducts (also called uterine tubes or Fallopian tubes) conduct ova from the surface of the ovaries to the uterine cavity and are also the site of fertilization with spermatozoa.

The oviduct has the shape of an elongated tunnel and is anatomically divided into four parts as shown in the diagram.

The infundibulum moves to overlie the site of rupture of the Graafian follicle in ovulation; finger-like projections called fimbria extending from the end of the tube, envelop the ovulation site and direct the ovum into the tube.

The movement of the ovum down the tube is mediated by a gentle peristaltic action of the longitudinal and circular smooth muscle layers of the oviduct wall and is promoted by a current of fluid propelled by the action of the ciliated epithelium lining the tube.

The mucous lining of the oviduct is thrown into a labyrinth of branching, epithelial-lined folds that provide a suitable environment for fertilization. This feature is the most prominent in the ampullary part of the tube as shown in a micrograph that is a specimen obtained during a female sterilization. Note membrane in this micrograph, the muscular wall and a highly vascular connective tissue serous which is continuous with the broad ligament.

The oviduct epithelium consists of, a single layer of columnar cells that are of two types: ciliated and non-ciliated. The non-ciliated cells, that are stained blue in the micrograph, produce a secretion, which is propelled towards the uterus by ciliated cells. This secretion may play it role in the nutrition and protection of the ovum. The ratio of ciliated cells to non-ciliated ones and the height of the cells influence cyclic variations under the influence of ovarian hormones. The epithelial

folds are supported by a highly vascular connective tissue core, its collagen being is stained blue in the micrograph.

Illustrate and indicate:

1. Tunica mucous: a) folds; b) simple columnar epithelium. 2. Tunica muscularis: c) circular layer.

3. Serous membrane.

V. Real-life situations to be solved:

1. In the specimen you can see the oviduct. Which layers does its wall include?
A. Mucosa, submucosa, muscularis, adventitia,
B. Mucosa and serosa.
*C. Mucosa, muscularis and serosa.
D. Mucosa, submucosa and muscularis.
E. Intima, media and adventitia.

2. In the specimen you can see the oviduct. Which epithelium lines the mucosa of this organ?
A. Stratified squamous nonkeratinising.
B. Stratified squamous keratinising.
C. Pseudostratified ciliated.
*D. Simple columnar.
E. Simple cuboidal.

3. In the specimen you can see the organ of the female reproductive system. Its wall include three layers: mucosa, muscularis and serosa. Mucosa of this organ is composed by single columnar epithelium and the lamina propria. Lamina propria includes simple tubular glands. Which organ is in the specimen?
A. Ovary.
B. Oviduct.
*C. Uterus.
D. Vagina.
E. Placenta.

4. In the specimen of uterus you can see the myometrium. Which tissue forms this layer?
*A. Smooth muscle tissue.
B. Loose connective tissue of the lamina propria.
C. Simple columnar epithelium
D. Skeletal muscle.
E. Cardiac muscle.

5. In the specimen of uterus you can see the endometrium. Which types of cells does its epithelium include?
A. Absorptive and goblet.
B. Columnar and cuboidal.
*C. Ciliated and secretory.
D. Chief and mucous.
E. Ciliates and basal.

6. In the specimen of uterus you can see the endometrium. It is subdivided into two zones. Which are they?
*A. Basalis and functionalis.
B. Basalis and adluminalis.
C. Morphological and functional.
D. Basal and apical.
E. Inner and outer.

7. In the specimen of uterus you can see the endometrium. Its morphology depends on the phases the menstrual cycle. Which are they?
A. Follicular and lutein.
B. Menstrual and postmenstrual.
C. Menstrual and premenstrual.
D. Proliferation, growth, maturation and formation.
*E. Menstrual, proliferative and secretory.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room

METHODOLOGICAL INSTRUCTIONS TO LESSON 64 FOR STUDENTS

THEME: MAMMARY GLANDS. MENSTRUAL CYCLE

PROFESSIONAL MOTIVATION

Disorders of the menstrual cycle are one of the most sufficient causes of the female infertility. During last years the problem of the population decrease is very actual. It is extraordinary important for doctors to know the morphogenesis of the menstrual cycle disorders (amenorrhea, dismenorrhea, anovular cycles etc).

The increase of regenerative structure in the mammary glands is no less important problem of society. Diagnose this impairment by physical methods of inspection, but only at cellular and subcellular levels.

GENERAL AIM: Know the morphological base of the menstrual cycle and its neural-endocrine adjusting and to be able to recognize the phases of the menstrual cycle depending on the structure of the endometrium. To know the development, general structure and the function of the mammary gland and to be able to define the structural elements of the mammary gland on the histological specimens.

Final aims: Students should be able to:

1. Interpret the general description of some cyclic changes in the uterus and ovary. Periods of the menstrual (sexual cycle).
2. Identify the morphological and functional changes of the endometrium in the menstrual phase.
3. Interpret the histological changes of the endometrium that cause the uterine bleeding.
4. Explain the histophysiology of the endometrium in the postmenstrual phase.
5. Interpret the hormonal adjusting of the cyclic changes in the uterus.
6. Identify the cyclic changes in the vagina.
7. Interpret the development and a general structure of the mammary gland.
8. Recognise the fine structure of the secretory portion of the mammary gland before lactation.
9. Identify the structure features of the parenchyma of the mammary gland in the period of lactation and in the nonlactational state.
10. Describe the secretory process and hormonal adjusting of the function of mammary gland.

BASIC LEVEL

1. The female genital organs (Anatomy department).
2. The mammary glands (Anatomy department).

STUDENTS' INDEPENDENT STUDY PROGRAM

I. Objectives for Students' Independent Studies

You should prepare for the practical classes using the existing textbooks and your lectures. Special attention should be paid to the following:

1. General description of some cyclic changes in the uterus and ovary. Periods of the menstrual (sexual cycle).
2. Morphological and functional changes of the endometrium in the menstrual phase.
3. Histological changes of the endometrium that cause the uterine bleeding.
4. Histophysiology of the endometrium in the postmenstrual phase.
5. Hormonal adjusting of the cyclic changes in the uterus.
6. Cyclic changes in the vagina.
7. Development and a general structure of the mammary gland.
8. Fine structure of the secretory portion of the mammary gland before lactation.
9. Structure features of the parenchyma of the mammary gland in the period of lactation and in the nonlactational state.
10. Description of the secretory process and hormonal adjusting of the function of mammary gland.

References:

1. Carlos Junqueira, Jose Carneiro, Robert O. Kelley. Basic Histology. - 7th ed. Appleton and Lange. Norwalk, Connecticut, 1992, pp. 451-459, 462-467.
2. Inderbir Singh. Textbook of Human Histology with colour atlas. – 4th ed. Jaypee Brothers Medical Publishers (P) LTD, 2002, pp. 297-299.
3. Wheater P.R., Burkitt H.G., Daniels V.G. Functional Histology: a text and colour atlas. - 2nd ed. Longman Group UK Limited, 1987, pp. 298-308.
4. Victor P. Eroschenko. Atlas of Histology with functional correlations. - 9th ed. Lippincott Williams and Wilkins, 2000, pp. 331-337.

II. For self-training students should fill in these tables

Characteristic of the placenta

Sides of the placenta	Key morphological features	Relation with other structures

Characteristic of the mammary gland

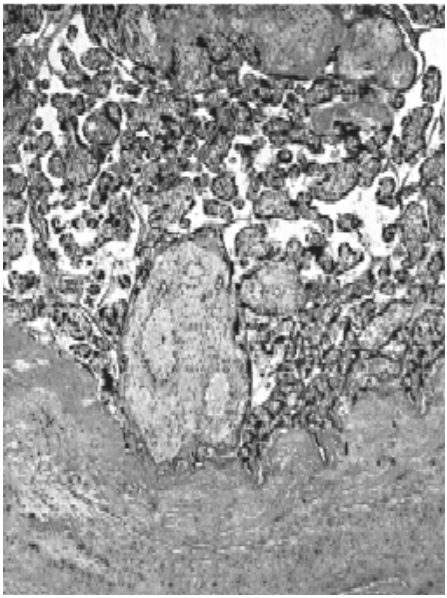
Age period	Morphological characteristic	Hormonal control

III. Students' practical activities:

Students must know and illustrate such histologic specimens:

Specimen 1. Placenta

Identify the key structures of the placenta, illustrate and designate all structure.

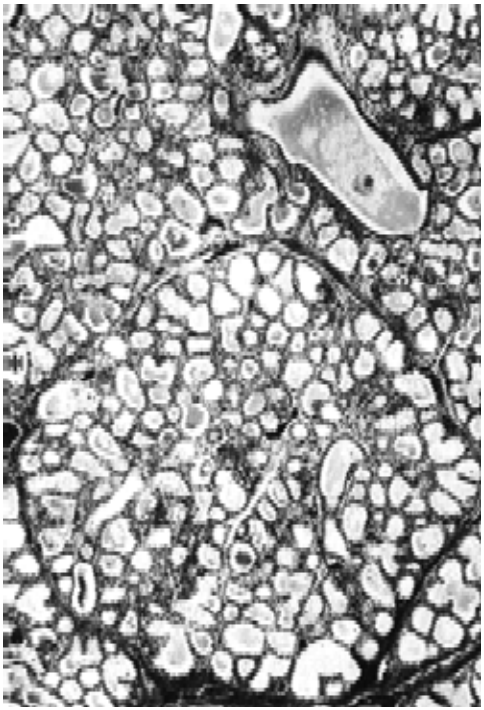


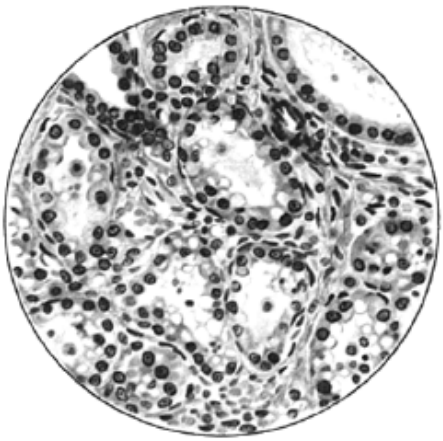
Specimen 3. Mammary glands.

Haematoxylin and Eosin.

At a low magnification, the lobules of the mammary glands are seen to form islands of a glandular tissue within an extensive mass of a dense fibrous and adipose connective tissue. At higher magnification, the lobules are seen to consist of alveolar ducts lined with a cuboidal epithelium supported by a prominent basement membrane. Similar sweat glands, a discontinuous layer of myoepithelial cells lies between the duct-lining cells and the basement membrane. During the reproductive years, the duct epithelium undergoes cyclic changes under the influence of ovarian hormones. Early in the cycle, the duct lumina are not clearly evident but later in the cycle the lumina become more prominent and may contain an eosinophilic secretion.

The interlobular connective tissue is usually dense and fibrous whereas the connective tissue within the lobule is loose, highly cellular, rarely contains fat, and has a rich capillary network.





Illustrate and indicate: 1. Lobule. Interlobular septum. 2. Alveolar secretory portion (lactocytes). 3. Alveolar lactiferous duct. 4. Myoepitheliocytes. 5. Interlobular milk duct.

What is formed at the ends of the alveolar ducts?

What cells are between the basis of the secretory cells and the basement membrane?

V. Real-life situations to be solved:

1. In the specimen you can see the organ of the female reproductive system. Its wall includes mucosa, muscularis and serosa. Mucosa is lined by stratified squamous nonkeratinising epithelium. Which organ is in the specimen?

A. Ovary.
B. Oviduct.
C. Uterus.

*D. Vagina.
E. Placenta.

2. In the specimen you can see the vagina wall. Which layers does it include?
A. Mucosa, submucosa, muscularis, adventitia,
B. Mucosa and serosa.
*C. Mucosa, muscularis and serosa.
D. Mucosa, submucosa and muscularis.
E. Intima, media and adventitia.

3. In the specimen you can see the vagina wall. Which epithelium lines the mucosa of this organ?
*A. Stratified squamous nonkeratinising.
B. Stratified squamous keratinising.
C. Pseudostratified ciliated.
D. Simple columnar.
E. Simple cuboidal.

4. In the specimen you can see an organ, which function is exchange between the mother and developing fetus. Which organ is in the specimen?
A. Ovary.
B. Oviduct.
C. Uterus.
D. Vagina.
*E. Placenta.

5. In the specimen you can see the placenta. Which is the name of structural and functional unit of this organ?
A. Nephron.
B. Decidua basalis.
C. Chorionic plate.
*D. Cotyledon.
E. Terminal villus.

6. In the specimen you can see the placenta. This organ has fetal and maternal parts /sides/. Which structures the maternal part of this organ does include?
A. Chorion.
B. Villus.
C. Amnion.
*D. Decidua basalis.
E. Decidua parietalis.

7. In the specimen of uterus of pregnant women you can see the embryo during implantation. Which structure of embryo is responsible for this process?
*A. Trophoblast.
B. Extraembryonic ectoderma.
C. Extraembrtyonic entoderma.
D. Embryonic mesoderma.
E. Amnion.

8. In the specimen of uterus of pregnant women you can see the embryo at 15 day of gestation. It has chorion, which forms villi. Each villus consists of mesenchyme and two layers of trophoblast (cyto- and syncytiotrophoblast). Which type of chorionic villi is described?
A. Primary.
*B. Secondary.
C. Tertiary.
D. Intestinal.
E. Mixed.

9. In the specimen of uterus of pregnant women you can see the embryo at 10 day of gestation. It has trophoblast, which forms villi. Each villus consists of two layers of trophoblast (cyto- and syncytiotrophoblast). Which type of chorionic villi is described
*A. Primary.
B. Secondary.
C. Tertiary.
D. Intestinal.
E. Mixed.

Technological card to practical classes

№	Types of activity	Duration	Methods	Technique	Site
1.	Control and correction of knowledge	10 min	Tests	Computers	Computer class
2.	Discussion of the main points	20 min	Slides, Tables	Projector	Class room
3.	Independent students activity	45 min	Specimens	Microscopes	Class room
4.	Summary and results of activity	5 min	-	-	Class room