Qasımov E.K.

ÜMUMİ HİSTOLOGİYA

Sxemlər

Azərbaycan Tibb Universitetinin Elmi Şurasının 30 oktyabr 2018-ci il tarixli iclasında dərs vəsaiti kimi dərc olunması qərara alınmışdır

Bakı 2021

Rəyçilər:

Azərbaycan Tibb Universitetinin Histologiya, embriologiya və sitologiya kafedrasının dosenti, b.ü.f.d. **M.R. Mehtiyev** və həmin kafedranın tədris hissə müdiri t.ü.f.d. **A.Ə. Əliyarbəyova**, baş müəllimi t.ü.f.d. **Quliyeva N.T.**

Azərbaycan Tibb Universitetinin İnsan Anatomiyası kafedrasının professoru, t.ü.e.d. **A.B. İsayev**

Bakı Dövlət Universitetinin Genetika və Təkamül təlimi kafedrasının dosenti, b.ü.f.d. **Ə.Ə. Səmədov**

Qasımov E.K. Ümumi histologiya (sxemlər). Bakı. 2019. ... səh. 120

Dərs vəsaiti tibb ixtisası üzrə təhsil alan ali və orta ixtisas məktəblərinin tələbələri üçün nəzərdə tutulmuşdur. Bununla birlikdə biologiya fakültəsinin tələbələri, həmçinin sitoloqlar, embrioloqlar və histoloqlar da istifadə edə bilərlər.

ÖN SÖZ

Son illər respublikamızın təhsil sistemində aparılan islahatlar, xüsusilə Avropa vahid təhsil ailəsinə inteqrasiya yönündə atılan ciddi addımlar bizim də qarşımızda vacib öhdəliklər qoyur. Əsas tibb fənlərindən biri olan histologiyanın tədrisini günün tələbləri səviyyəsində qurmaq üçün klassik məlumatlarla yanaşı, müasir elmi biliklərin toplanması və tələbələrə çatdırılması çox zəruridir.

Bu baxımdan tərtib edilmiş «Ümumi histologiya – sxemlər» adlı dərs vəsaiti sitologiya, ümumi embriologiya və ümumi histologiya fənlərinin daha dərindən və mükəmməl mənimsənilməsində tələbələrə yardımçı olmalıdır. Tələbələr sxemlərdəki strukturları dərs vəsaitinin elektron variantına müvafiq olaraq rəngləməli və onların adlarını sol tərəfdə ayrılmış boş yerdə yazmalıdırlar. Dərs vəsaitinə daxil edilmiş sxemlərin böyük əksəriyyəti tədris proqramında nəzərdə tutulmuş preparatlara uyğun çəkilmişdir. Ona görə də tələbələr dərs prosesi zamanı öyrənilən histoloji mikropreparatlarla bilavasitə mikroskopun müxtəlif böyüdücülərində baxmaqla yanaşı, onların sxemlərinin miqyasının kompüterdə artırıb - azalma imkanlarına da malik olacaqlar. Bu isə keçirilən materialın tələbələr tərəfindən mənimsənilməsini xeyli asanlaşdırmalıdır.

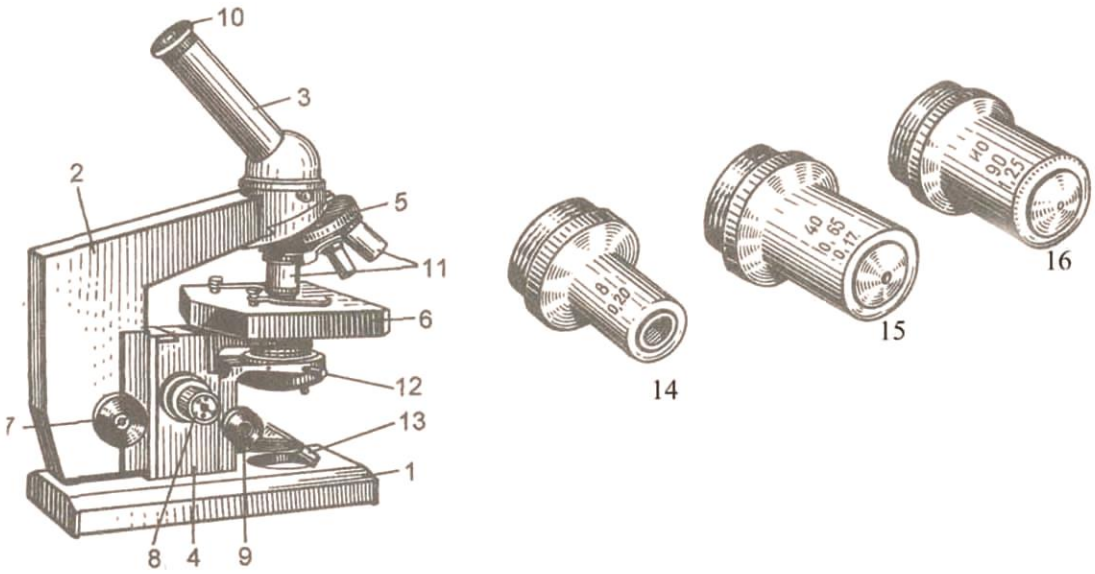
Müəllif sxemlərin tərtibində istifadə olunmuş ədəbiyyat materiallarının (adları ədəbiyyat siyahısında verilmişdir) və ələl xüsüs "Vikipediya" saytlarında istifadəsinə icazə verilmiş materialların müəlliflərinə, həmçinin kafedra əməkdaşlarından baş müəllim t.ü.f.d. N.T.Quliyevaya və tədris hissə müdiri t.ü.f.d. A.Ə. Əliyarbəyovaya öz dərin minnətdarlığını bildirir.

Dərs vəsaitinin tərtibində buraxılmış xətalara görə əvvəlcədən üzr istəyir və bu haqda məlumat verənlərə öz minnətdarlığımı bildirirəm.

Müəllif

MÜNDƏRİCAT

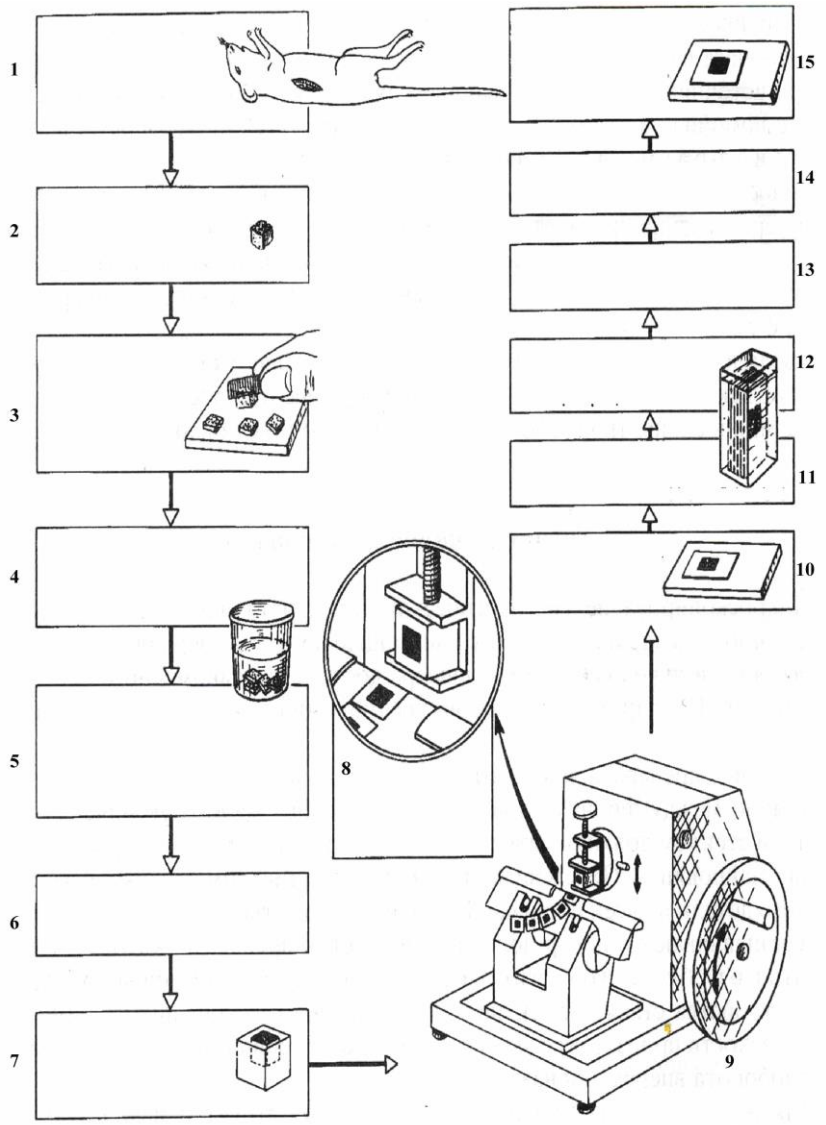
Histoloji texnika. Mikroskoplar, tədqiqat üsulları.	1



Şəkil 1.1. **Рисунок 1.1.** **Figure 1.1.**

Schematic drawing of a light microscope.

1. basis of support column of support 2.sloping lens barrel 3.micromotion mechanism box 4.triple nose piece 5.stage 6.focus adjustment macroscrew 7.focus adjustment microscrew 8.condenser screw 9.ocular lens 10.objective lenses 11.condenser 12.mirror 13.low magnification objective 14.high magnification objective 15.immersion objective.

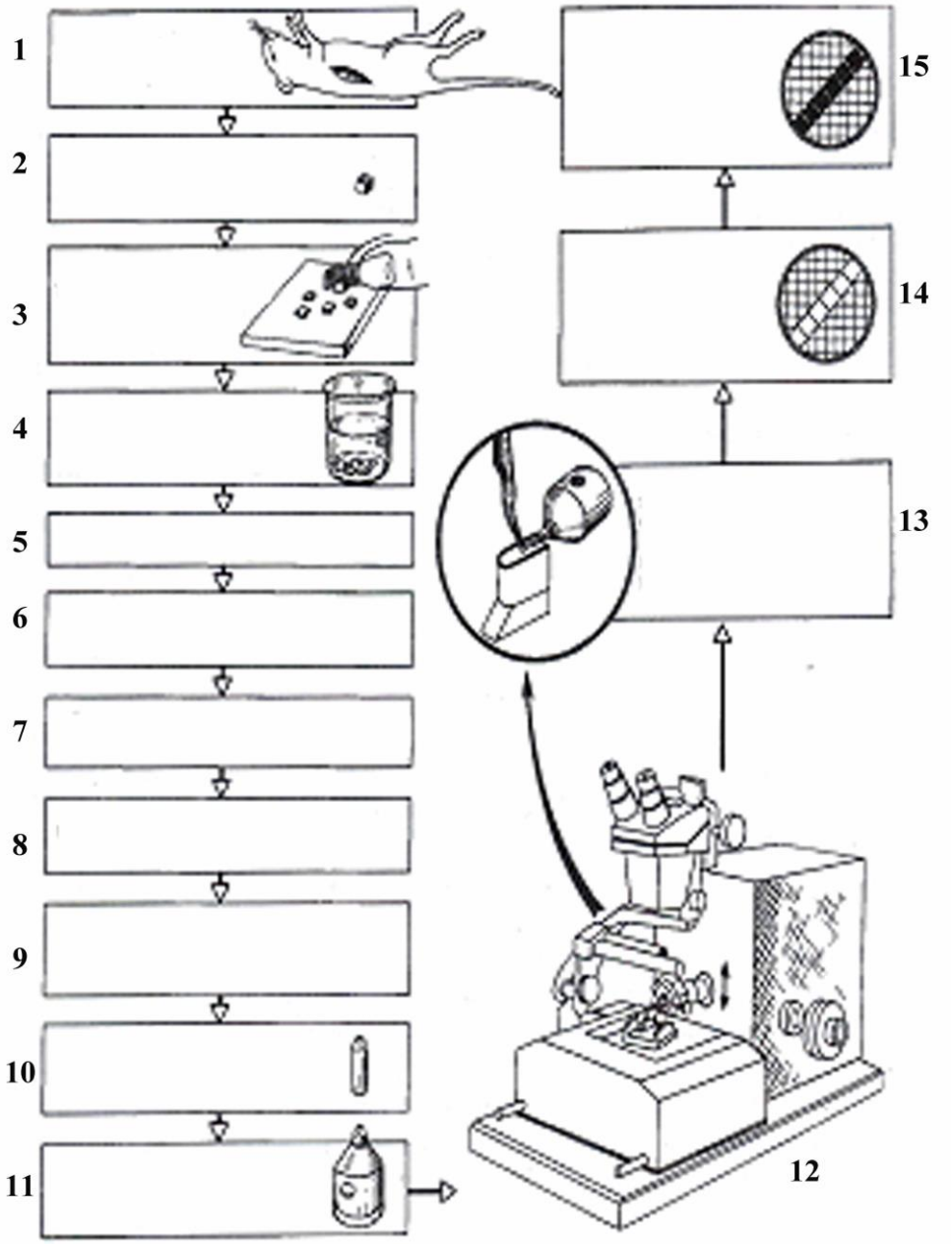


Şəkil 1.2. **Рисунок 1.2.** **Figure 1.2.**

Stages of histological slide preparation for light microscope.

1. **taking of material**
2. **taken tissue specimen**

3. **to cut into small pieces as required (1sm^3)**
4. **fixation (formalin) and washing**
5. **Dehydration with increasing concentration of alcohol (70%, 80%, 90%, 96%, 100%)**
6. **embedding (paraffin)**
7. **preparation of histological blocks**
8. **cutting in microtome with steel knife**
9. **microtome**
10. **glue of sections to glass**
11. **deparaffinization**
12. **series with decreasing concentration of alcohol**
13. **staining of sections**
14. **series with increasing concentration of alcohol**
15. **Cover of sections with covering glass.**



Şəkil 1.3. **Рисунок 1.3.** **Figure 1.3.**

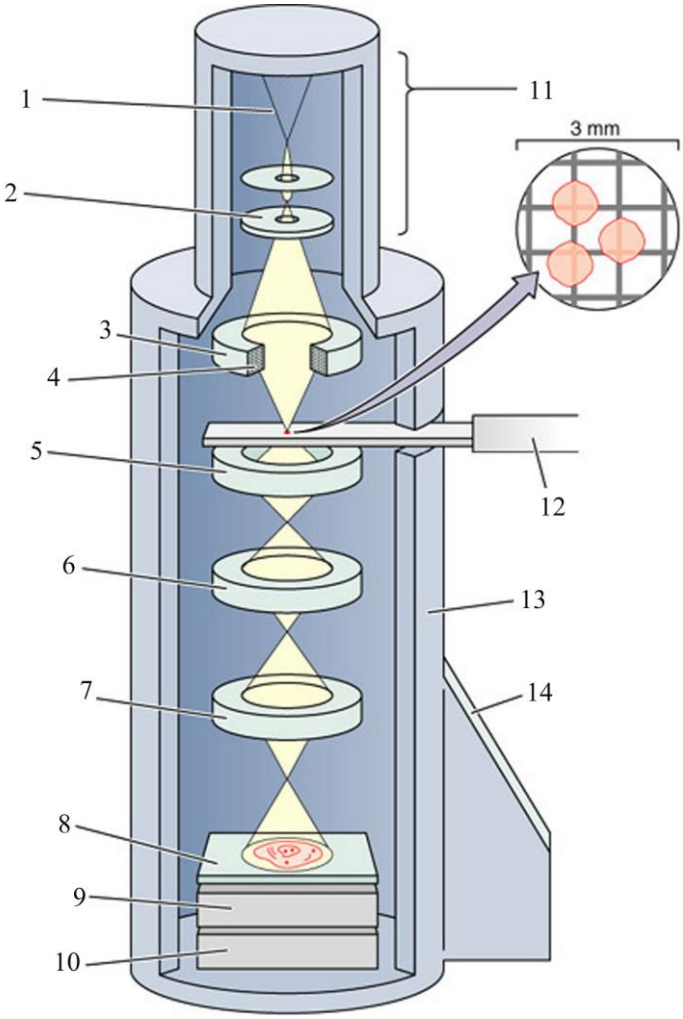
Stages of semithin and ultrathin sections preparation for electron microscope.

1. taking of material
2. taken tissue specimen
3. to cut into small pieces as required (1 mm)
4. fixation (glutaraldehyde)
5. washing of specimen in buffer solutions
6. staining of specimen in block with osmium acid
7. dehydration with increasing concentration of alcohol (70%, 80%, 90%, 96%, 100%)
8. absorption to unpolymerized embedding milieu
9. embedding (epon-araldite) and polymerization
10. preparation of epon-araldite block
11. epon-araldite block with block-keeper
12. ultramicrotome
13. collection of sections on a cooper grid,
    cutting in ultramicrotome with glass or diamond knife
14. thin-section staining with heavy metal salts (uranyle acetate, lead citrate)
15. ultrathin sections ready for electron microscopy.

STAGES OF HISTOLOGIC SECTIONS STAINING WITH HEMATOXYLIN AND EOSIN:

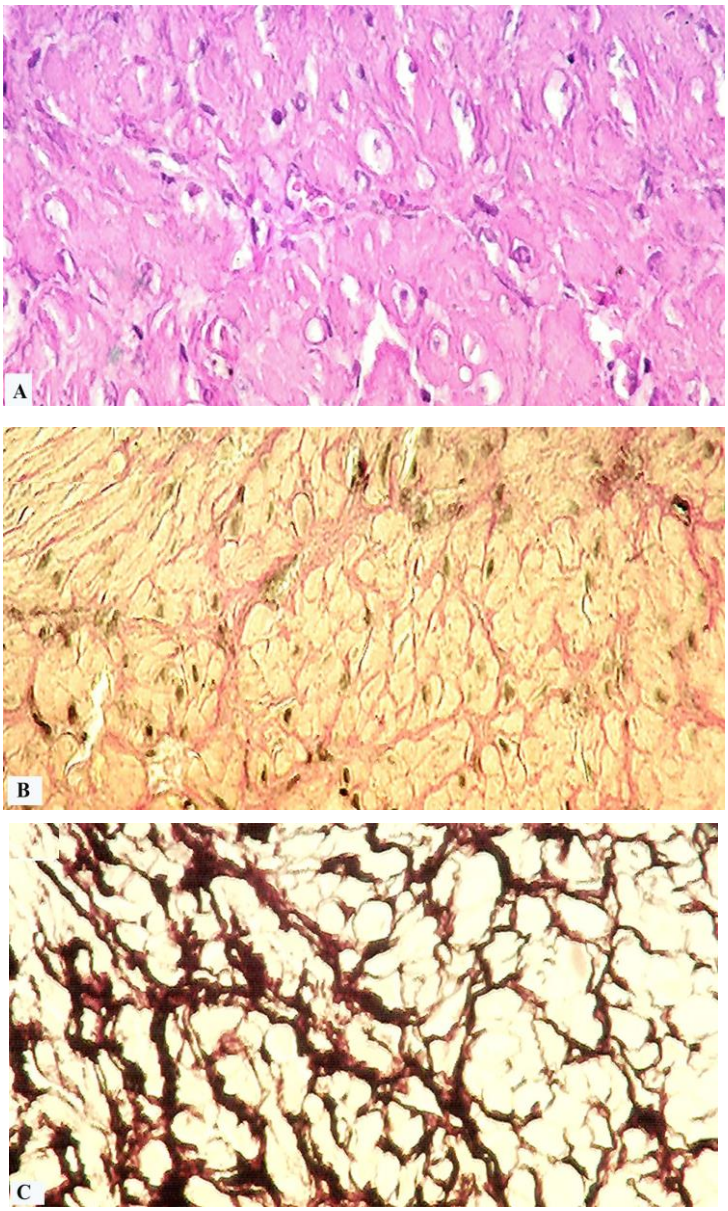
N	STAGE	REAGENT	TIME	NOTE
1.	Deparaffinization (cleaning of paraffin from section)	Toluol 1 Toluol 2 Toluol and ethanol Alcohol 96^0 Alcohol 70^0 Distilled water	5 min 5 min 2 min 2 min 5 min	
2.	Staining with hematoxylin	Solution of hematoxylin	15-20 min	Control by microscope
3	Washing	Distilled water		
4.	Staining with eosin	Solution of eosin		
5.	Washing	Distilled water		Untill to washing of additional eosin
6.	Dehydratation	Ethanol 70^0 Ethanol 80^0 Ethanol 96^0	1-2 min 1-2 min 1-2 min	
7.	To elucidate of sections	Toluol	2-3 min	
8.	Covering of colored sections	Cover glass, balzam		
9.	Draining of sections	Thermostat (37^0 C)		

Şəkil 1.4. Рисунок 1.4. Figure 1.4.



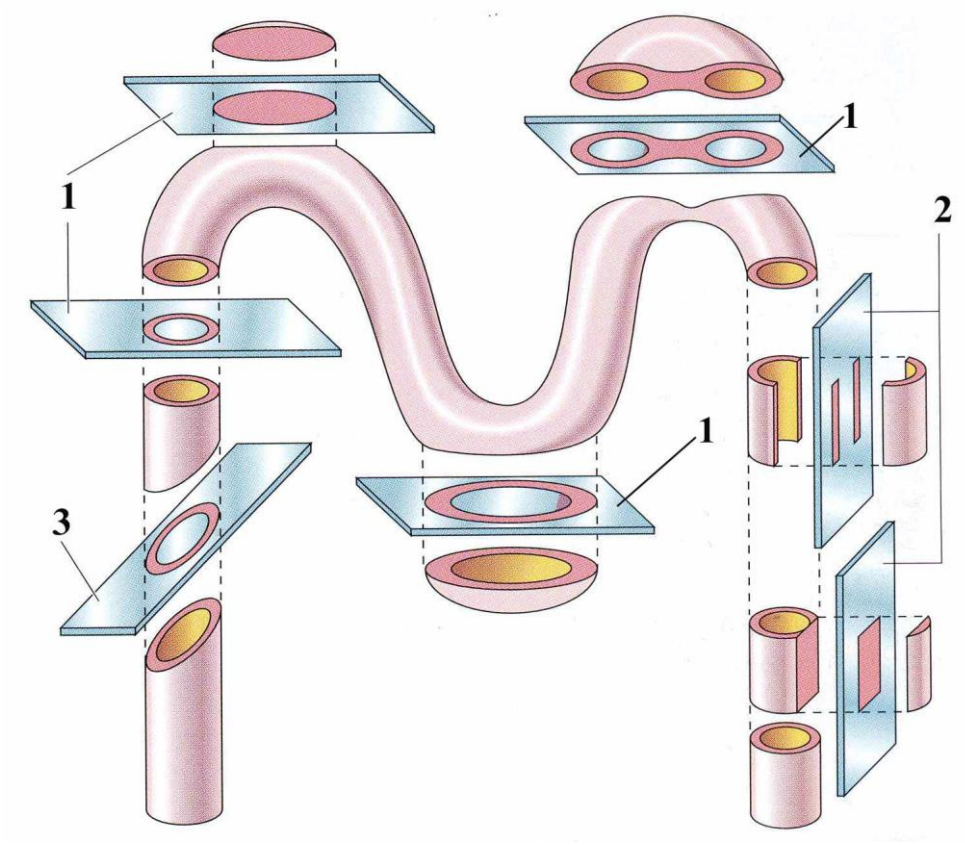
Şəkil 1.5. Рисунок 1.5. Figure 1.5.
Schematic representation of structure and direction of electron flow in transmission electron microscopy.

1.cathode 2.anode 3.condenser lens 4.electrical coil 5.objective lens 6.intermediate lens 7.projector lens 8.fluorescent screen 9.photographic film 10.digital camera 11.electron gun 12.specimen holder 13.column 14.glass window.



Şəkil 1.6. **Рисунок 1.6.** **Figure 1.6.**

Comparative view of smooth muscle cells and surrounding connective tissue elements stained with different methods (A – hematoxylin-eosin; B – Van-Gison; C – silvering for Fut).



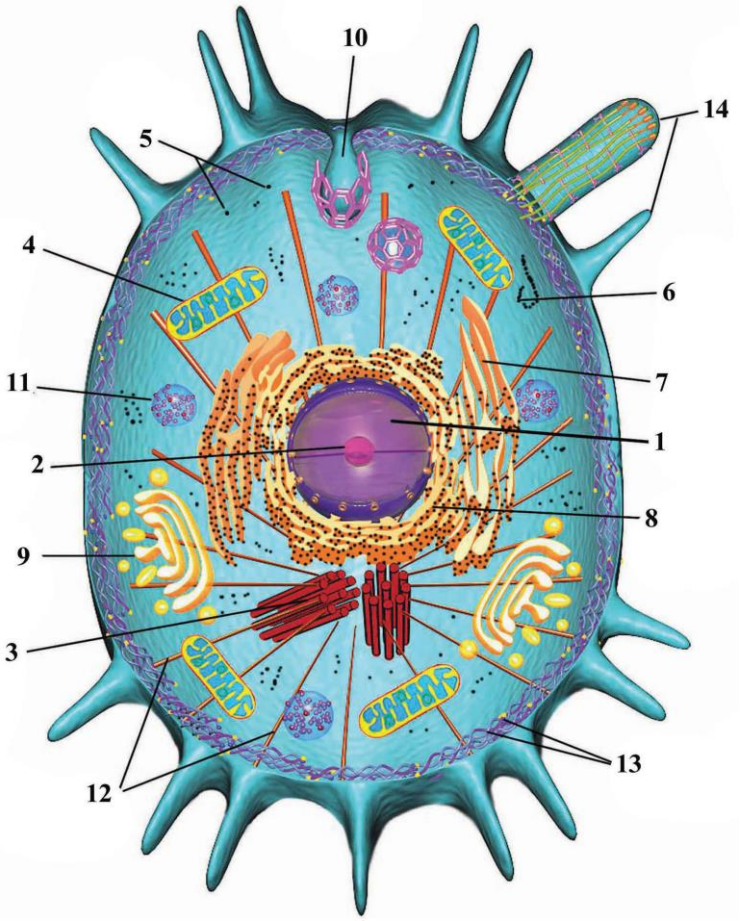
Şəkil 1.7. **Рисунок 1.7.** **Figure 1.7.**

Schematic representation of view of tubular organs in sections with different directions.

1.transitional section 2.longitudinal section 3.oblique section.

Eukariot hüceyrələrin ümumi morfologiyası. Hüceyrə zarının kimyəvi tərkibi və ultrastrukturu.

2



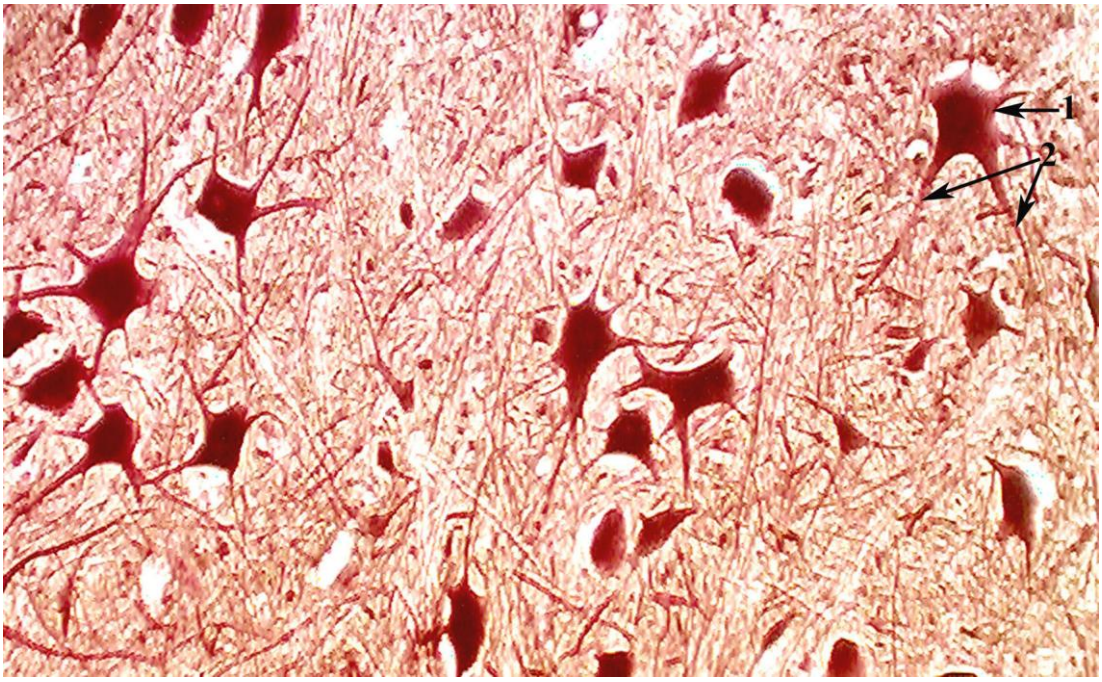
Şəkil 2.1. Рисунок 2.1. Figure 2.1.
Schematic representation of structural elements of somatic cell.

1.nucleus 2.nucleolus 3.centriol 4.mitochondrion 5.free ribosomes 6.polyribosome 7.smooth endoplasmic reticulum 8.rough endoplasmic reticulum 9.Golgi complex 10.receptor-gated endocytosis 11.lysosome 12.microtubules 13.cortical cytoplasm 14.microvilli.

Şəkil 2.2. **Рисунок 2.2.** **Figure 2.2.**

Polyhedral liver cells. Stain: hematoxylin-eosin.

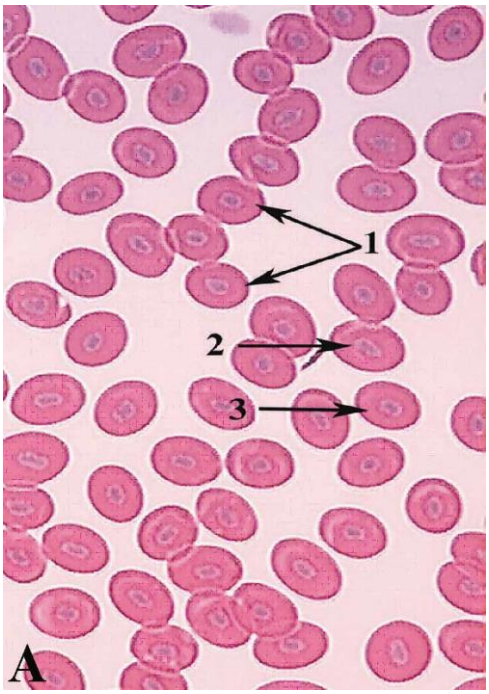
1.liver cell – hepatocyte 2.nucleus 3.cytoplasm 4.cell border 5.blood vessel.

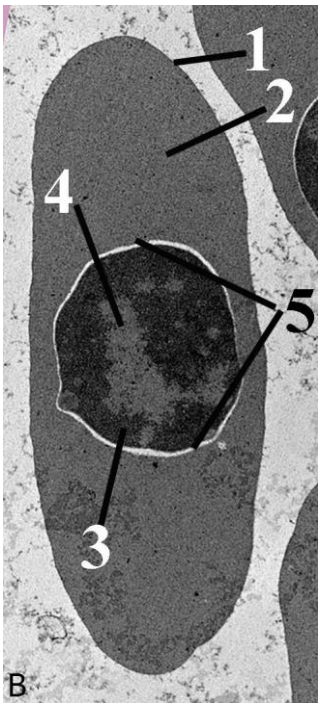


Şəkil 2.3. **Рисунок 2.3.** **Figure 2.3.**

Nerve cells. Stain: silvering.

1.body of nerve cell – perikaryon 2.process of nerve cells





Şəkil 2.4. **Рисунок 2.4.** **Figure 2.4.**

A Ovoid erythrocytes. Frogs blood smear. Stain by methods Giemsa.

1. Erythrocyte 2. nucleus 3. cytoplasm

B Electron microscopic structure of nucleated erythrocyte

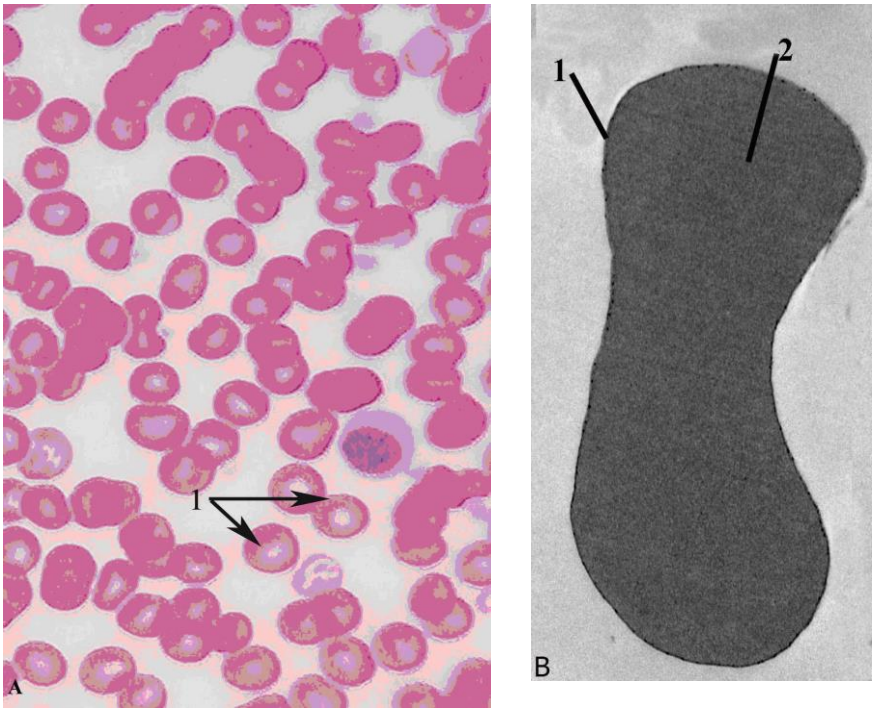
1 plasma membrane of nucleated erythrocyte

2 cytoplasm of nucleated erythrocyte

3 heterochromatin

4 euchromatin

5 nucleus



Şəkil 2.5. **Рисунок 2.5.** **Figure 2.5.**

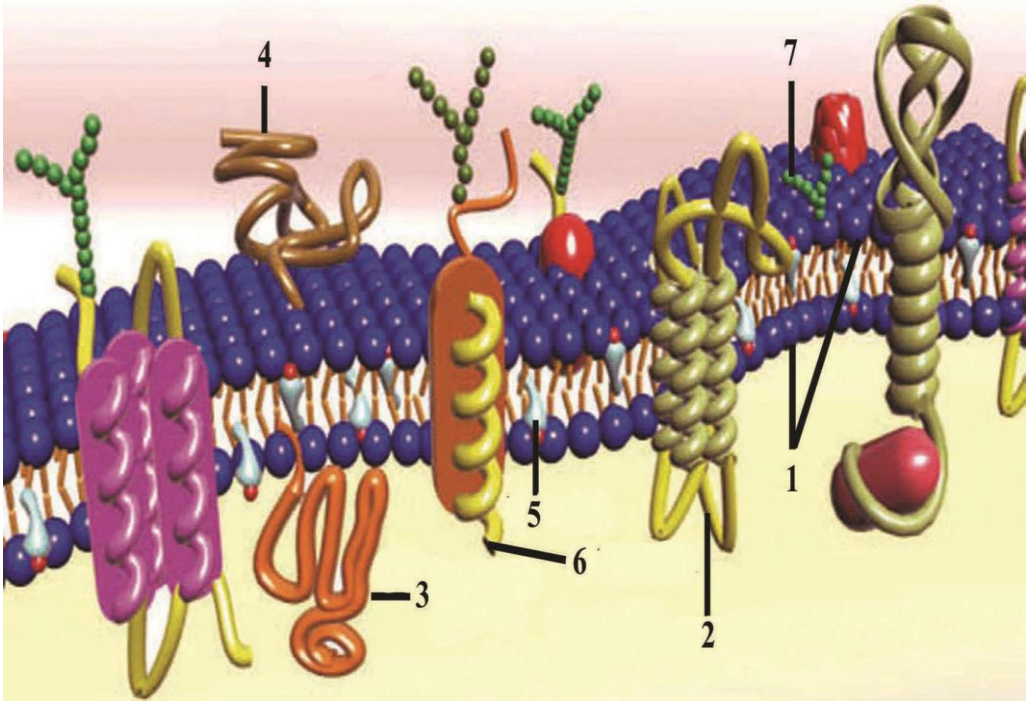
A Ovoid erythrocytes. Human blood smear. Giemsa stain.

1. erythrocyte

B Electron microscopic structure of nonnucleated erythrocyte

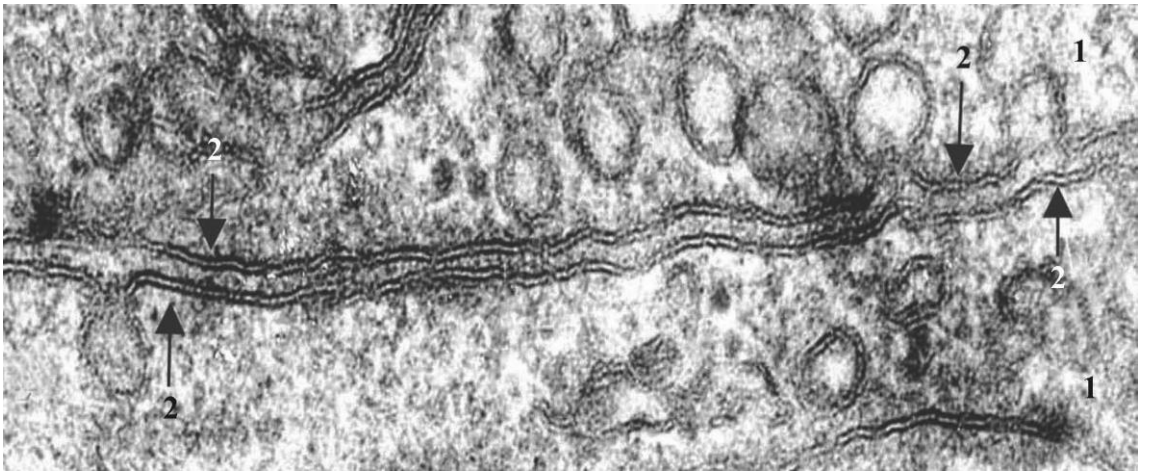
1 plasma membrane

2 cytoplasm



Şəkil 2.6. Рисунок 2.6. Figure 2.6.
Schematic representation of fluid-mosaic model of structure of plasma membrane.

1.phospholipids 2.integral protein 3.internal peripheral protein 4.external peripheral protein 5.cholesterol 6.glycoprotein 7.glycolipid

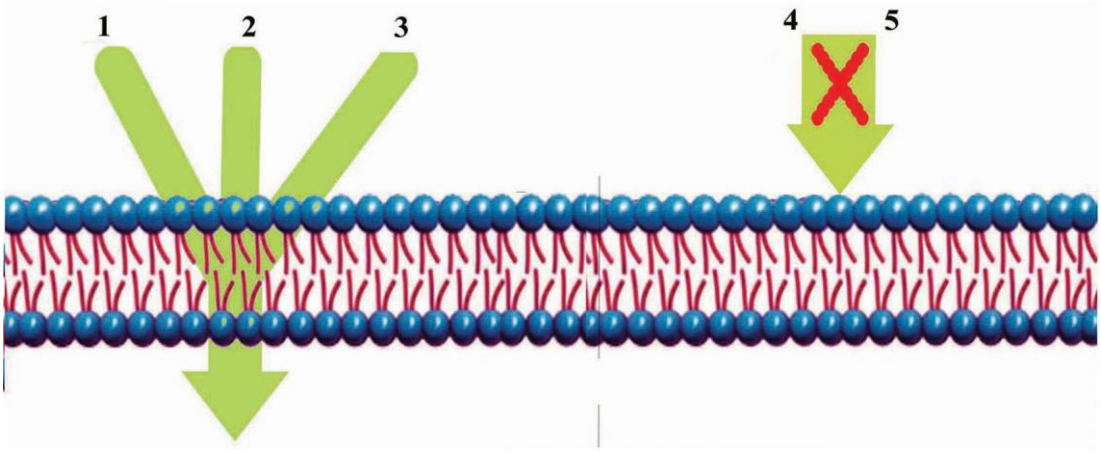


Şəkil 2.7. Рисунок 2.7. Figure 2.7.

Electron microscopic structure of plasmalemma (cell membrane) of neighbor endothelial cells.

1. endothelial cells; 2. plasmalemma.

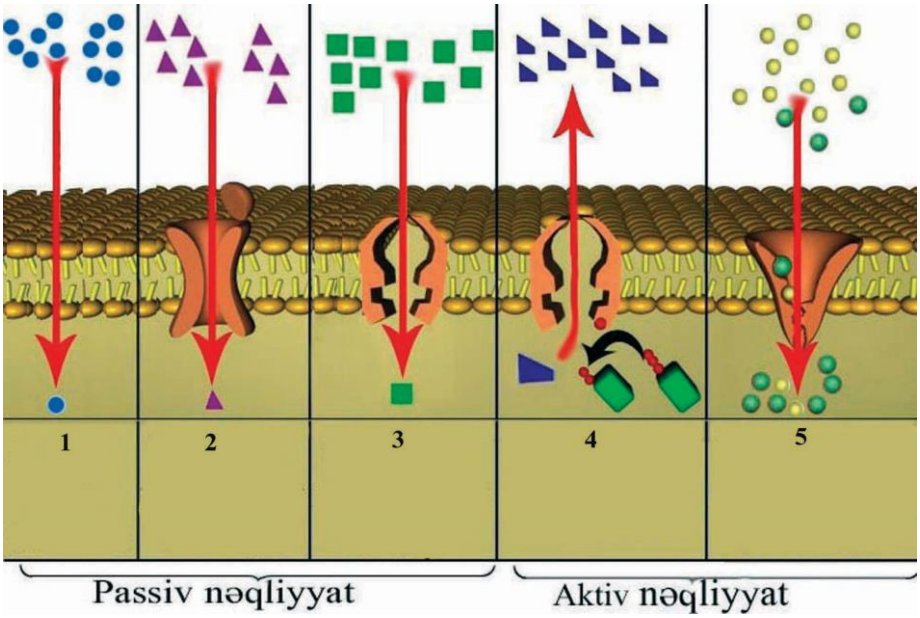
Hüceyrə zarı: seçici keçiricilik | 3



Şəkil 3.1. **Рисунок 3.1.** **Figure 3.1.**

Permeability features of phospholipid bilayer of plasma membrane.

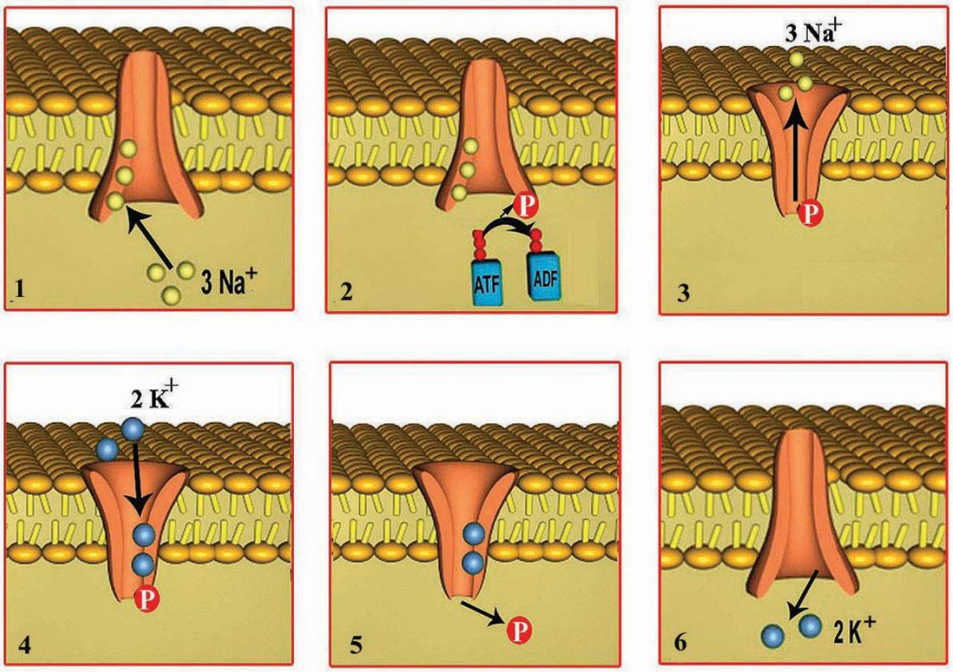
1.gases 2.hydrophobic molecules 3.neutral hydrophilic molecules 4.big measured molecules 5.loaded molecules and ions.



Şəkil 3.2. Рисунок 3.2. Figure 3.2.

Types of passive and active transport.

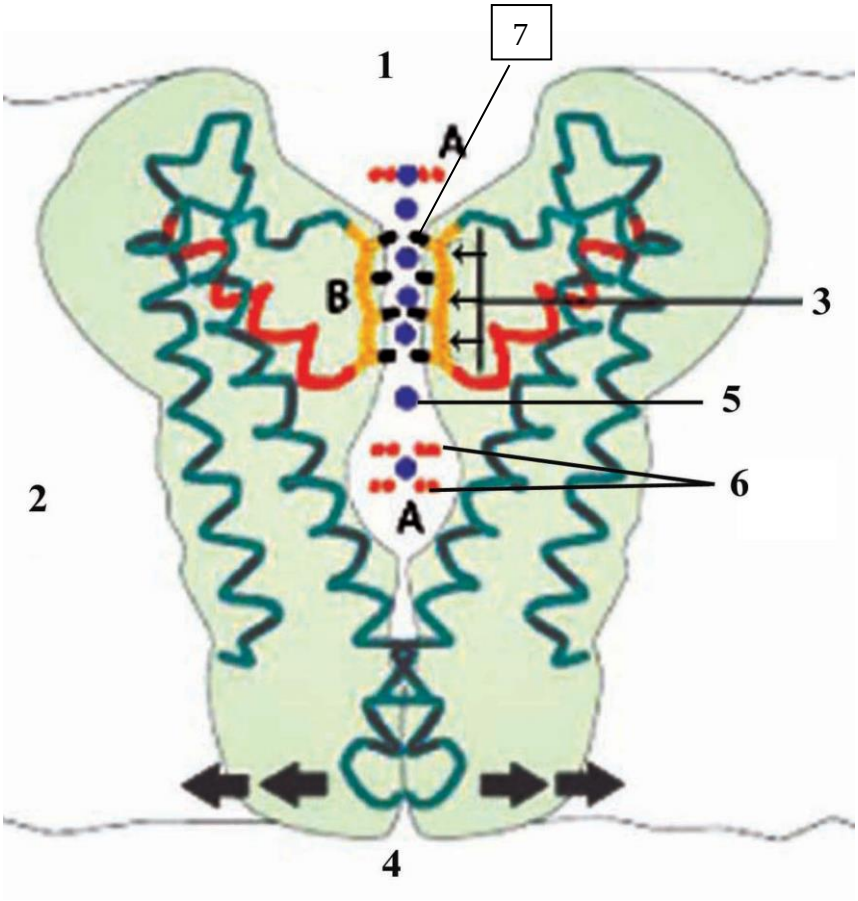
1.simple diffusion 2.channel-mediated diffusion 3.carrier-mediated diffusion 4.pump-mediated transport 5.secondary active transport by concentration difference.



Şəkil 3.3. **Рисунок 3.3.** **Figure 3.3.**

Schematic representation of functioning of Na^+ /K^+ pump.

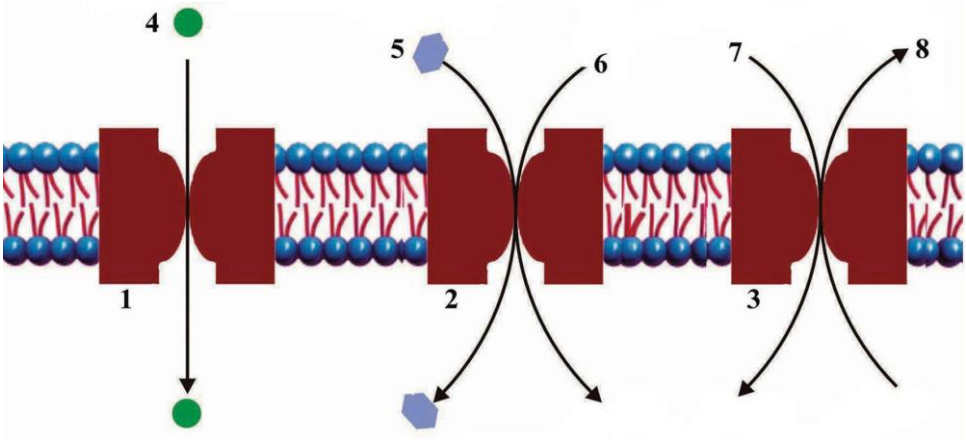
1.binding of 3 Na^+ to cytosolic aspect surface of Na^+ /K^+ pump 2. hydrolysis of ATP and phosphorylation of α-subunit 3.releasing of Na^+ from cell 4.binding of 2 K^+ to external aspect of Na^+ /K^+ pump 5.dephosphorylation of ATPase 6.transfer of K^+ into cell.



Şəkil 3.4. **Рисунок 3.4.** **Figure 3.4.**

Schematic representation of gated potassium (K^+) channel.

1.ion channel 2.plasma membrane 3.ion filter 4.gate 5.K^+ ion 6.water molecules. 7. oxygen atom

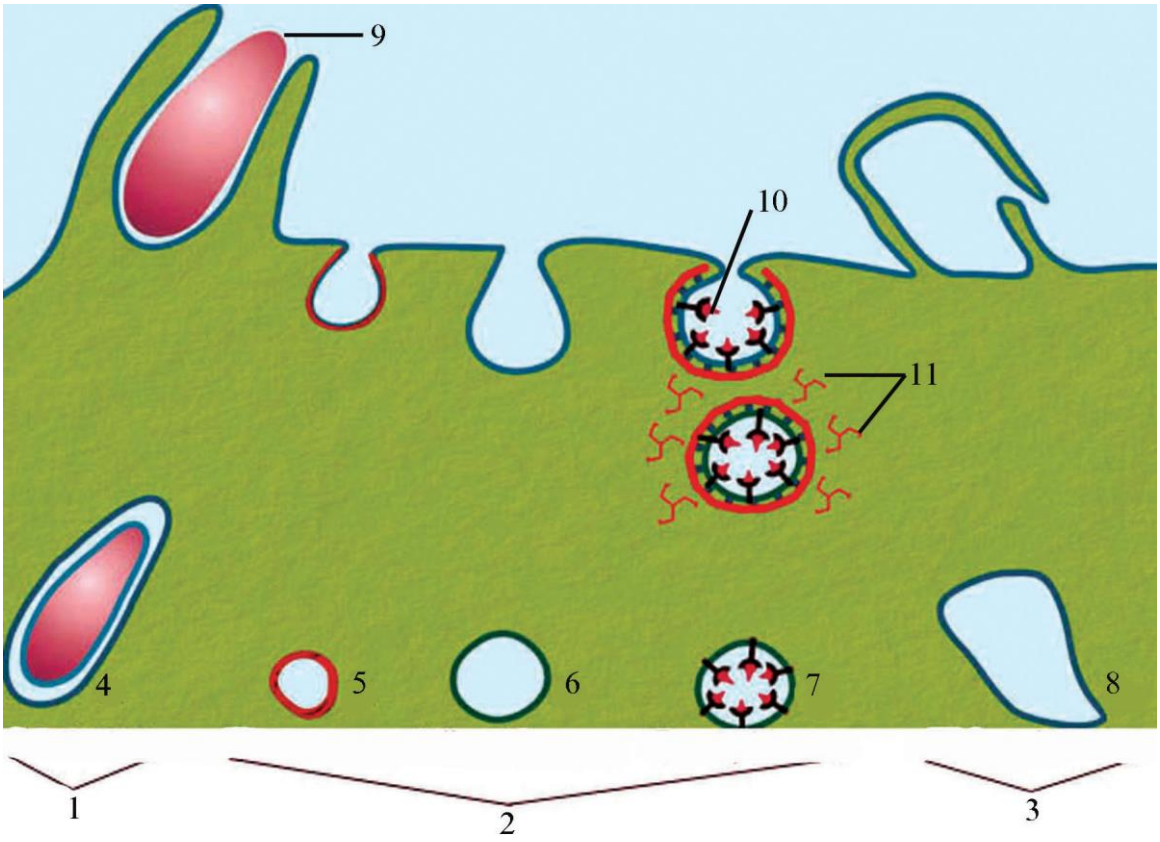


Şəkil 3.5. Рисунок 3.5. Figure 3.5.

Schematic representation of types of single and coupled transport.

1.single uniport transport 2.symport coupled transport 3.antiport coupled transport 4.amino acid 5.glucose 6.Na^+7.ADP 8.ATP.

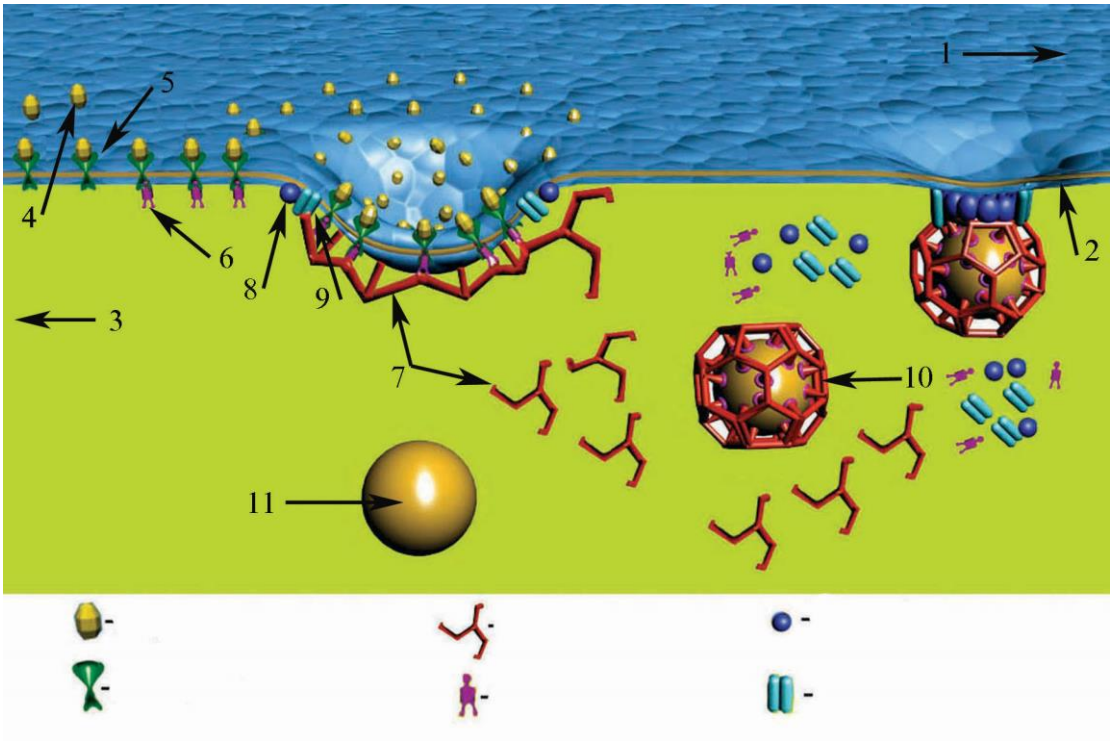
Hüceyrə zarı: endositoz və ekzositoz. 4



Şəkil 4.1. **Рисунок 4.1.** **Figure 4.1.**

Kinds of endocytosis. Schem.

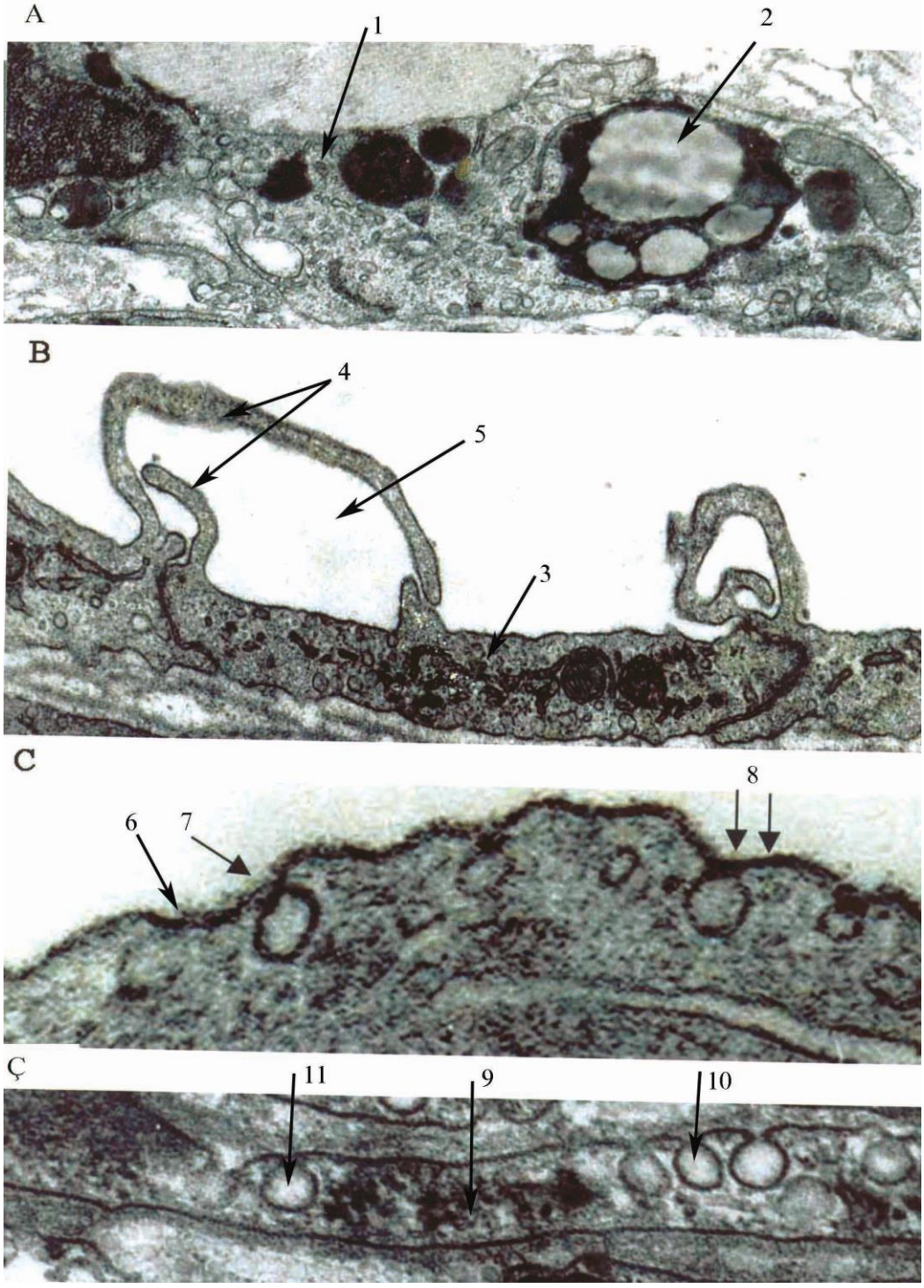
1.phagocytosis 2.micropinocytosis 3.macropinocytosis 4.phagosome 5.caveosome 6.micropinosome 7.receptosome 8.macropinosome 9.swallowing particle 10.ligand-receptor complex 11.clathrin.



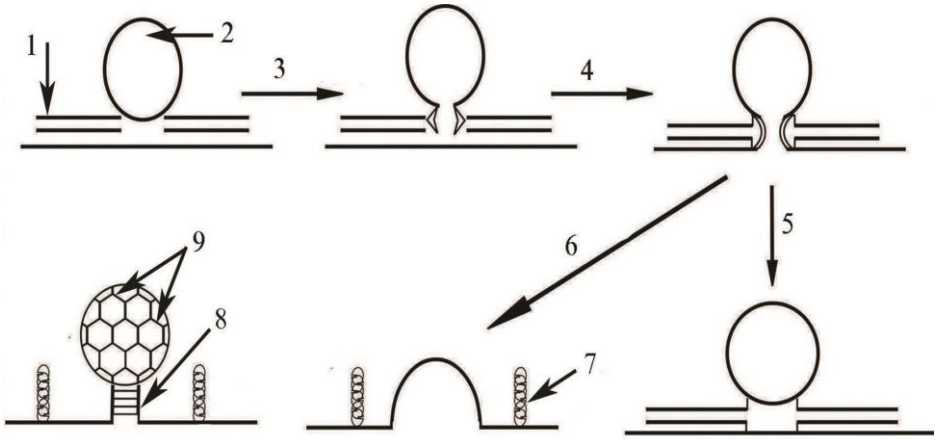
Şəkil 4.2. **Рисунок 4.2.** **Figure 4.2.**

Schematic diagram of forming mechanism of clathrin-coated pinocytotic vesicle.

1.extracellular environment 2.plasma membrane 3.cytoplasm 4.ligand 5.receptor 6.AP-2 7.clathrin 8.dynamin 9.amphiphizin 10.clathrin-coated vesicle 11.vesicle that lost clathrin coat.


A
1
2
B
4
5
3
C
8
6
7
Ç
11
9
10

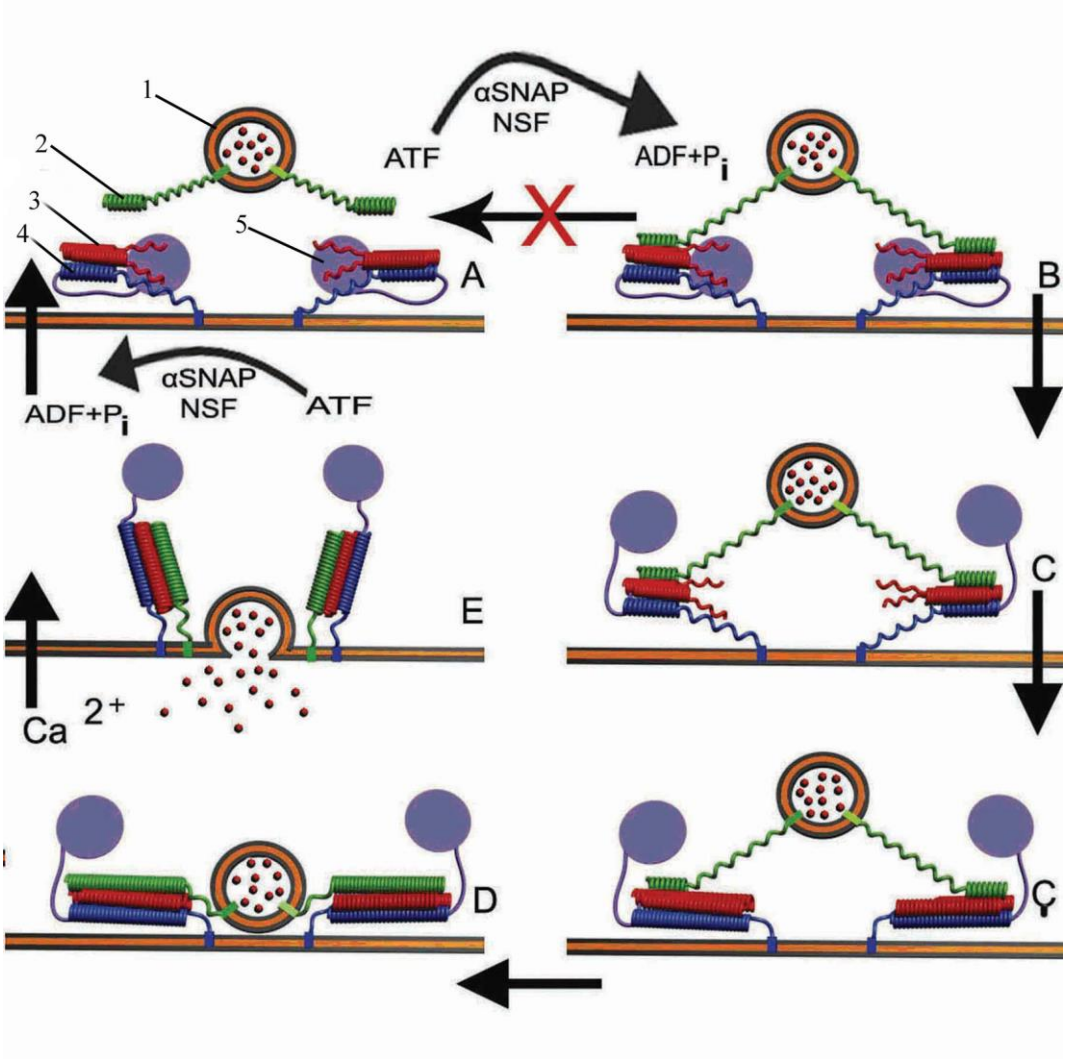
Şəkil 4.3. Рисунок 4.3. Figure 4.3.
Types of endocytosis. Electron micrographs.
A – phagocytosis;
B – macropinocytosis;
C – receptor mediated endocytosis and simple pinocytosis;
Ç – caveolas.
1. endoneural macrophage; 2. destructured myelinated nerve fiber; 3. endothelial cell; 4. process of endothelial cell; 5. swallowing liquid; 6. plasma membrane; 7. receptosome; 8. pinosome; 9. perineural cell; 10. caveola connected with plasma membrane; 11. caveola disconnected with plasma membrane.



Şəkil 4.4. Рисунок 4.4. Figure 4.4.

Kinds of exosytosis: kiss and run, and complete connection. Schema.

1.plasma membrane 2.exosome 3.forming of connection pore 4.expanding of connection pore 5.kiss and run 6.complete connection 7.SNARE complex 8.dynamin 9.clathrin.



Şəkil 4.5. Рисунок 4.5. Figure 4.5.

Schematic representation of exocytosis.

1.secretory vesicle

2. v-SNARE

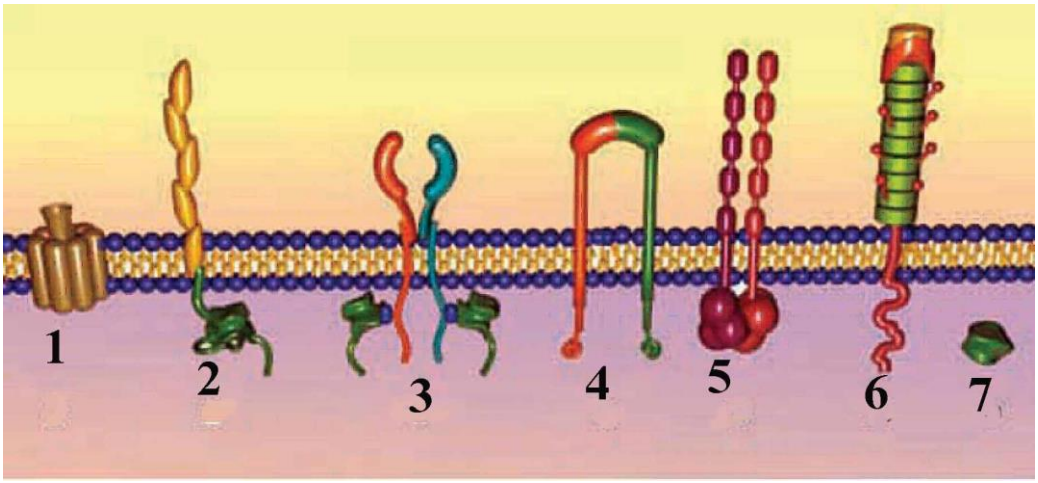
3.SNAP-25

4.t-SNARE

5. regulatory part

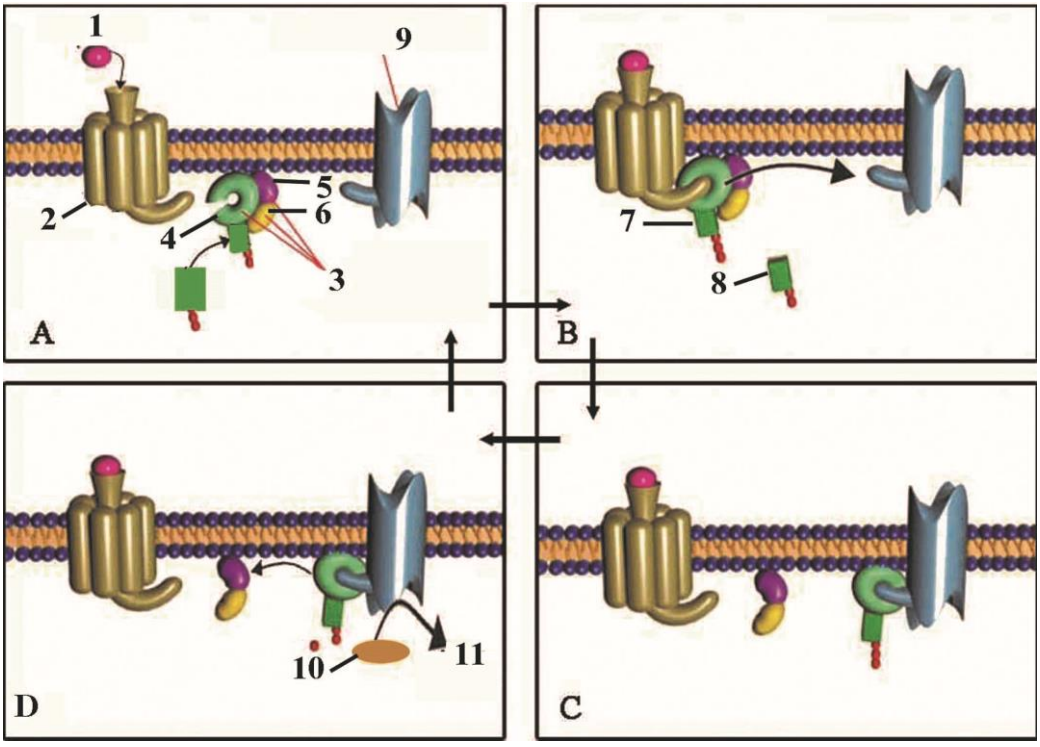
Hüceyrə zarının reseptor funksiyası. İkinci vasitəçilər

5



Şəkil 5.1. **Рисунок 5.1.** **Figure 5.1.**

Schematic representation of membrane and nuclear receptors. 1.seven-spiral receptor 2.receptor enzyme 3.enzyme-linked receptor 4.integrin 5.cadherin 6.selectin 7.nuclear receptor.

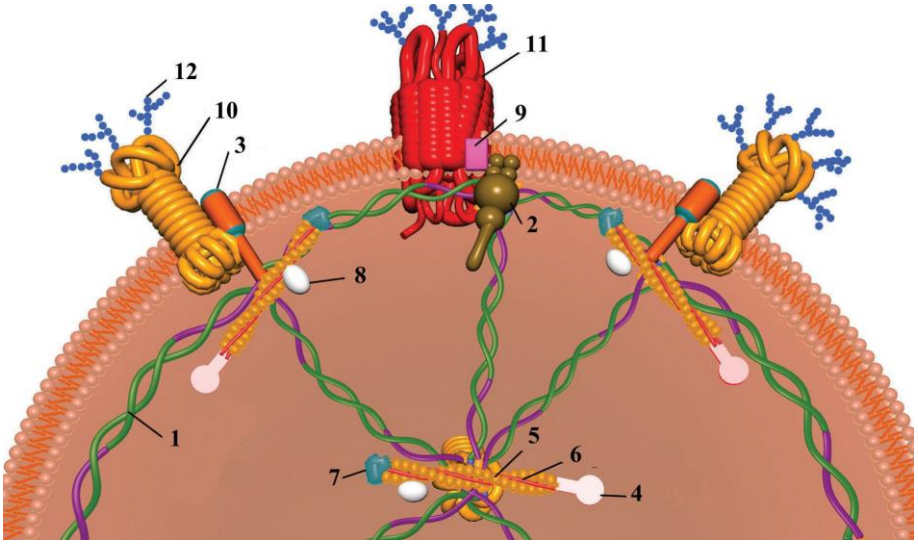


Şəkil 5.2. **Рисунок 5.2.** **Figure 5.2.**

Schematic representation of continual process happening between seven-spiral receptor and adenylatcyclase with participation of G-protein.

1. ligand 2. receptor 3. G-protein 4. α-subunit 5. β-subunit 6. γ-subunit 7.GTP 8.GDP 9. adenylatcyclase 10.ATP 11. cyclic AMP + pyrophosphate.

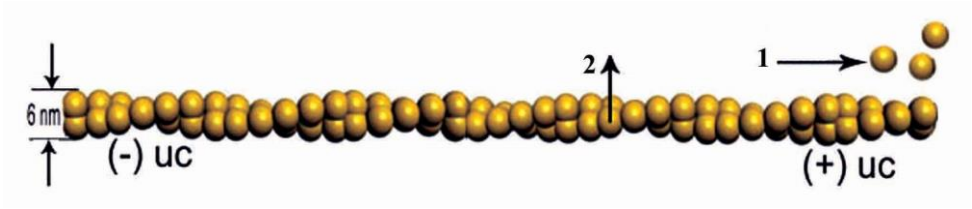
Sitoskelet. Xemomexaniki çeviricilər. 6



Şəkil 6.1. **Рисунок 6.1.** **Figure 6.1.**

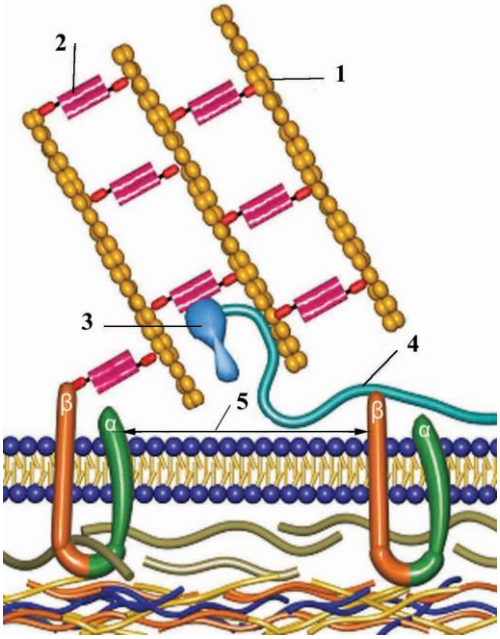
Schematic representation of topography of the cortical cytoplasm proteins of erythrocyte.

1. spectrin
2. ankyrin
3. 4.1 protein
4. adduxin
5. actin
6. tropomyosin
7. tropomodulin
8. 4.9 band protein
9. palladin (4.2 band protein)
10. glycophorin
11. anion changer (9 band protein)
12. carbohydrate remnants.



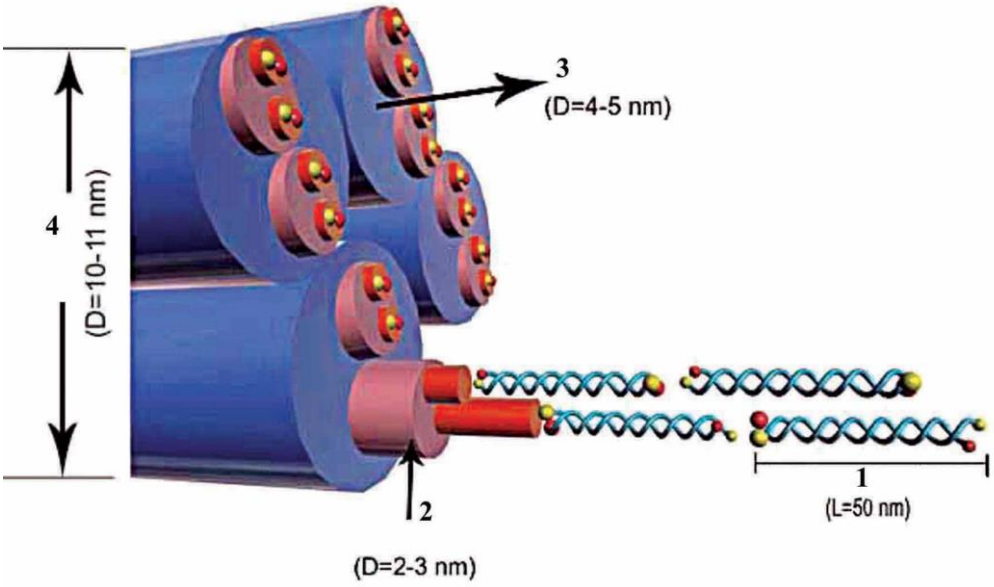
Şəkil 6.2. Рисунок 6.2. Figure 6.2.
Schematic representation structural elements of actin filaments.

1. G-actin;
2. F-actin.



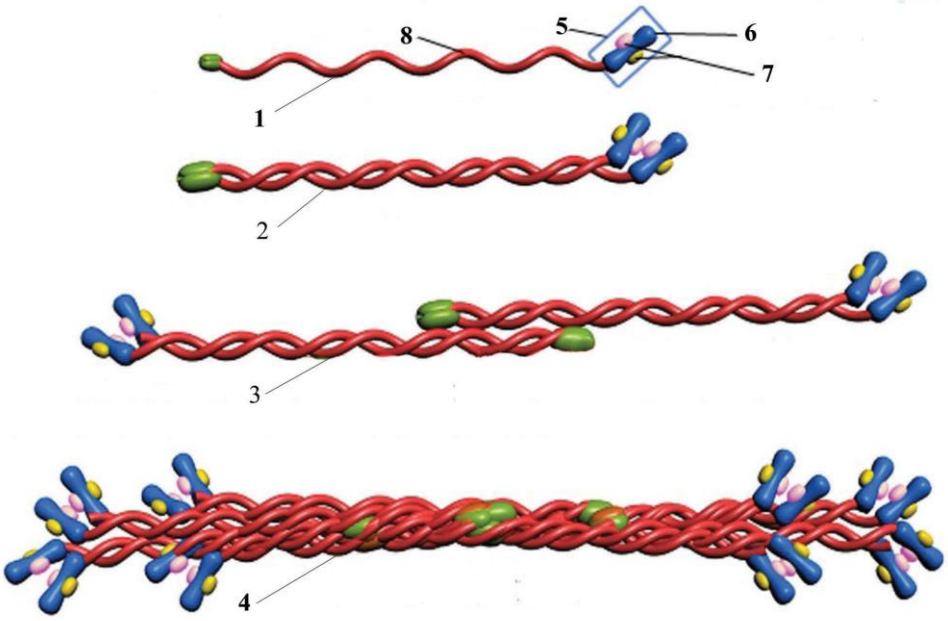
Şəkil 6.3. Рисунок 6.3. Figure 6.3.
Schematic drawing of stress fibers.

1. **F-actin**
2. **α-actinin**
3. **vinculin**
4. **talin**
5. **integrins**



Şəkil 6.4. Рисунок 6.4. Figure 6.4.
Schematic representation of formation of the intermediate filament.

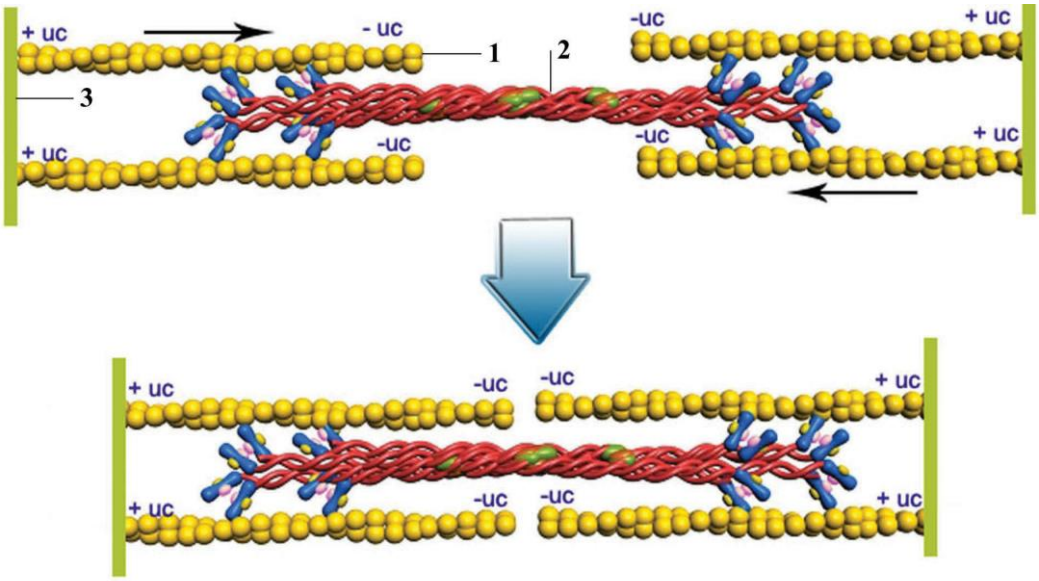
1. **Coiled-coli dimer**
2. **Protofilament**
3. **Protofibril**
4. **Intermediate filament**



Şəkil 6.5. **Рисунок 6.5.** **Figure 6.5.**

Schematic representation of non-muscular myosin II molecule

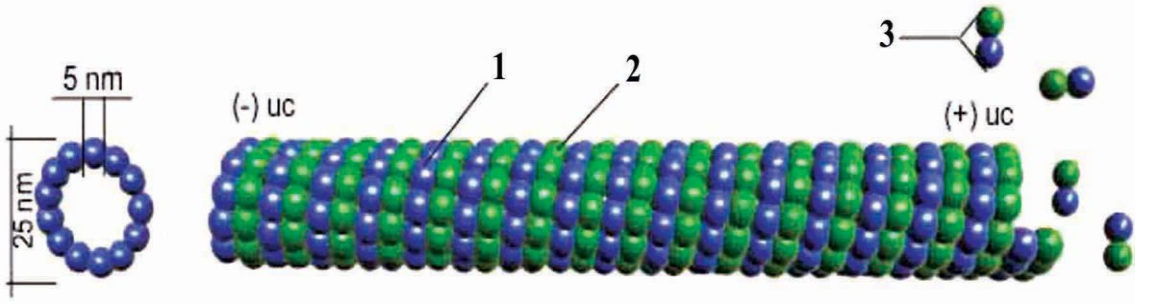
1. **Monomer**
2. **Dimer**
3. **Tetramer**
4. **Myosin II minifilament**
5. **Head**
6. **Heavy chains**
7. **Light chains**
8. **tail**



Şəkil 6.6. **Рисунок 6.6.** **Figure 6.6.**

Schematic representation of actin- myosin complex during the relaxed and contracted conditions.

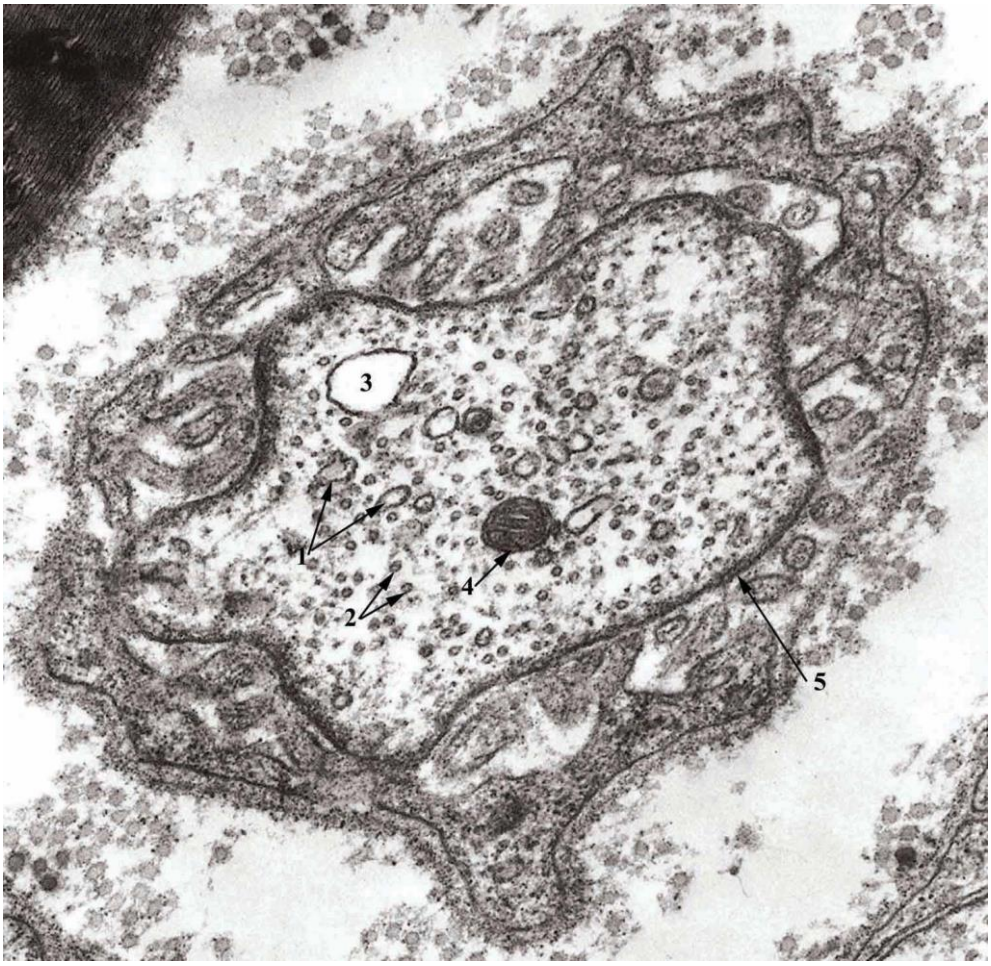
1. **F-actin**
2. **Myosin II minifilament**
3. **Z line**



Şəkil 6.7. **Рисунок 6.7.** **Figure 6.7.**

Schematic diagram of structure of microtubule.

1. α-tubulin; 2. β-tubulin; 3. tubulin dimer.

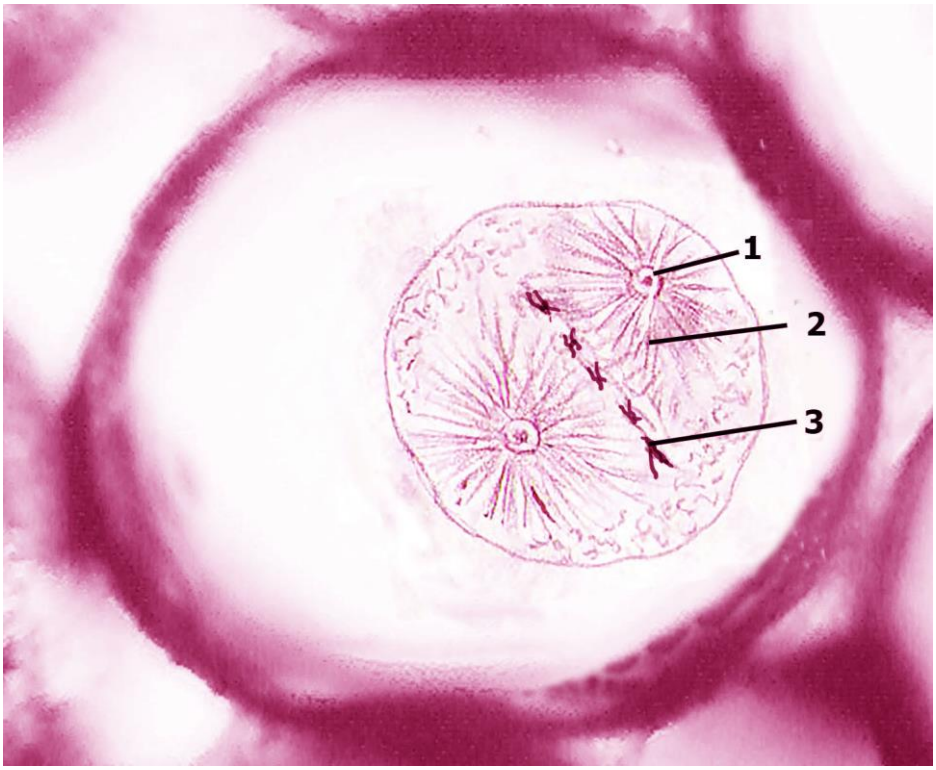


Şəkil 6.8. Рисунок 6.8. Figure 6.8.
Electron micrograph of myelinated nerve fiber on the myelin sheath gap region

1. microtubules; 2. neurofilaments; 3. tubule of smooth endoplasmic reticulum; 4. mitochondrion; 5. axolemma

Hüceyrə orqanelləri: Hüceyrə mərkəzi. Mitoxondri.

7



Şəkil 7.1. **Рисунок 7.1.** **Figure 7.1.**

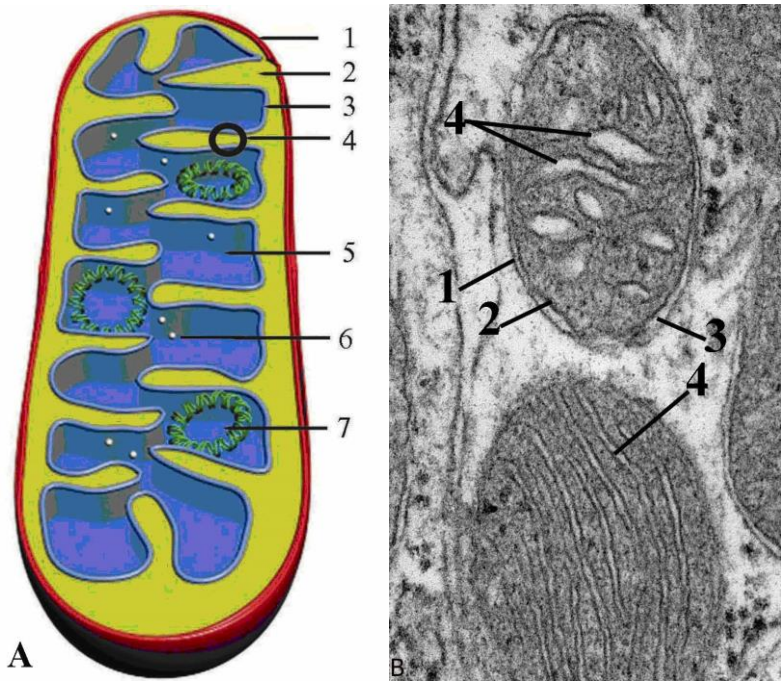
Centrosome – cell center in impregnated ovule of horse ascaride. Stain: ferrous – hematoxylin.

1. centriole
2. pericentriolar matrix
3. chromosome.

Şəkil 7.2. **Рисунок 7.2.** **Figure 7.2.**

Schematic representation of the mitochondrion in intestinal epithelial cell.

1. **Nucleus**
2. **Point like mitochondrion**
3. **Fiber like mitochondrion**



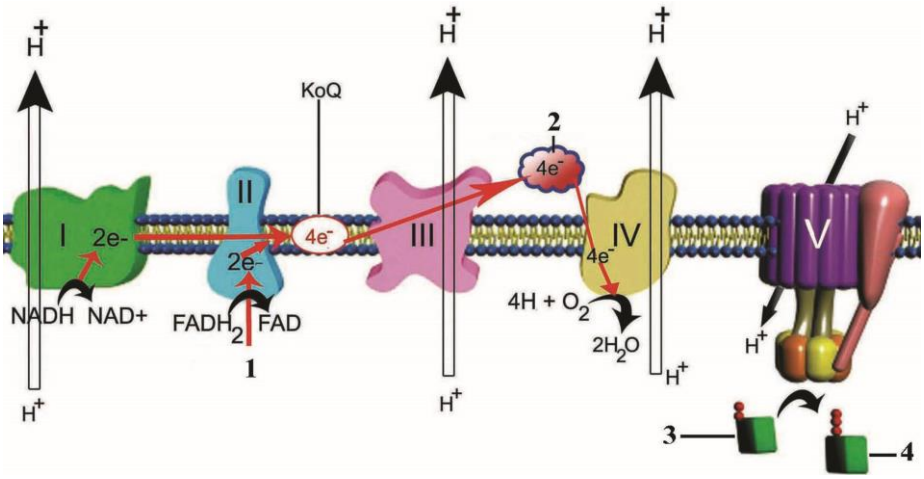
Şəkil 7.3. Рисунок 7.3. Figure 7.3.

A Schematic representation of longitudinal section of mitochondrion.

1. outer mitochondrial membrane
2. intermembranous space
3. mitochondrial crista
4. inner mitochondrial membrane
5. mitochondrial matrix
6. mitochondrial granules
7. circular DNA.

B Electron micrograph of mitochondrion.

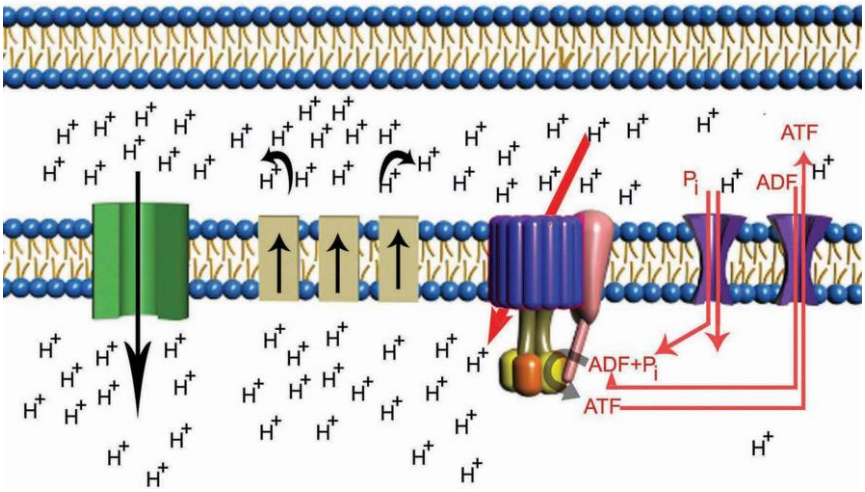
1. outer mitochondrial membrane
2. inner mitochondrial membrane
3. intermembranous space
4. mitochondrial crista



Şəkil 7.4. **Рисунок 7.4.** **Figure 7.4.**

Schematic diagram of protein complexes locating in inner mitochondrial membrane.

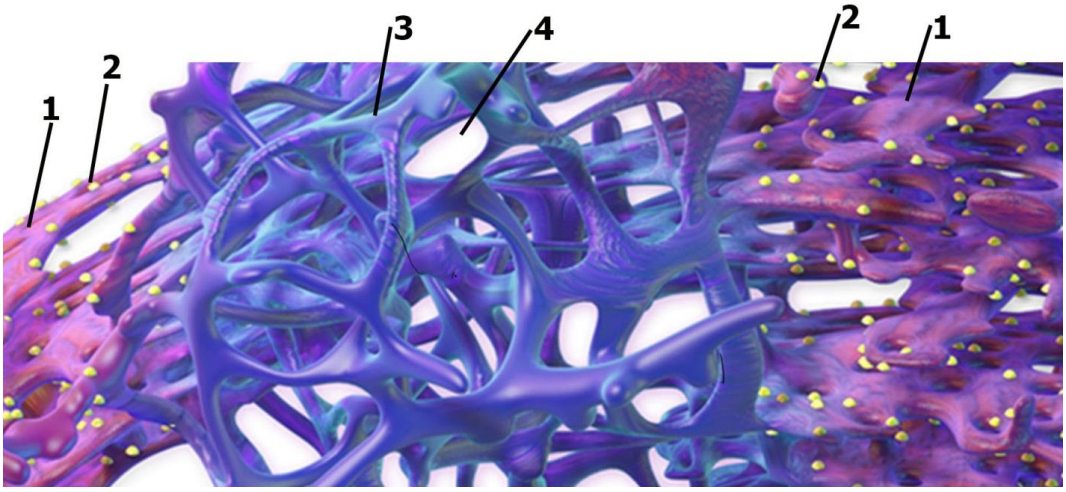
I-IV – electron transport system (respiratory chain); V – ATP-synthase.
1. succinate 2. cytochrome; 3. ADP; 4. ATP



Şəkil 7.5. **Рисунок 7.5.** **Figure 7.5.**

Schematic representation of proton gradient theory of ATP synthesis in mitochondria.

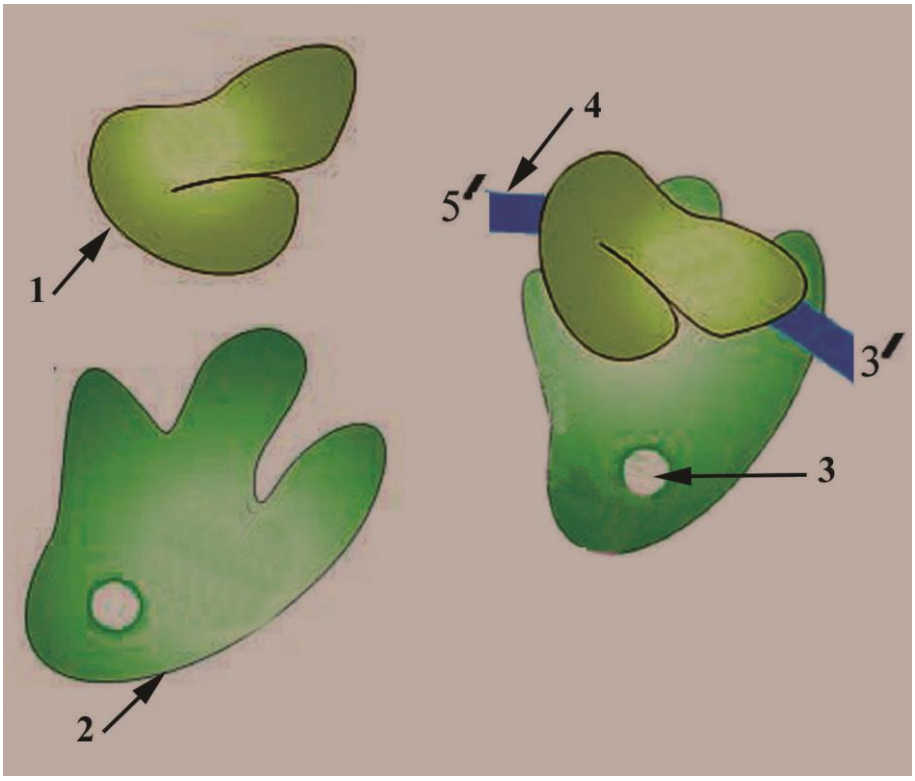
Ribosom. Endoplazmatik şəbəkə. 8



Şəkil 8.1. **Рисунок 8.1.** **Figure 8.1.**

Schematic representation of the endoplasmic reticulum

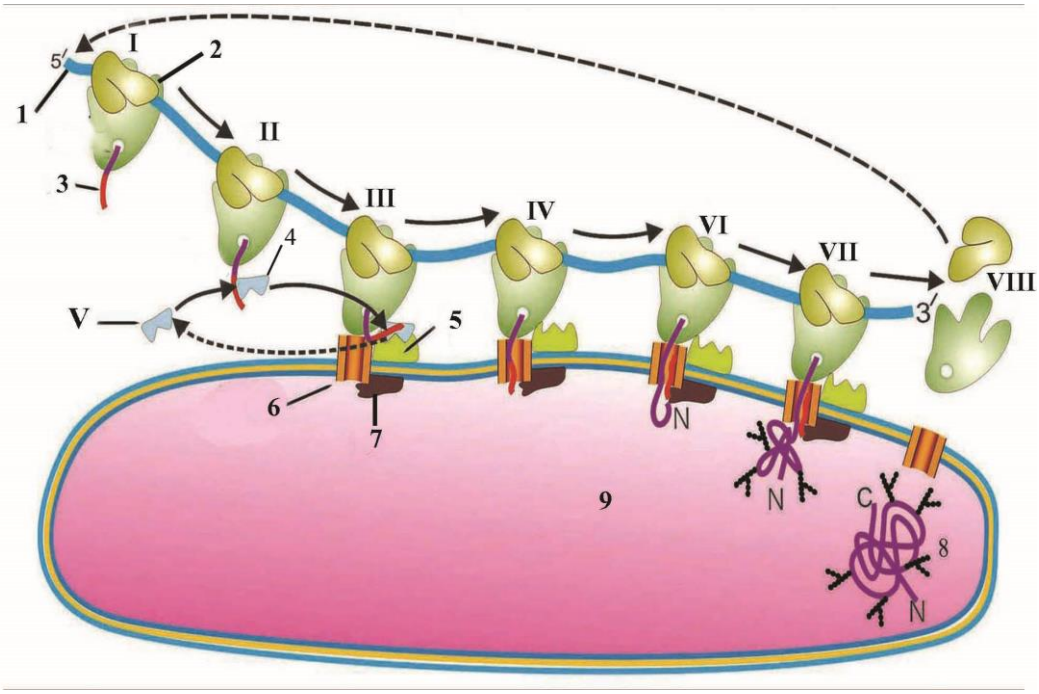
1. **Rough endoplasmic reticulum**
2. **Ribosome**
3. **Smooth endoplasmic reticulum**
4. **Cytoplasm**



Şəkil 8.2. **Рисунок 8.2.** **Figure 8.2.**

Schematic representation of ribosome.

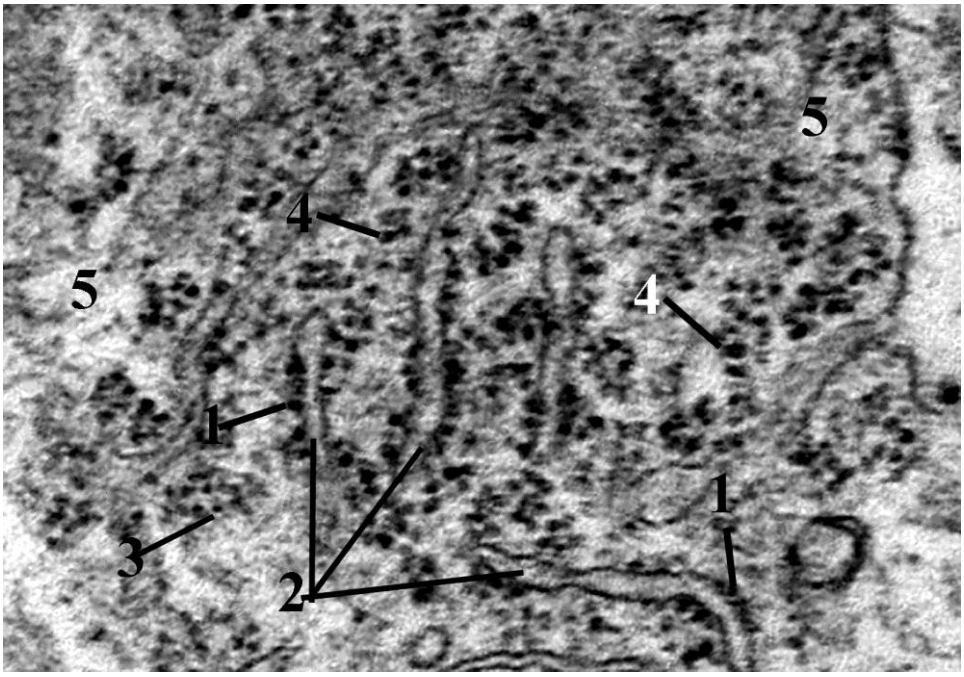
1. small subunit
2. large subunit
3. existing pore
4. mRNA.



Şəkil 8.3. Рисунок 8.3. Figure 8.3.
Schematic showing of signal theory of protein synthesis.

I synthesis of signal peptide II binding of signal peptide with signal-recognition particle (SRP) III binding of SRP with receptors IV entering of protein into rough endoplasmic reticulum V liberation of signal peptide from protein VI Growing polypeptide VII Terminal period of protein synthesis VIII separation of ribosomal subunits

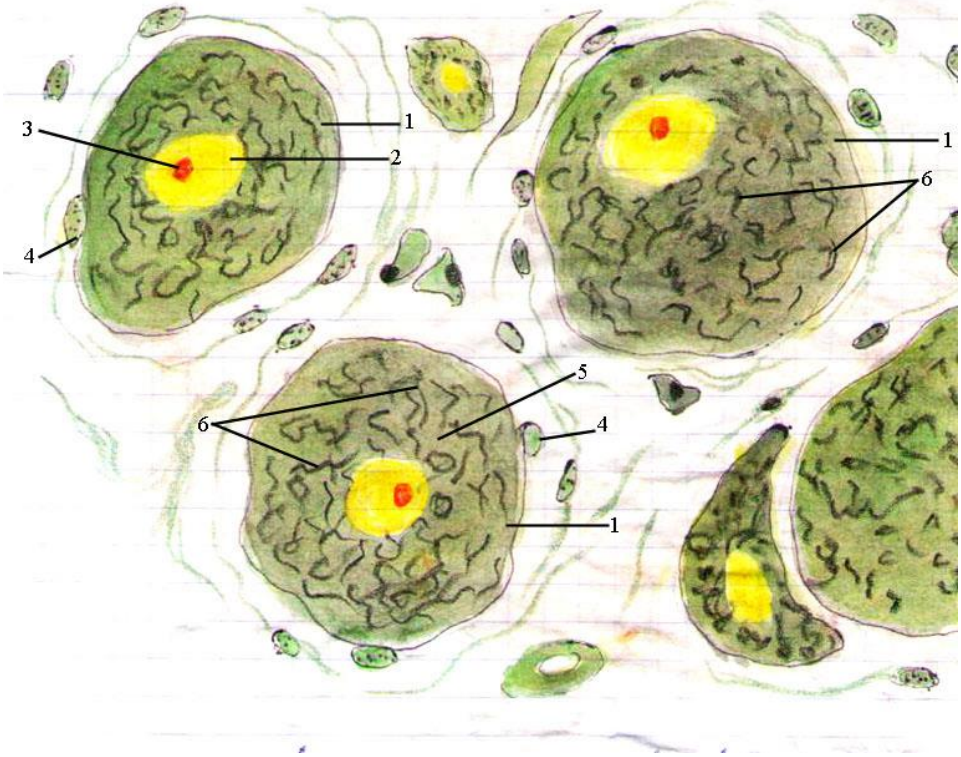
1. mRNA
2. ribosome
3. signal peptide
4. signal-recognition particle
5. SRP receptor
6. Sec61 protein
7. signal peptidase.
8. synthesized protein
9. cistern of rough endoplasmic reticulum



Şəkil 8.4. Рисунок 8.4. Figure 8.4.
Electron micrograph of ribosome and endoplasmic reticulum

1. ribosome of rough endoplasmic reticulum
2. cistern of rough endoplasmic reticulum
3. poliribosome
4. free ribosome
5. cytosol

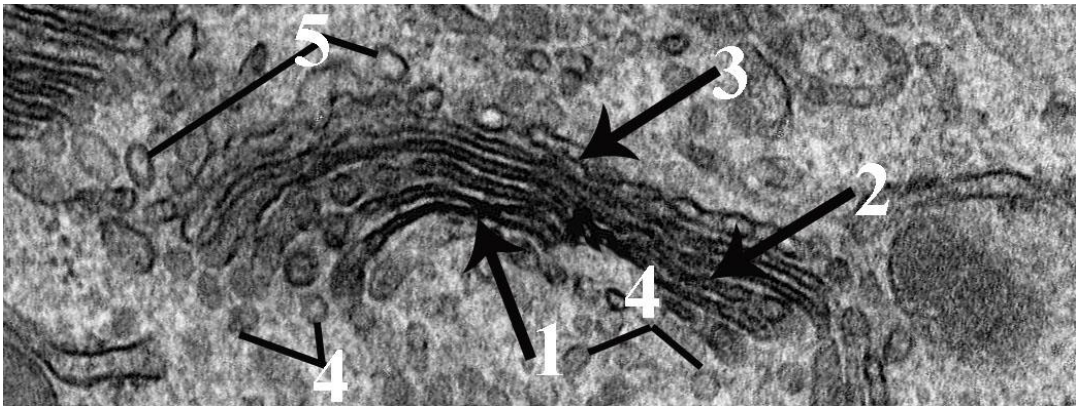
Holci kompleksi. Endosom. 9



Şəkil 9.1. **Рисунок 9.1.** **Figure 9.1.**

Golgi complex in pseudounipolar neurons of spinal ganglion. Stain: osmic acid.

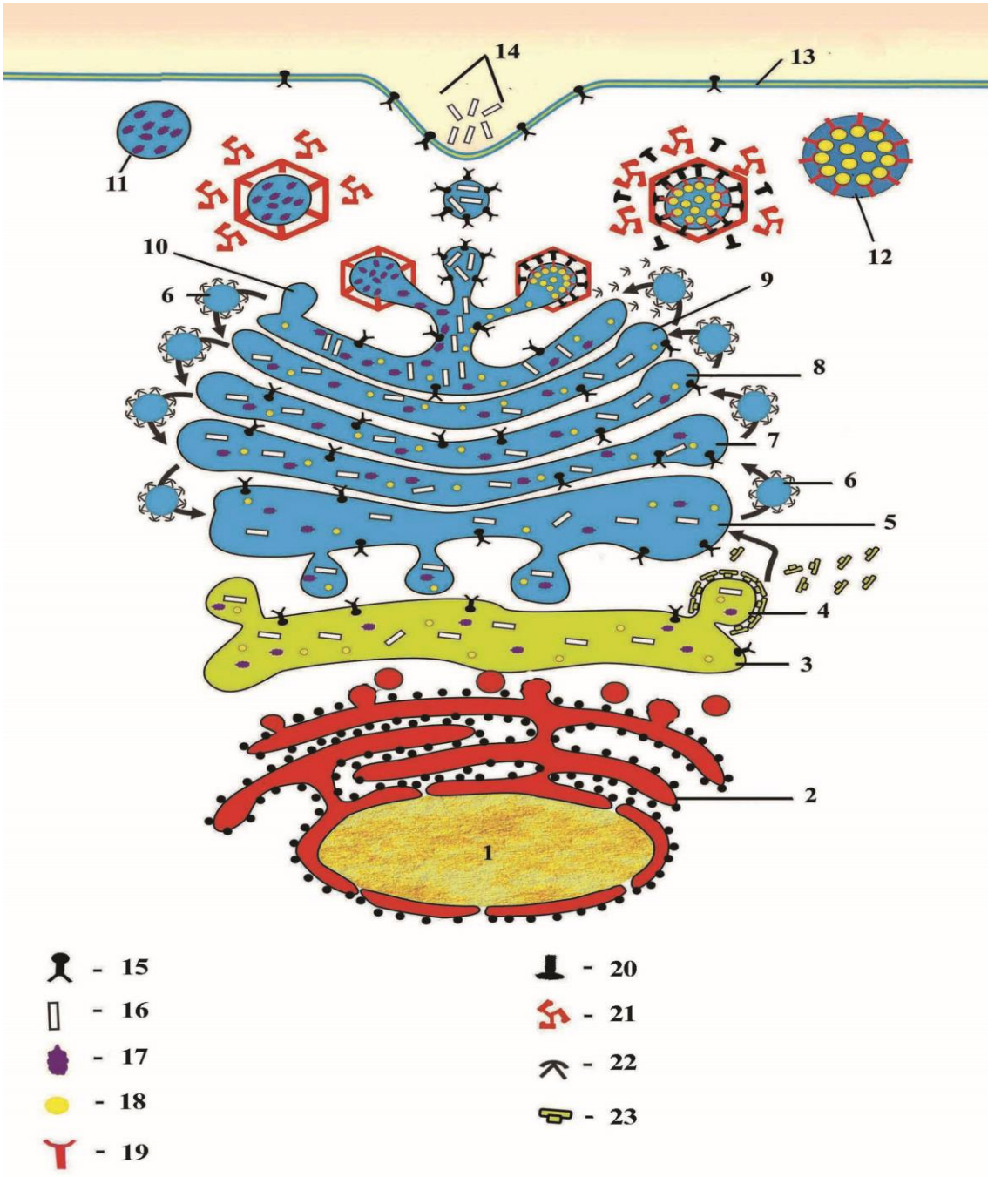
1. **neurons**
2. **nucleus**
3. **nucleolus**
4. **satellite cell**
5. **cytoplasm**
6. **Golgi complex.**



Şəkil 9.2. Рисунок 9.2. Figure 9.2.

Electron micrograph of Golgi complex and surrounding structure

1. trans face
2. medial face
3. cis face
4. secretory vesicle
5. transport vesicles

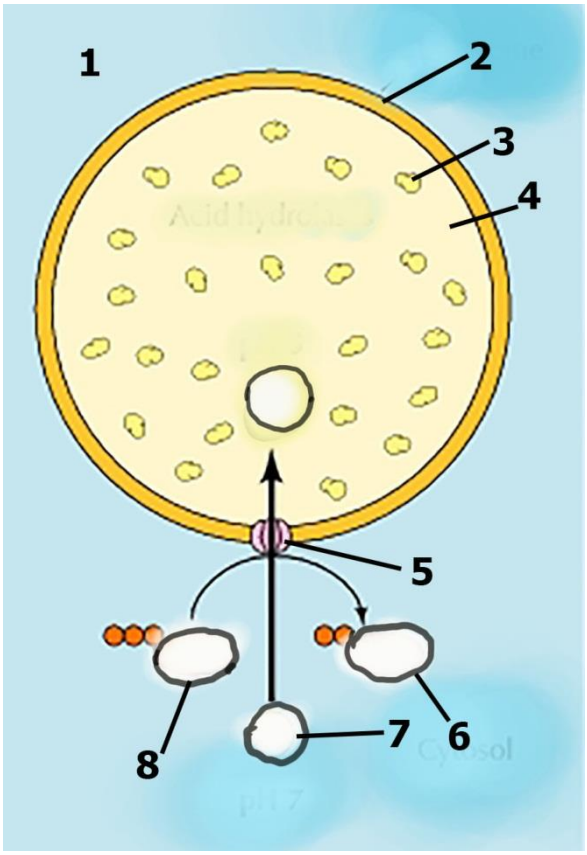


Şəkil 9.3. **Рисунок 9.3.** **Figure 9.3.**

Schematic representation of structures including to cellular secretory compartment.

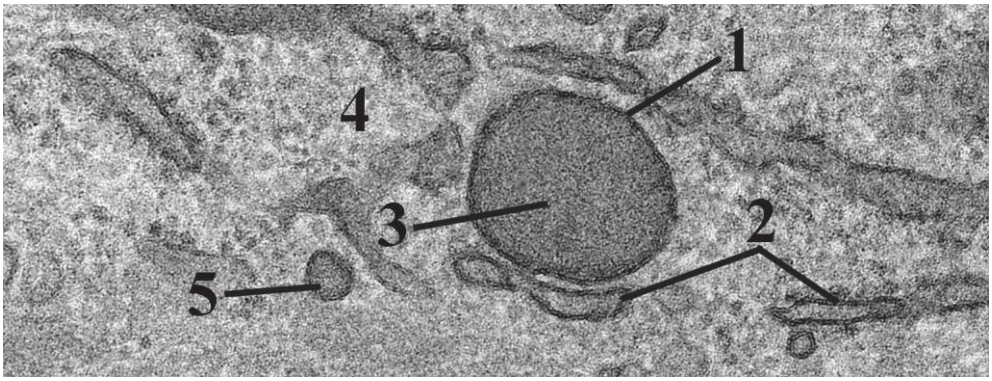
1. nucleus
2. rough endoplasmic reticulum
3. transitional endoplasmic reticulum
4. COP II coated vesicle
5. proximal tubulovesicular complex
6. COP I coated vesicle
7. cis face
8. medial face
9. trans face
10. distal tubulovesicular complex
11. secretor vesicle
12. primary lysosome
13. plasma membrane
14. Constitutive secretion.
15. plazmolemma's protein
16. Constitutive secreted protein
17. regulatory secreted protein
18. lysosomal enzymes
19. mannose 6 phosphatase
20. receptor for mannose 6 phosphatase
21. clathrin
22. COP I protein
23. COP II protein

Lizosom. Proteasom. Peroksisom. Sitoplazmatik əlavələr. 10



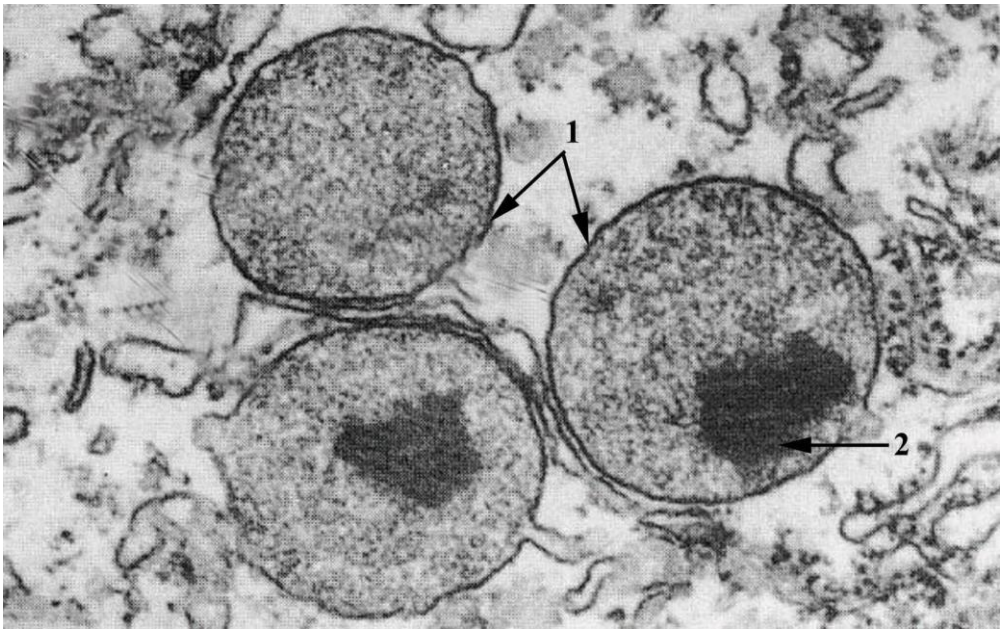
Şəkil 10.1. Рисунок 10.1. Figure 10.1.
Schematic diagram of lysosomes.

1. **cytoplasm**
2. **plasma membrane of lysosome**
3. **acid hydrolases**
4. **lumen of lysosome**
5. **proton pump**
6. **ADP**
7. **H atoms**
8. **ATP**



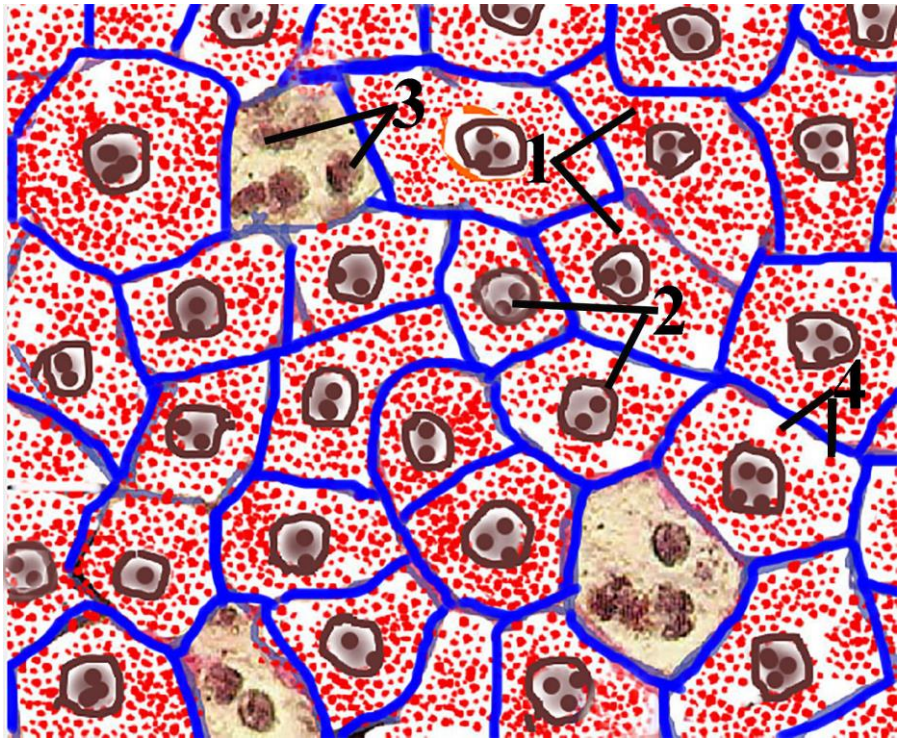
Şəkil 10.2. Рисунок 10.2. Figure 10.2.
Electron micrograph of lysosome and surrounding structures

1. **plasma membrane of lysosome**
2. **Cistern of smooth endoplasmic reticulum**
3. **Matrix of lysosome**
4. **cytosol**
5. **secretory vesicle**



Şəkil 10.3. **Рисунок 10.3.** **Figure 10.3.**

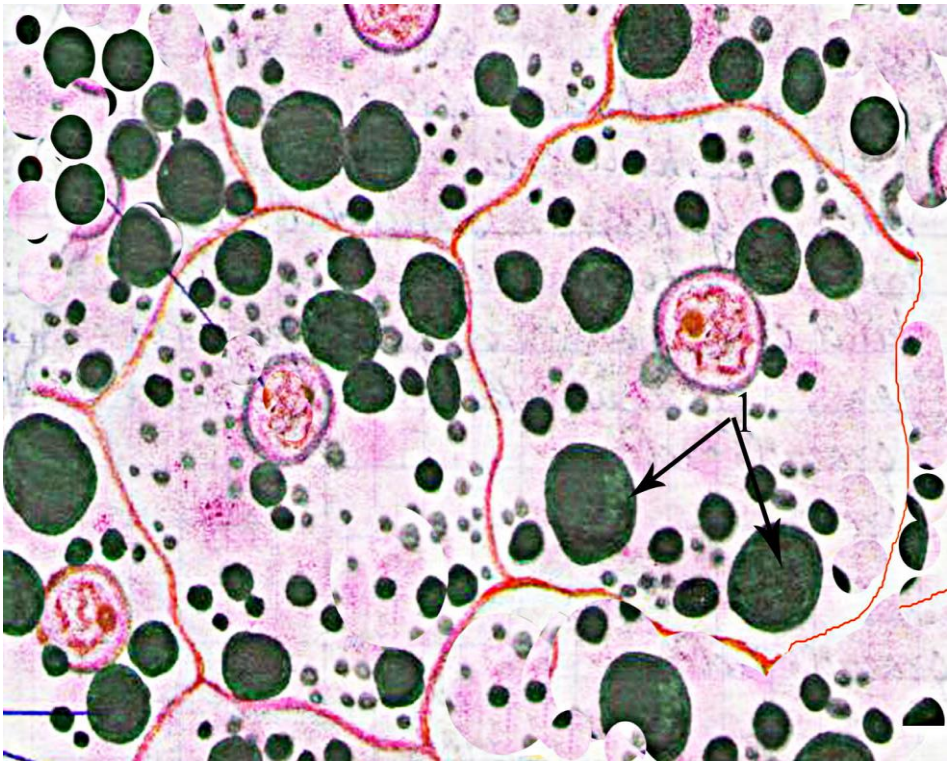
Electron microscopic structure of peroxisomes in the rat hepatocyte.
1. peroxisome; 2. urat oxidase crystalloid.



Şəkil 10.4. **Рисунок 10.4.** **Figure 10.4.**

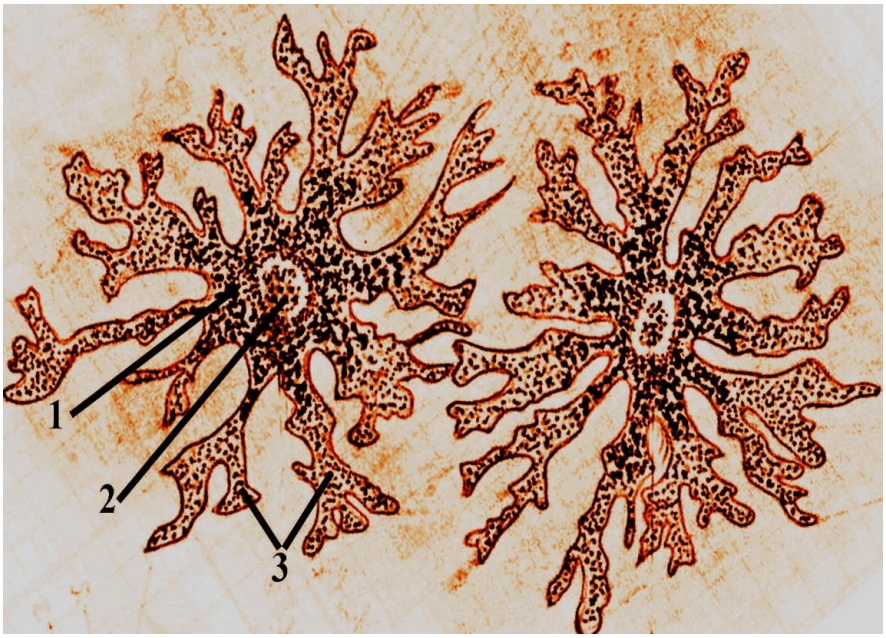
Histological structure of glycogen inclusions in liver cells. Best's carmine stain.

1. Cytoplasm of liver cell –hepatocyte
2. Nucleus of hepatocyte
3. Formed elements of blood
4. glycogen inclusions



Şəkil 10.5. **Рисунок 10.5.** **Figure 10.5.**

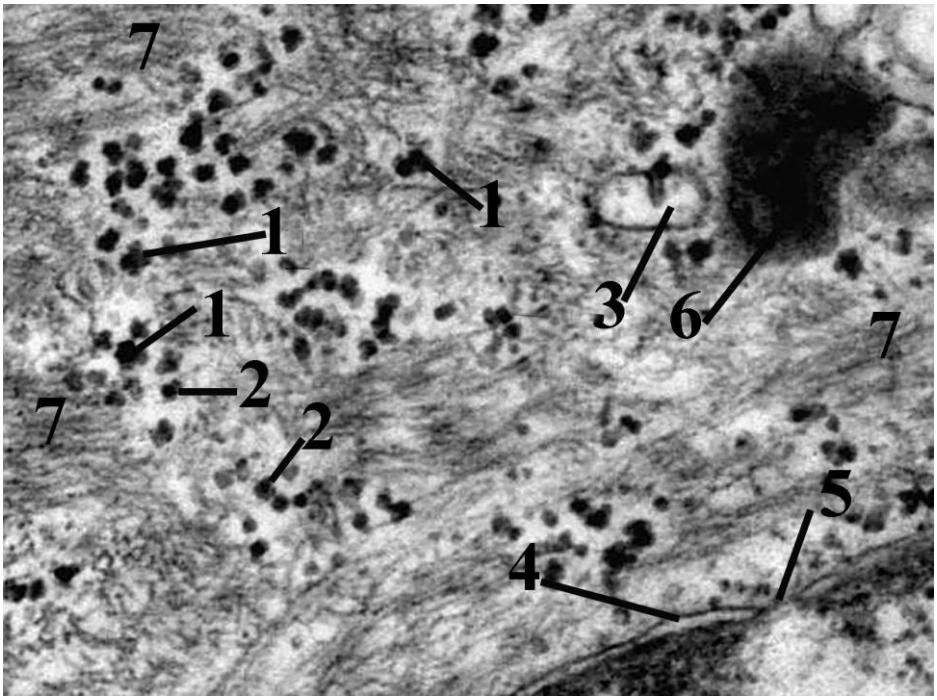
Fat droplets in liver cells.
Stain: osmic acid – safranin.
1. fat droplets



Şəkil 10.6. **Рисунок 10.6.** **Figure 10.6.**

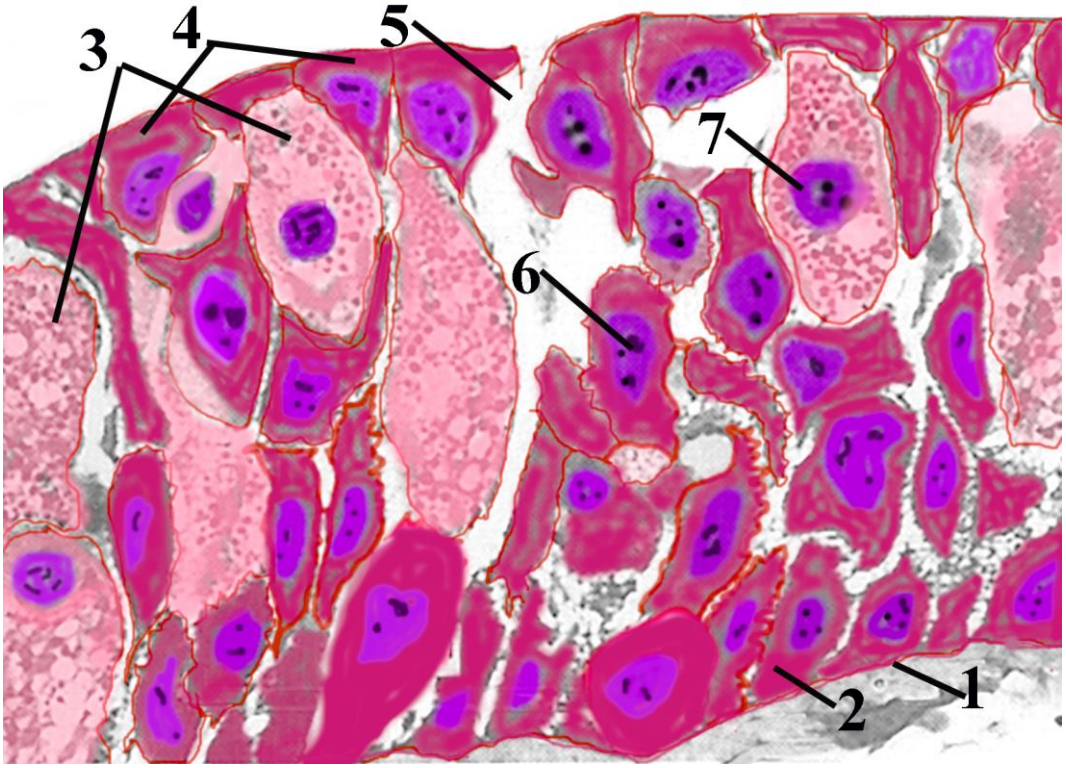
Pigment inclusions in melanocyte. Uncolored.

1. pigment cell – melanocyte
2. nucleus
3. pigment granules.



Şəkil 10.7. Рисунок 10.7. Figure 10.7.
Electron micrograph of glycogen granules situated in cytoplasm of keratinocyte and surrounding structure.

1. α-granules
2. β- granules
3. smooth endoplasmic reticulum
4. outer nuclear membrane
5. nuclear pore
6. lysosome
7. intermediate filament



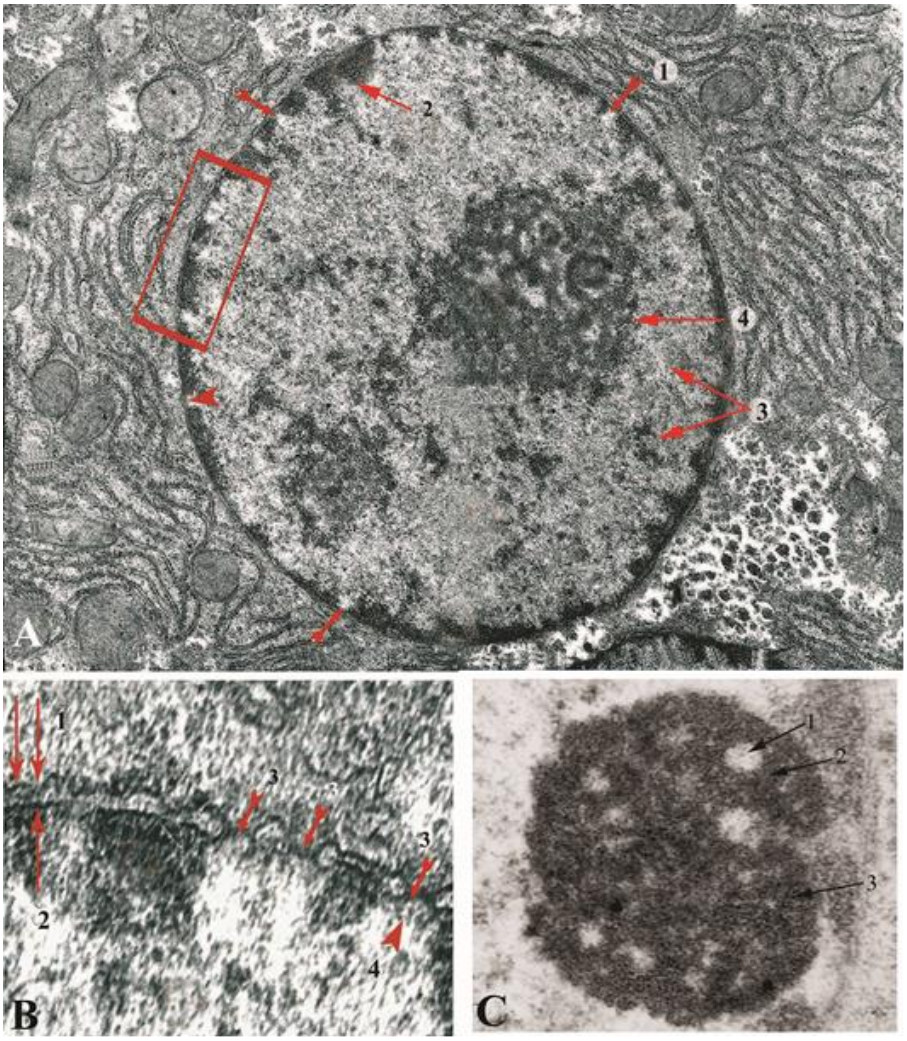
Şəkil 10.8. **Рисунок 10.8.** **Figure 10.8.**

Electron micrograph of secretory granules in the Leydig cells of axolots skin. Scheme. Stain: hematoxylin-eosin.

1 basal membrane
2 cells of stratum basale
3 cytoplasm of Leydig cells
4 epidermal cell
5 intercellular space in superficial layer of skin
6 nucleolus of Leydig cells
7 nucleus of Leydig cells

Nüvə haqqında ümumi məlumat. Nüvə örtüyü.

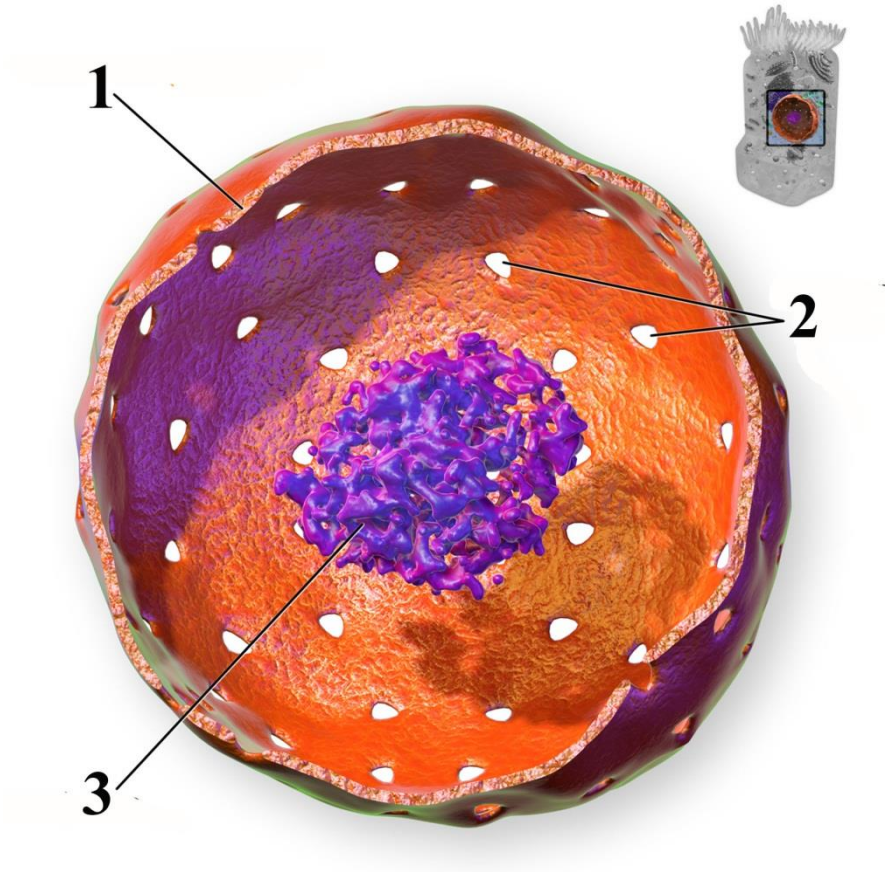
11



Şəkil 11.1. **Рисунок 11.1.** **Figure 11.1.**

Electron micrograph of nucleus and its structural elements.

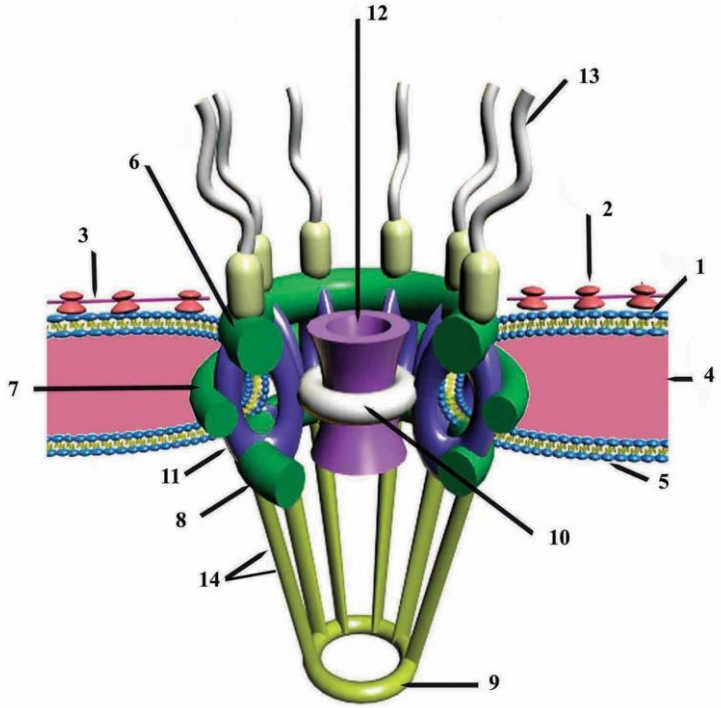
1. nuclear envelope; 2. heterochromatin; 3. euchromatin; 4. nucleolus; 5. outer nuclear membrane; 6. inner nuclear membrane; 7. nuclear pore; 8. nuclear pore complex.



Şəkil 11.2. **Рисунок 11.2.** **Figure 11.2.**

Schematic structure of nucleus.

1. **Nuclear envelope**
2. **Nuclear pore**
3. **Nucleolus**

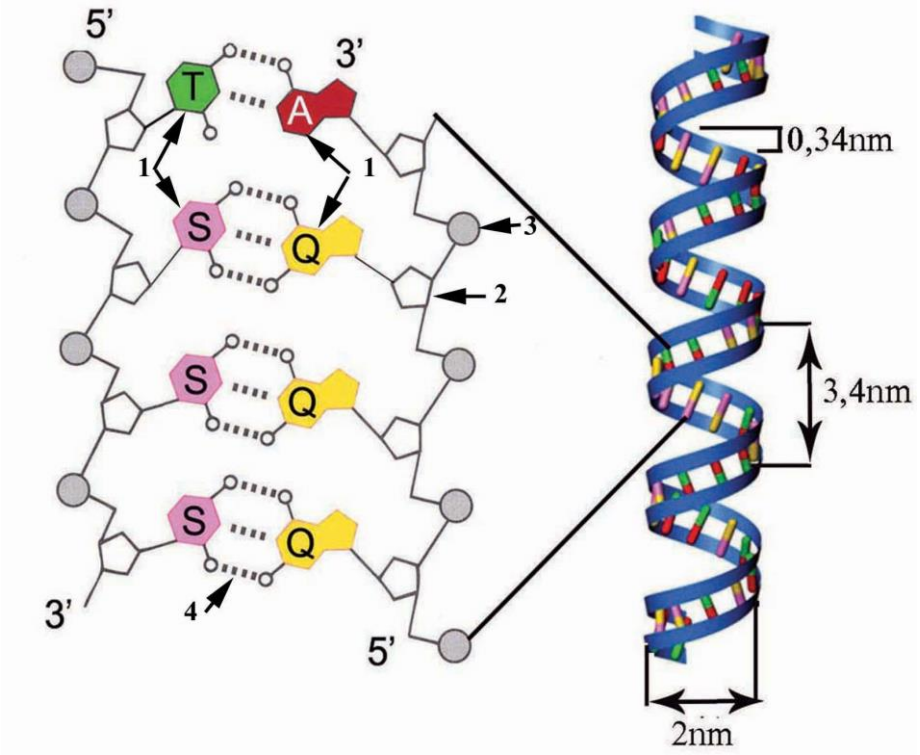


Şəkil 11.3. Рисунок 11.3. Figure 11.3.

Schematic representation of three-dimensional structure of nuclear pore complex.

1. outer nuclear membrane
2. ribosome
3. mRNA
4. perinuclear space
5. inner nuclear membrane
6. cytoplasmic ring
7. luminal (middle) ring
8. nuclear ring
9. terminal ring
10. inner core ring
11. core
12. central part
13. cytoplasmic filament
14. nuclear filaments.

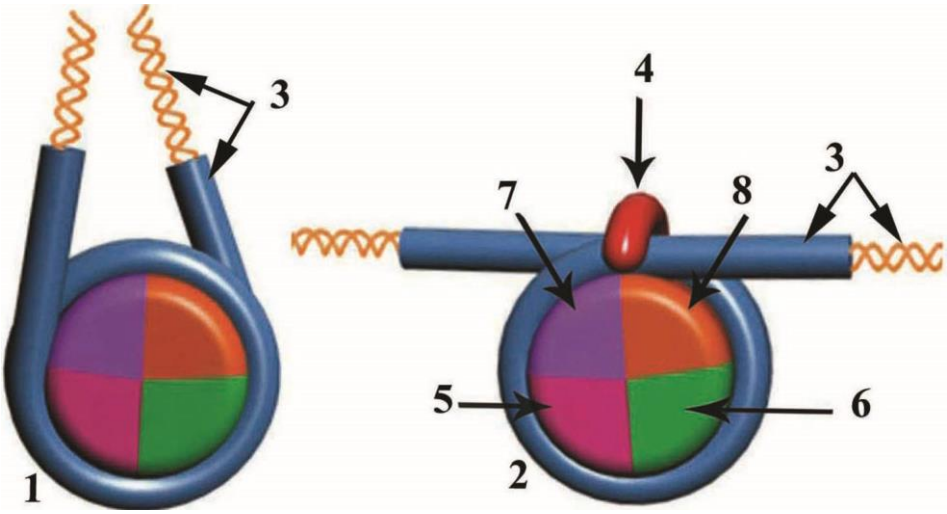
Nukleoplazma. Xromatin. Nüvəcik. 12



Şəkil 12.1. **Рисунок 12.1.** **Figure 12.1.**

Schematic representation of three-dimensional structure of DNA molecule.

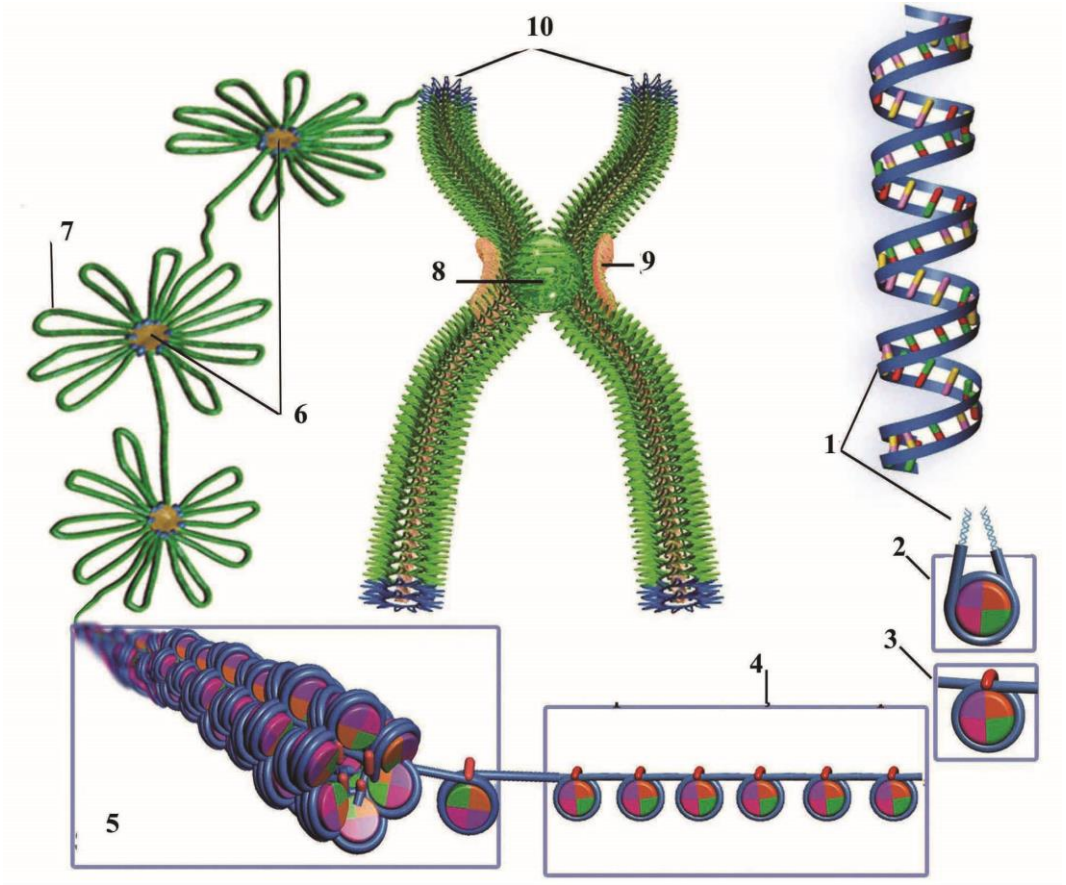
1. nitrogenous base
2. desoxiribose
3. phosphate acid.



Şəkil 12.2. **Рисунок 12.2.** **Figure 12.2.**

Schematic representation of nucleosome and chromatosome.

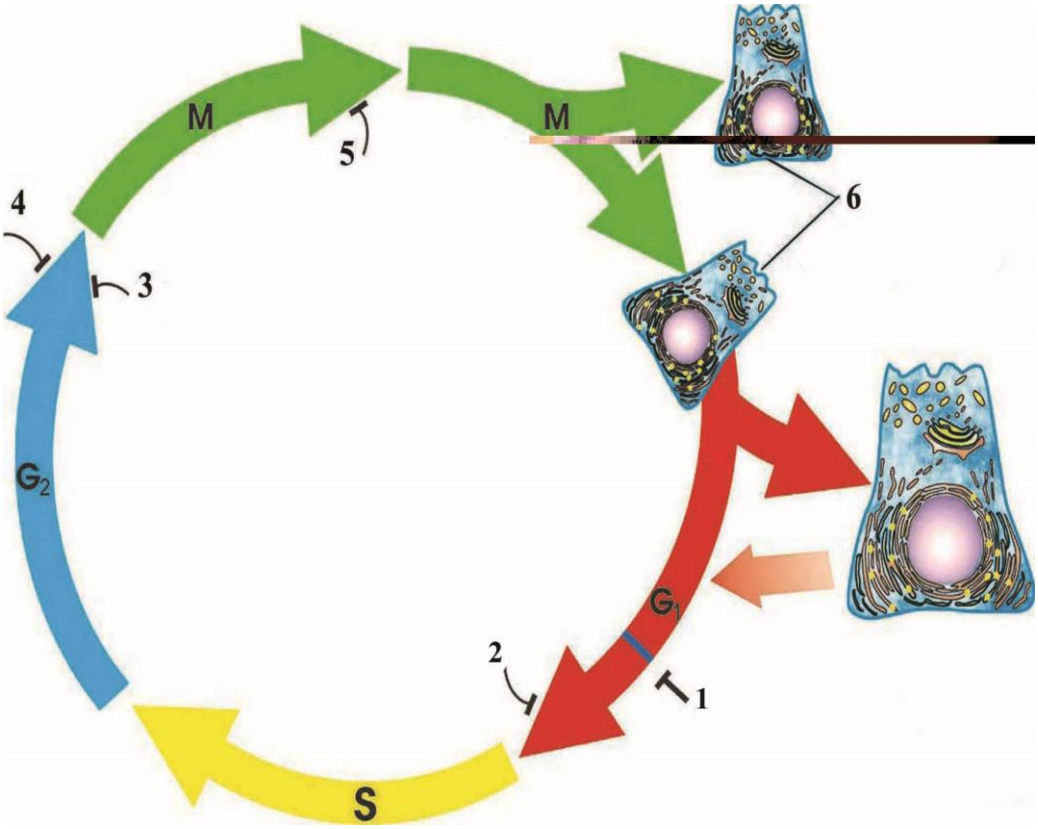
1. nucleosome
2. chromatosome
3. DNA chain
4. H1 protein
5. H2A protein
6. H2B protein
7. H3 protein
8. H4 protein.



Şəkil 12.3. Рисунок 12.3. Figure 12.3.
“Radial-loop” model of structure of metaphase chromosome.

1. DNA
2. nucleosome
3. chromatosome
4. stringing bead
5. solenoid
6. chromosome core
7. chromosome loop (fiber)
8. centromere
9. kinetochore
10. telomere

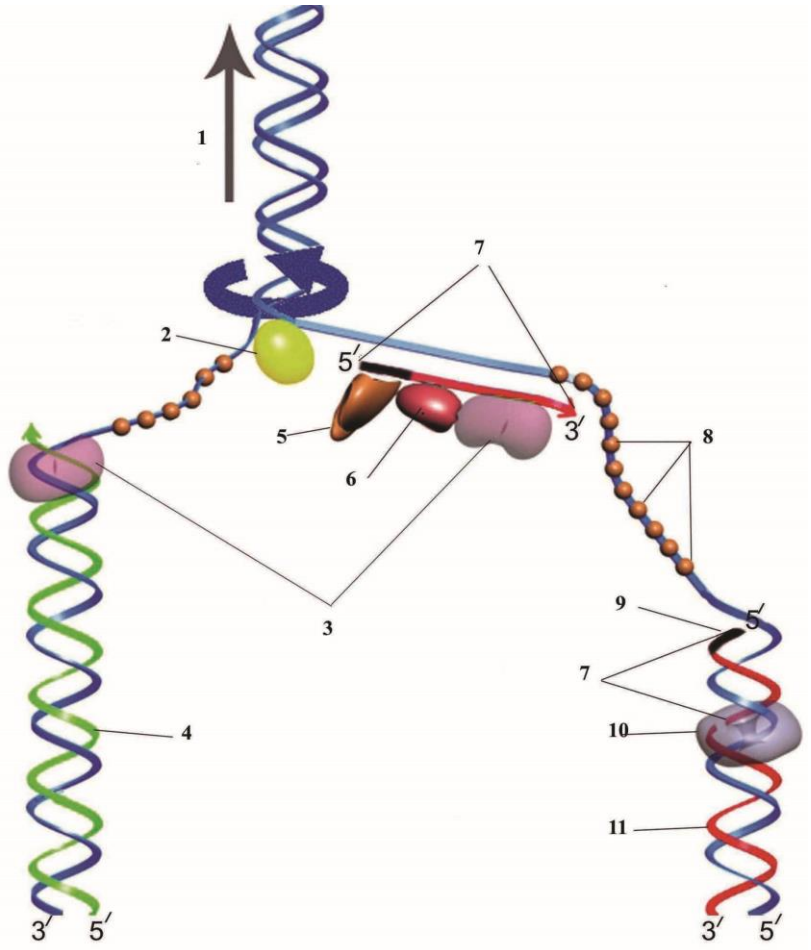
Hüceyrə tsikli. Mitoz. 13



Şəkil 13.1. **Рисунок 13.1.** **Figure 13.1.**

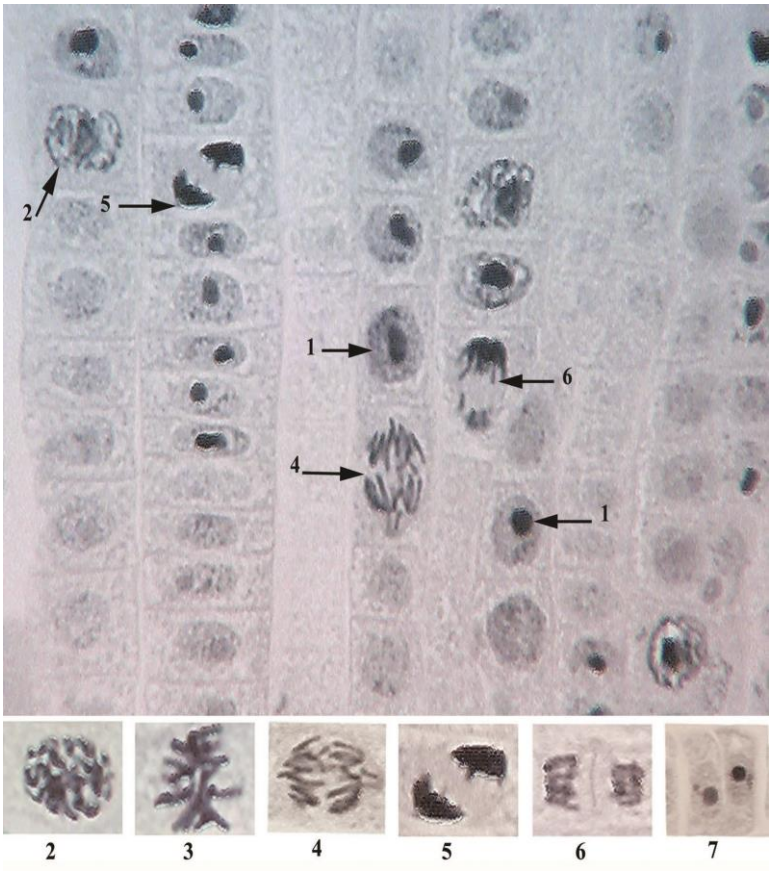
Schematic drawing of cell cycle phases and checkpoints.

1. checkpoint regulated the damaging of DNA
2. restriction point of G_1 phase
3. checkpoint regulated correct DNA replication
4. checkpoint regulated correct DNA duplication
5. checkpoint defined the damaging of DNA
6. daughter cells.



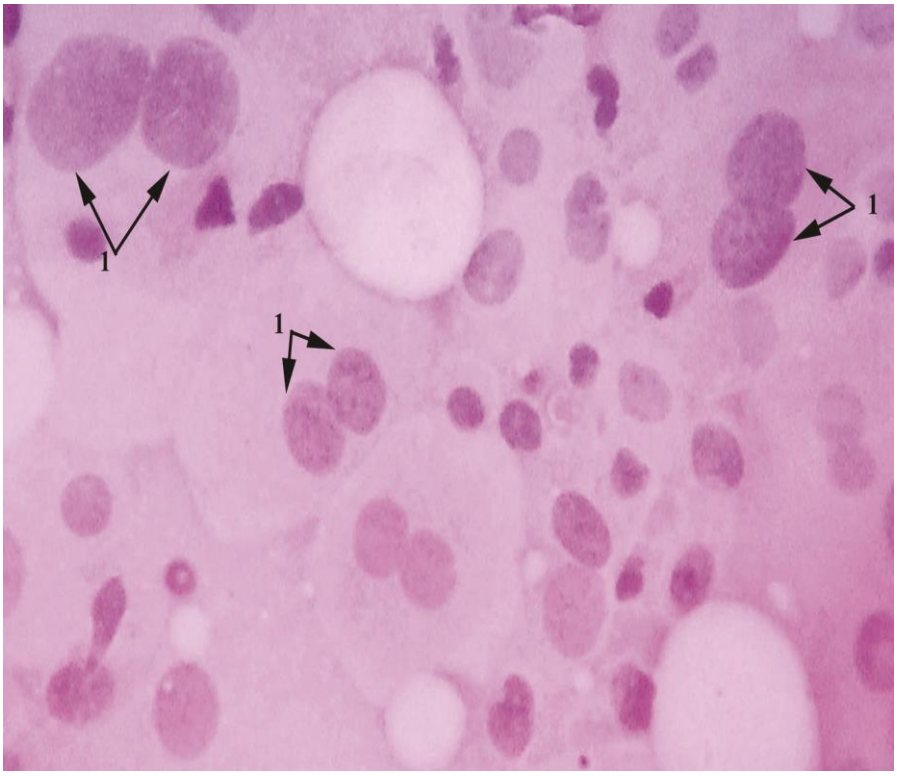
Şəkil 13.2. Рисунок 13.2. Figure 13.2.
Schematic drawing of DNA replication.

1. movement of replication fork
2. helixase
3. δ-polymerase
4. leading chain
5. primase
6. α- polymerase
7. Okazaki fragment
8. proteins jointed with single DNA chain
9. primer
10. DNA ligase
11. lagging chain.



Şəkil 13.3. **Рисунок 13.3.** **Figure 13.3.**

Mitosis. In onion root cells.
Stain: ferrous-hematoxylin.
1. interphase
2. Prophase
3. metaphase
4. Anaphase A
5. Anaphase B
6. telophase
7. Daughter cells.

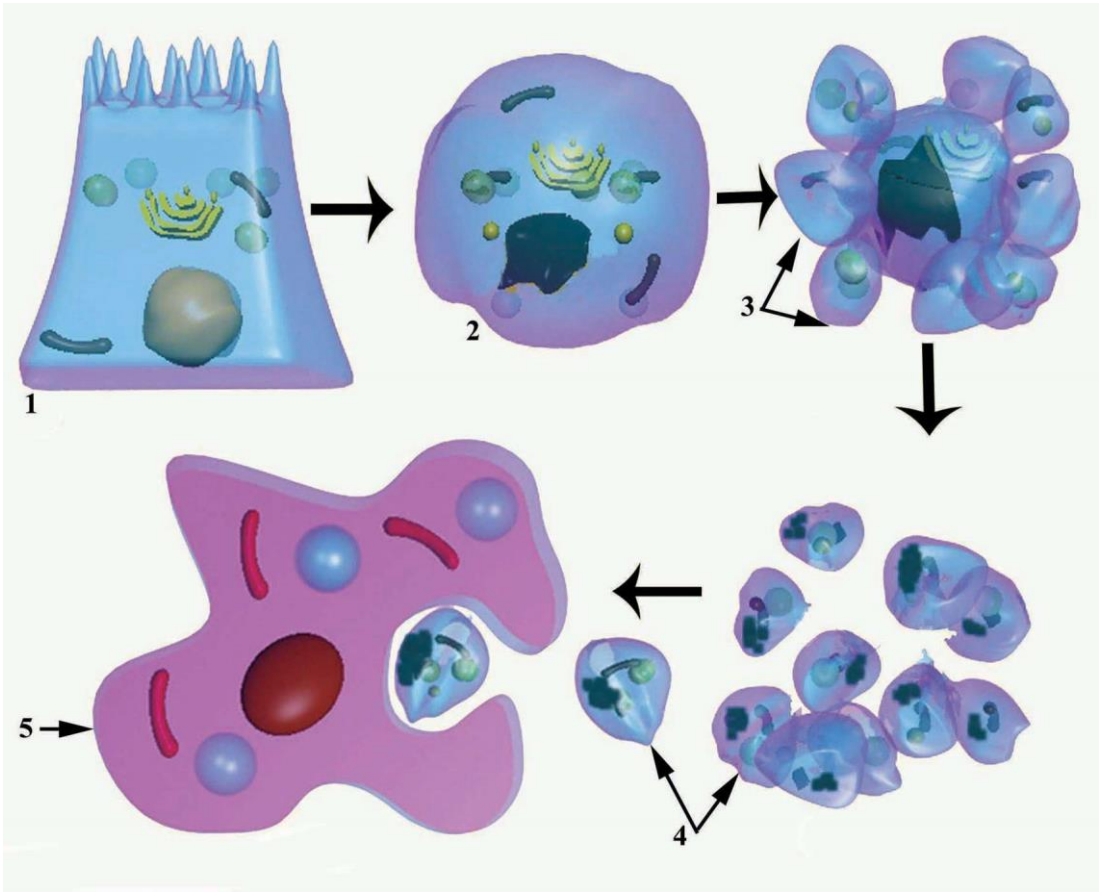


Şəkil 13.4. **Рисунок 13.4.** **Figure 13.4.**

Amitosis. In the epithelial cell of urinary bladder mucosa.

Stain: hematoxylin-eosin.

1.daugther cells

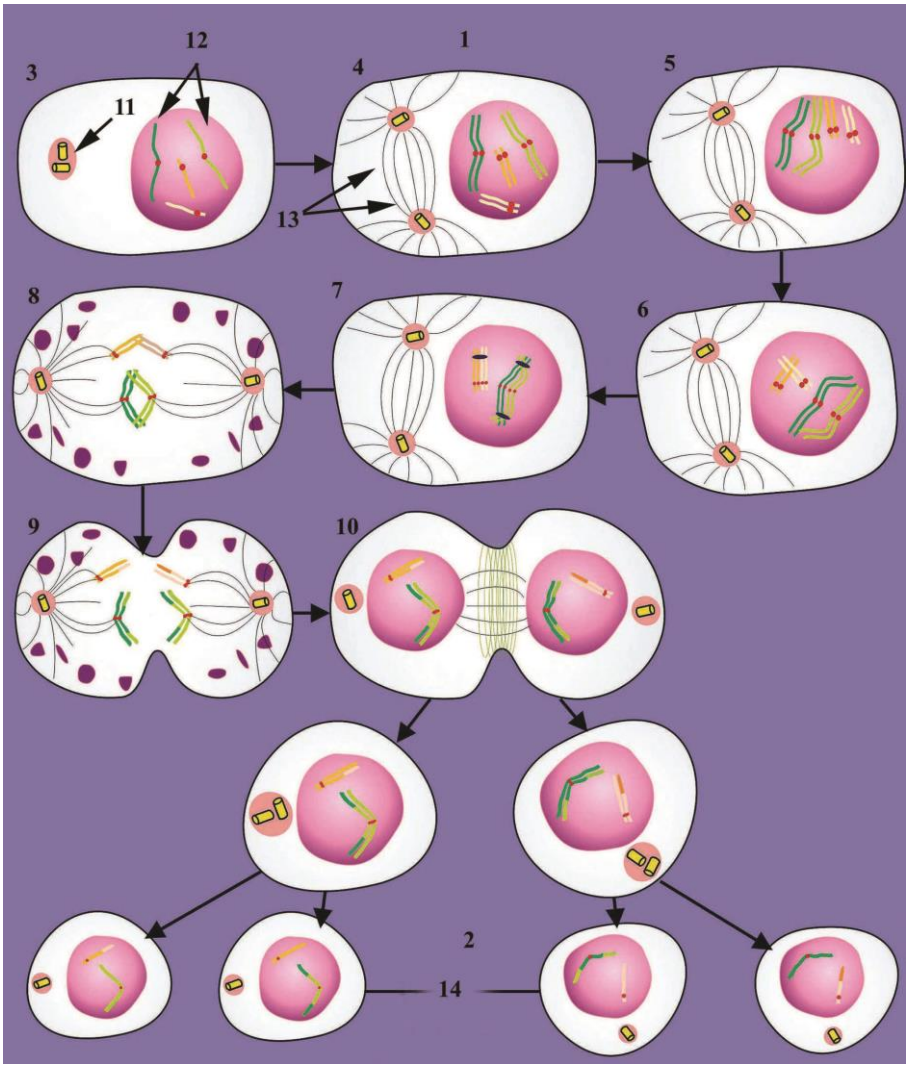


Şəkil 13.5. **Рисунок 13.5.** **Figure 13.5.**

Schematic diagram of the morphological changes occurs during the apoptosis.

1. cell
2. disappearing of microvilli and destroying of intercellular junctions
3. formation of apoptotical vesicles
4. shattering of cell to apoptotical bodies
5. phagocytotic cell
6. swallowing of apoptotical body.

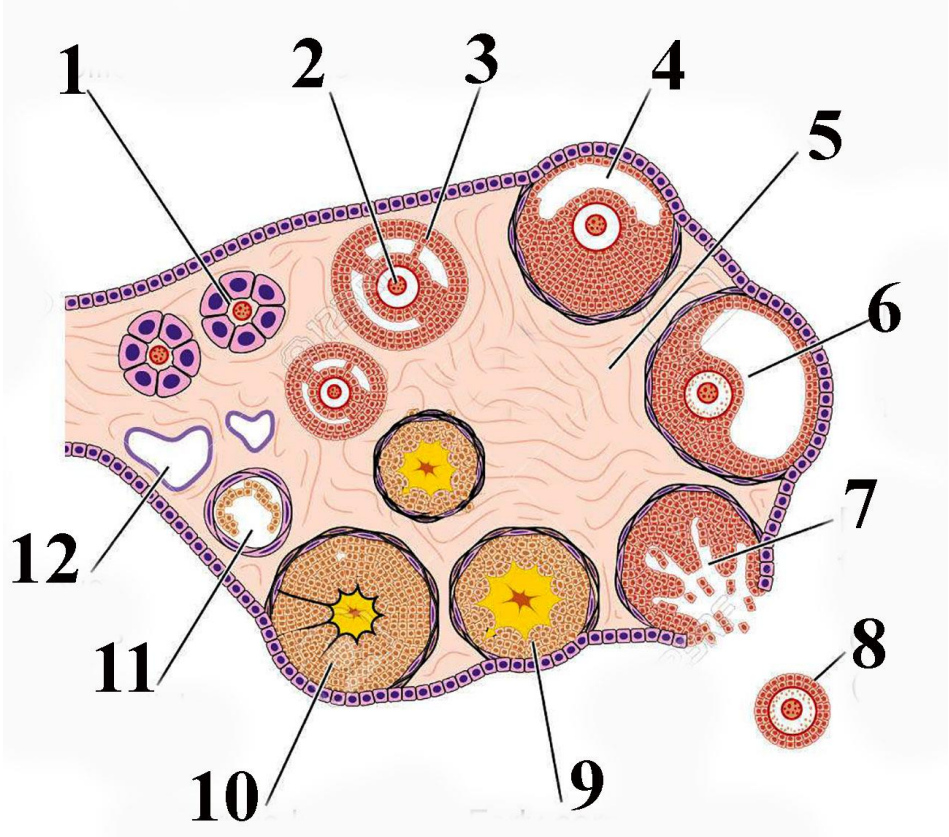
I diaqnostikum.	14
Progenez. Meyoz. Cinsi hüceyrələrin quruluşu.	**15**



Şəkil 15.1. **Рисунок 15.1.** **Figure 15.1.**

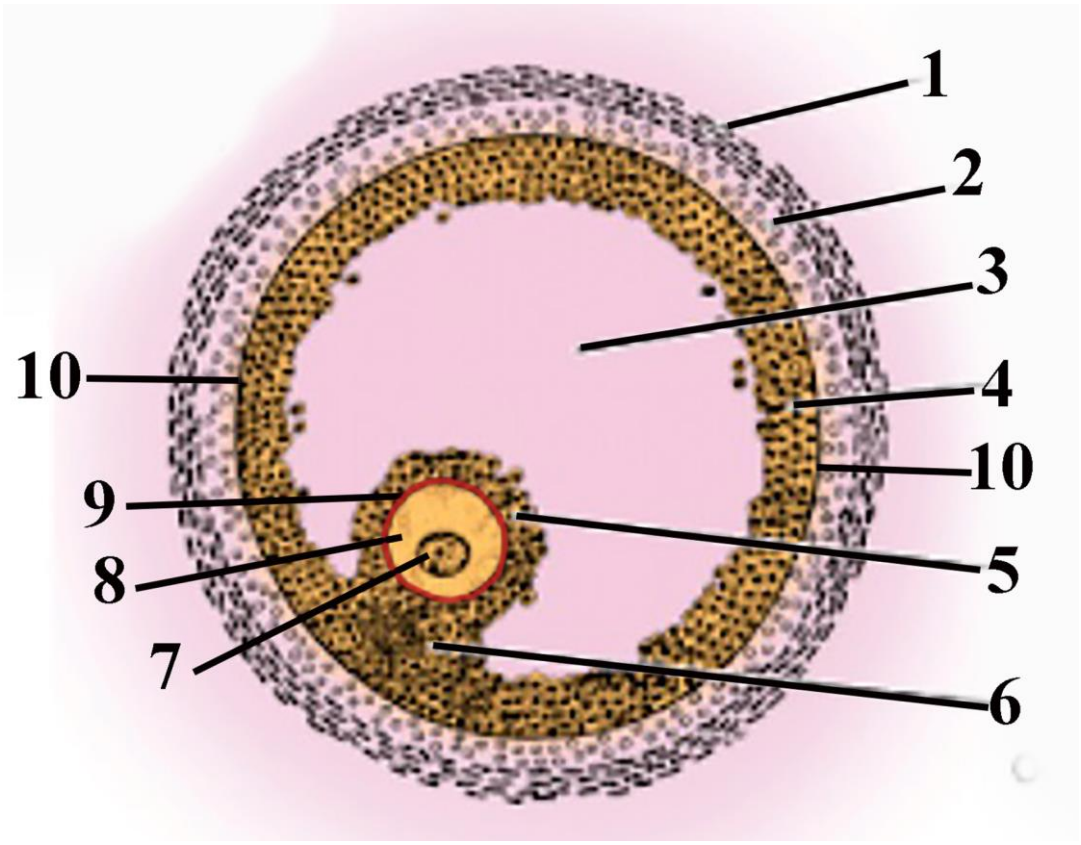
Schematic drawing of different stages of meiotic division in men.

1. I meiosis
2. II meiosis
3. and 4. premeiotic S phase
5. leptotene-zygotene bouquet
6. zygotene
7. pachytene
8. metaphase
9. anaphase
10. telophase
11. centrosome
12. chromosomes
13. mitotic spindle
14. daughter cells.



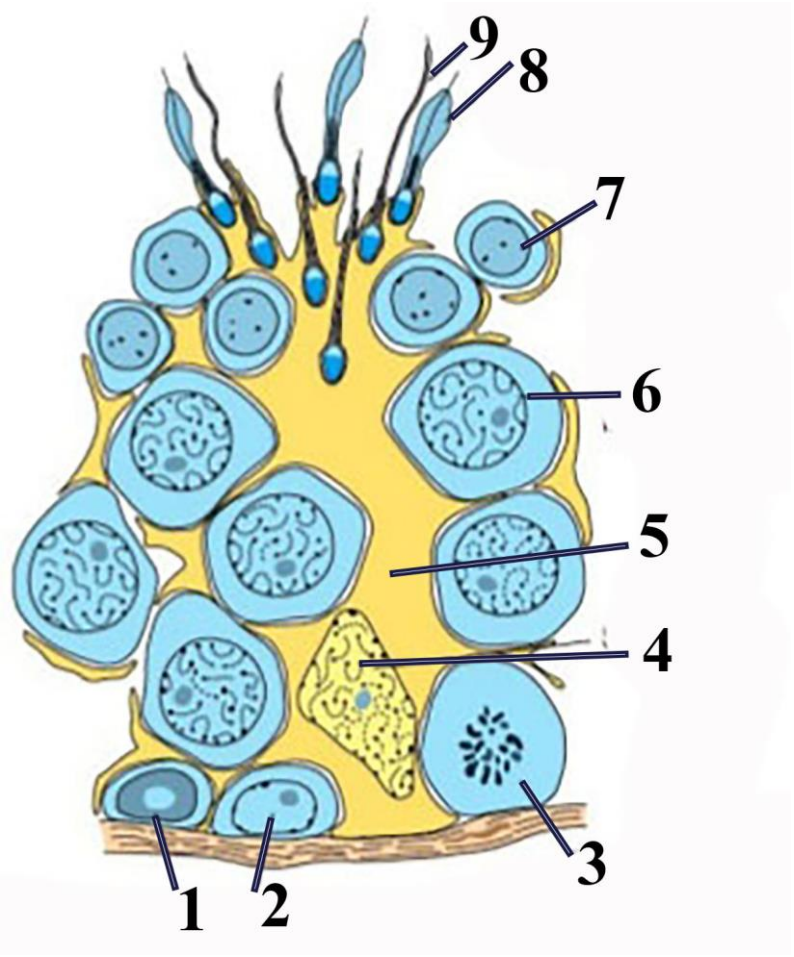
Şəkil 15.2. **Рисунок 15.2.** **Figure 15.2.**

Diagram of ovarian structure and follicular development.
1. primary preantral follicule
2. primary oocyte
3. secondary antral vesicular follicle
4. antrum
5.connective tissue of the ovary
6. mature vesicular Graafian follicle
7. ruptured follicle - ovulation
8. secondary oocyte in 2nd meiotic division
9.formated corpus luteum
10. corpus luteum of pregnancy
11. corpus atreticum
12.corpus albicans



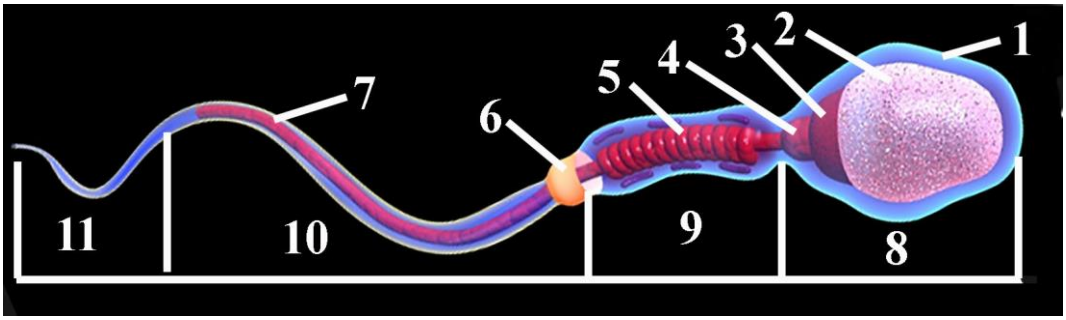
Şəkil 15.3. **Рисунок 15.3.** **Figure 15.3.**

Schematic structure of the mature vesicular Graafian follicle
1. theca externa
2. theca interna
3. antrum
4. layer of granulosa cells
5. corona radiata
6. cumulus oophorus.
7. nucleus of primary oocyte
8. cytoplasm of primary oocyte
9. zona pellucida
10. basement membrane



Şəkil 15.4. Рисунок 15.4. Figure 15.4.
The different stages of spermatogenesis

1. dark type A spermatogonia
2. pale type A spermatogonia
3. spermatogonial division
4. nucleus of sustentacular or Sertoli cells
5. cytoplasm of sustentacular or Sertoli cells
6. primary spermatocytes
7. spermatids
8. maturing spermatids
9. spermatozoa (mature sperm)



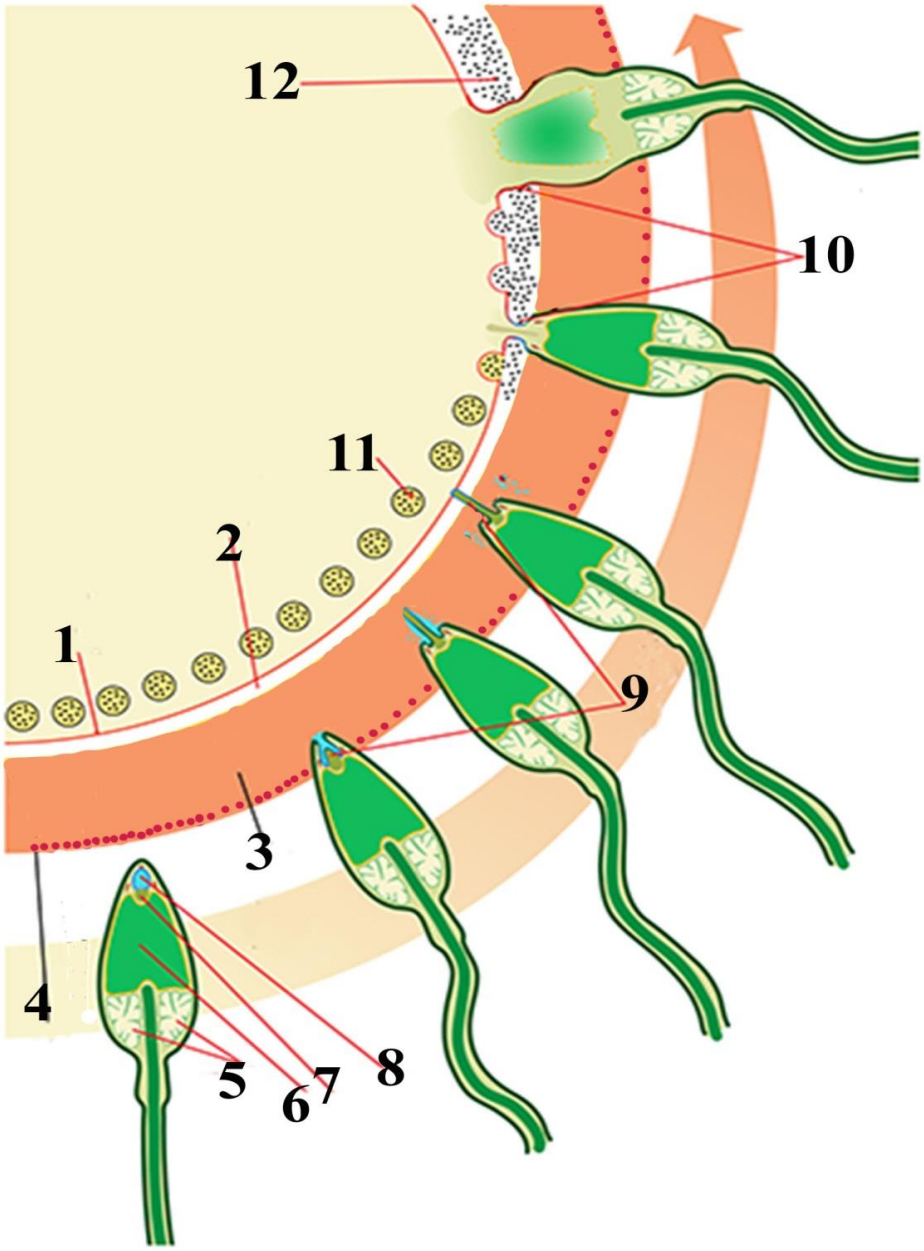
Şəkil 15.5. **Рисунок 15.5.** **Figure 15.5.**

Schematic structure of the spermatozoa.

1. plasmalemma,
2. acrosome
3. nucleus
4. neck
5. Mitochondrion
6. Annulus
7.axoneme
8. head
9. Middle piece
10. Principal piece
11. End piece

Mayalanma. Ziqotanın xırdalanması. Morula.

16



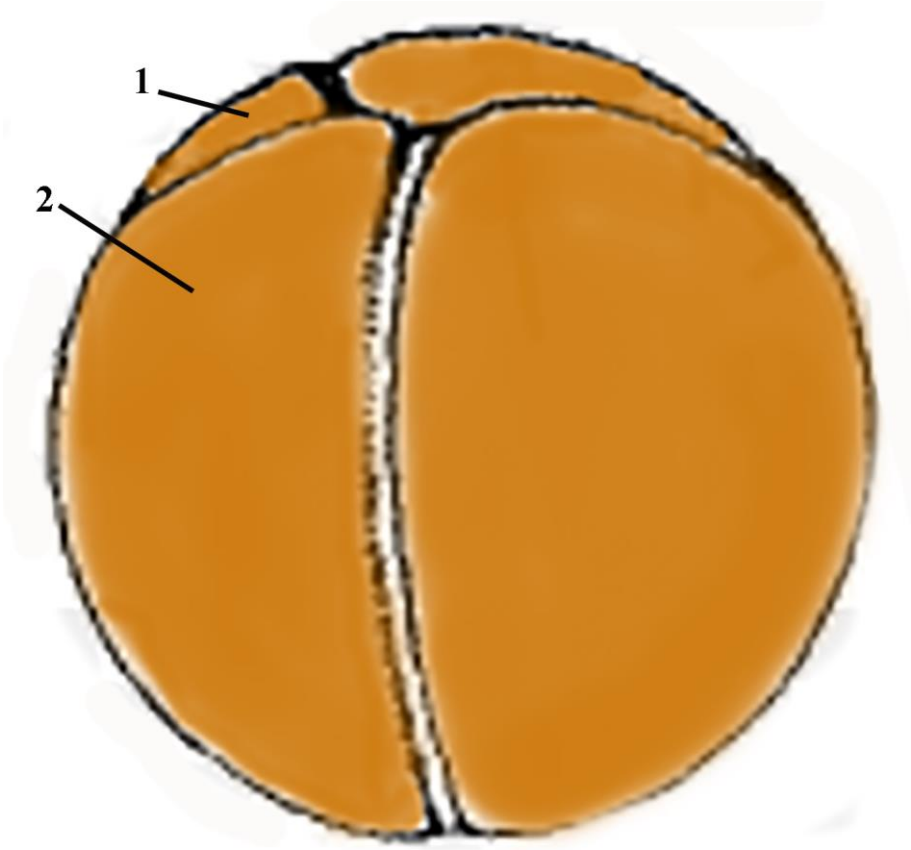
Şəkil 16.1. **Рисунок 16.1.** **Figure 16.1.**

Schematic picture of acrosomal reactions

1. **plasma membrane of oocyte – oolemma**
2. **perivitteline space**
3. **zona pellucida**
4. **receptor proteins**
5. **mitochondria**
6. **nucleus**
7. **actin filaments**
8. **acrosomal granules**
9. **acrosomal reactions**
10. **perforation of oolemma**
11. **cortical granules**
12. **content of cortical granules**

Şəkil 16.2. **Рисунок 16.2.** **Figure 16.2.**

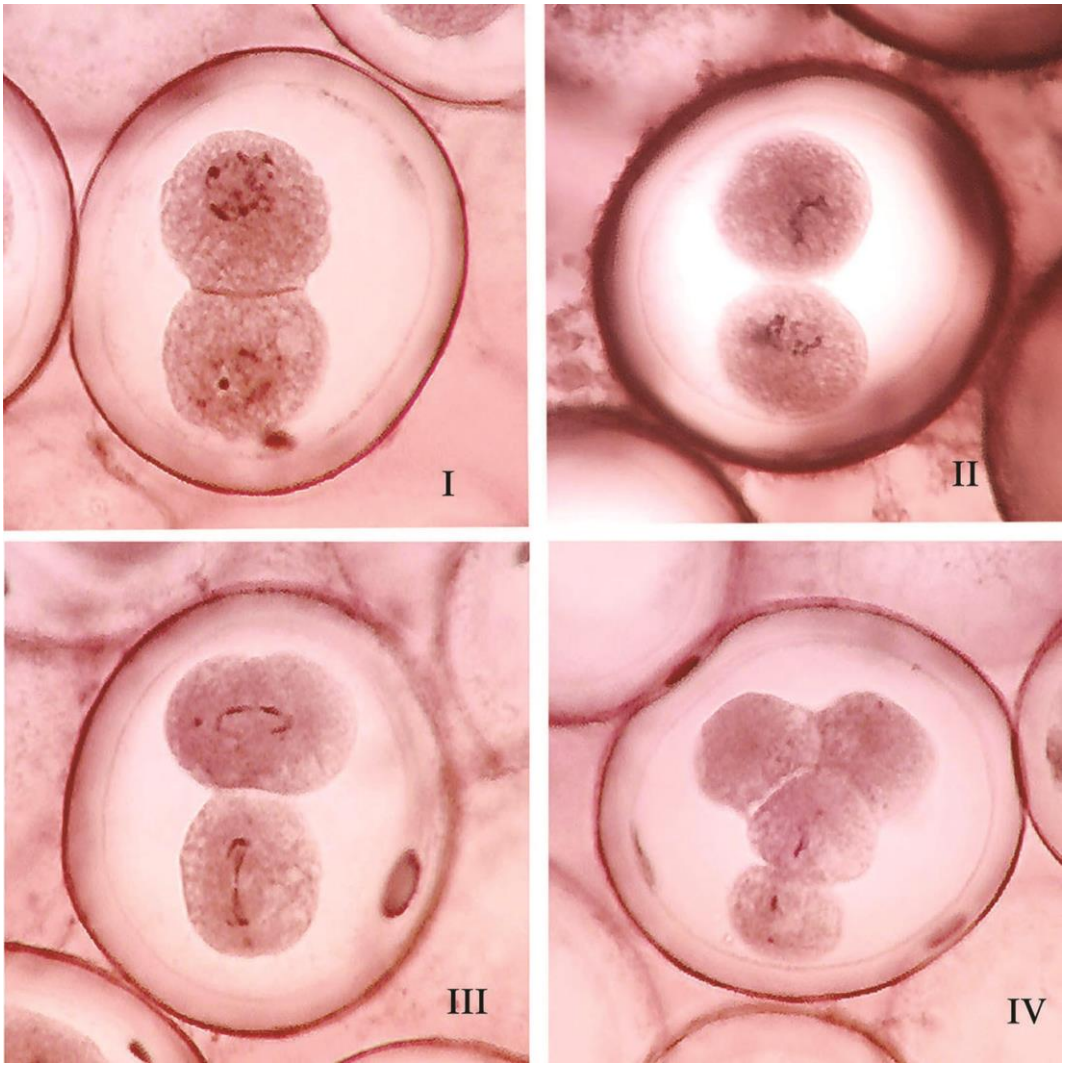
The microscopic picture of syncaryon in a fertilized horse ascaride oocyte.
Stain: ferrous hematoxylin.
1. fusion of male and female pronuclei.



Şəkil 16.3. **Рисунок 16.3.** **Figure 16.3.**

Complete non-equal cleavage of frog zygote.
Stain: hematoxylin-picrofuchsine.

1. macromers (large blastomeres)
2. micromers (small blastomeres)

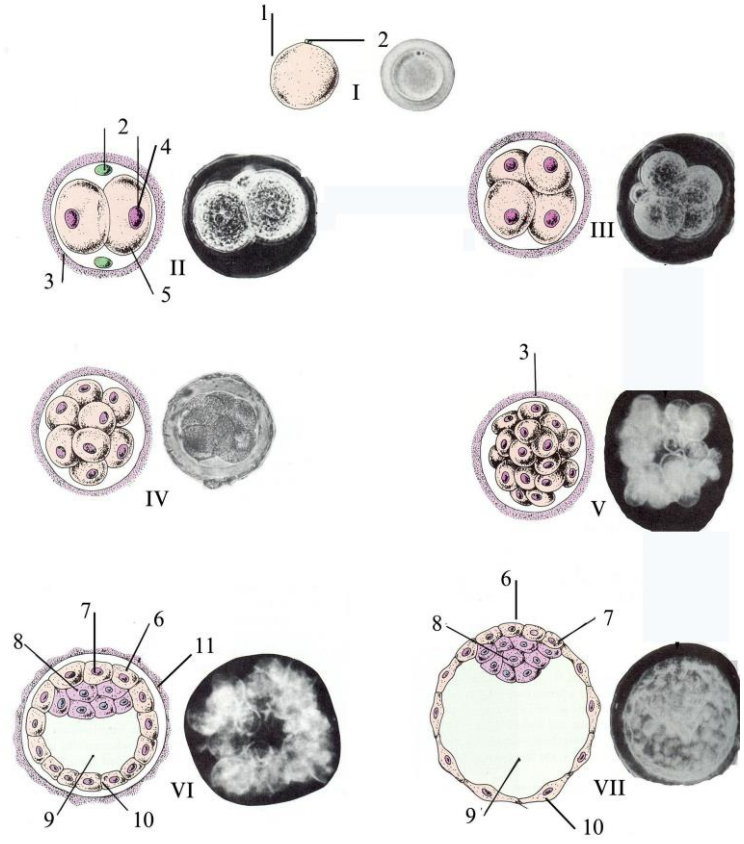


Şəkil 16.4. **Рисунок 16.4.** **Figure 16.4.**

Complete equal cleavage of horse ascaride zygote.
Stain: ferrous hematoxylin.

I formation of groove of division in telophase II formed 2 blastomeres III 2 blastomeres in metaphase IV 4 blastomeres stage due bilateral division.

Blastosist. İmplantasiya. Prenatal inkişafın ikinci həftəsi. 17

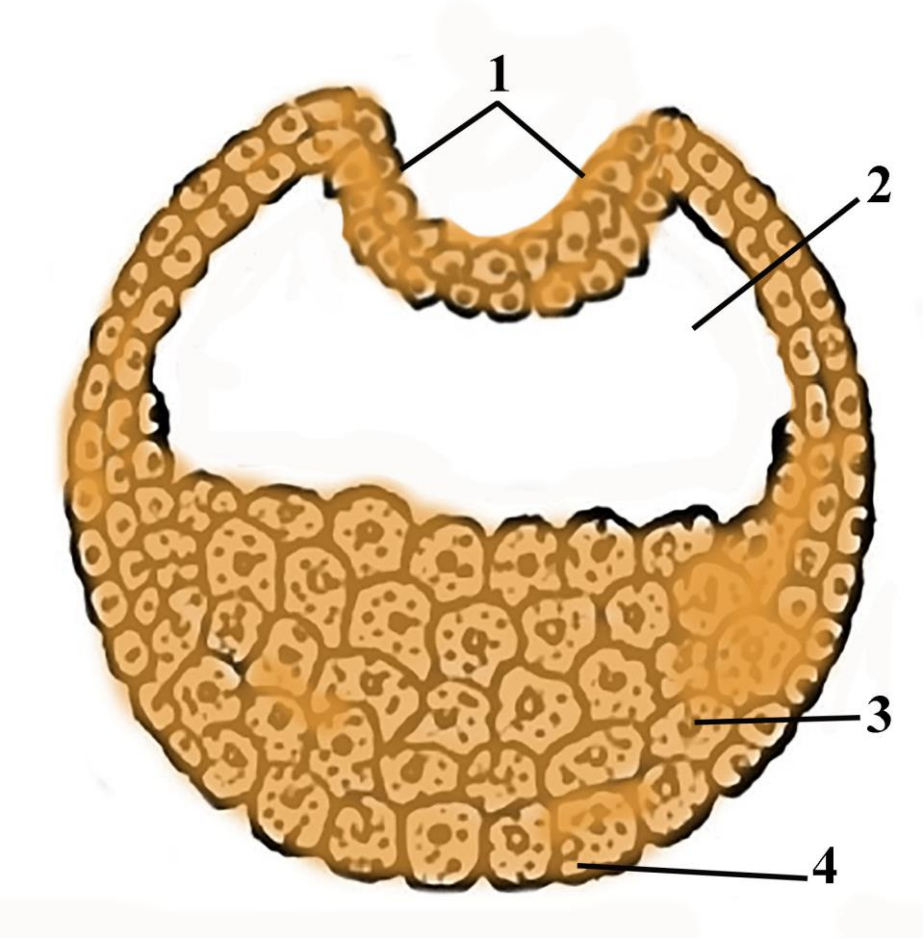


Şəkil 17.1. **Рисунок 17.1.** **Figure 17.1.**

Schematic (in left side) and microscopic (in right side) views of processes occurring in human embryo after 8 day from fertilization.

I. zygote before cleavage; II. 36 hours after fertilization, I division – 2 cells; III. Second division – 4 cells; IV. Third division – 8 cells; V. 3 to 5 days after fertilization – Morula; VI. 5 to 6 days after fertilization – Early blastocyst; VII. Late blastocyst

1. zygote; 2. polar bodies; 3. zona pellucida; 4. nucleus; 5. blastomere; 6. embryonic pole of blastocyst; 7. trophoblast; 8. inner cell mass – embryoblast; 9. blastocoel; 10. trophoblast cell; 11. degenerating zona pellucida.

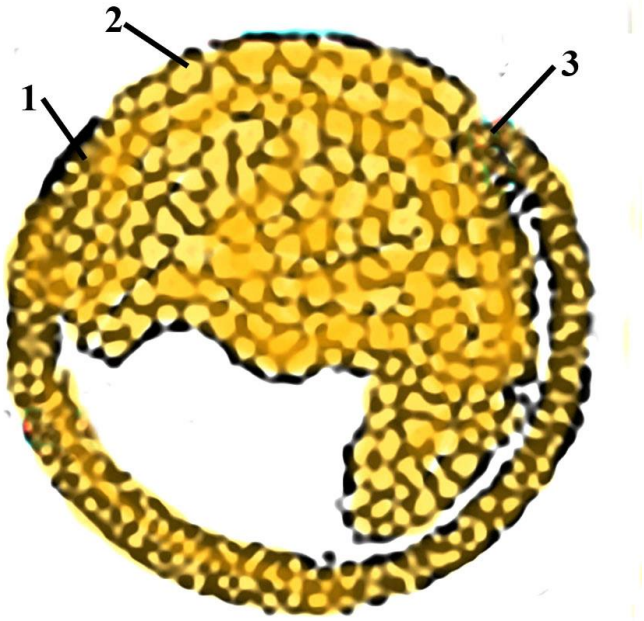


Şəkil 17.2. **Рисунок 17.2.** **Figure 17.2.**

Blastula of frog. Stain: hematoxylin-picrofuchsine.

1. roof of blastula;
2. blastocoel;
3. blastomere;
4. bottom of the blastula.

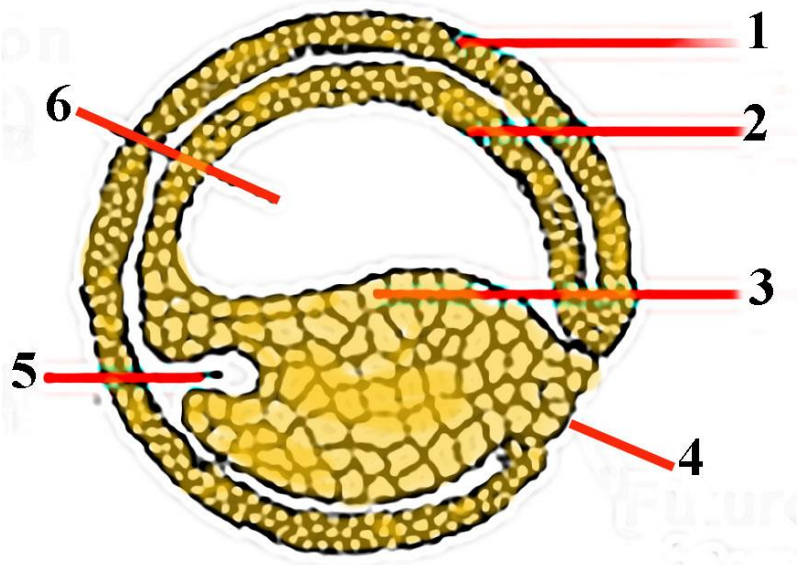
Qastrulyasiya. Rüşeym vərəqələrinin formalaşması. 18



Şəkil 18.1. **Рисунок 18.1.** **Figure 18.1.**

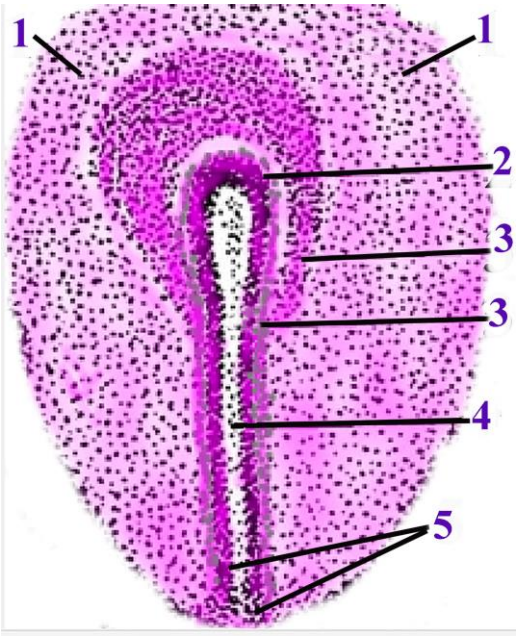
Gastrula of frog.
Stain: hematoxylin-picrofuchsine.

1. ventral lip of blastopore
2. yolk sac core
3. dorsal lip of blastopore



Şəkil 18.2. Рисунок 18.2. Figure 18.2.
Late stage of frogs gastrula

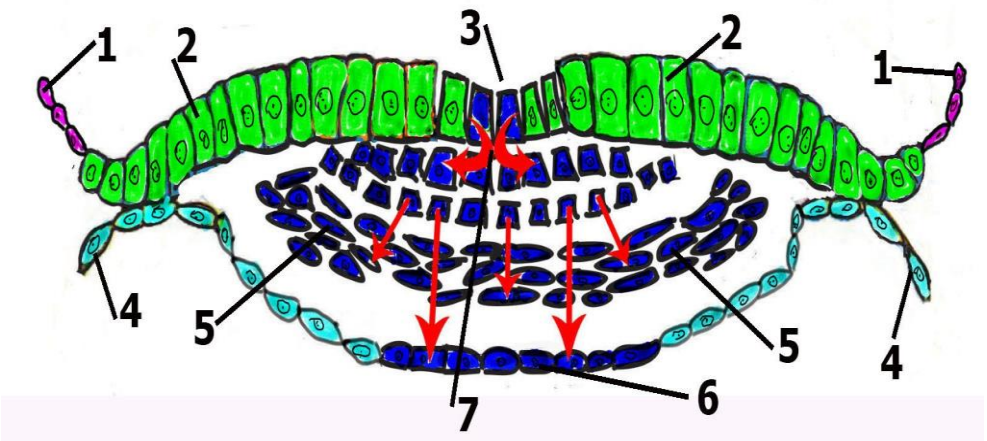
1. **ectoderm**
2. **mesoderm**
3. **endoderm**
4. **future anus**
5. **blastocoel**
6. **future gut (archenteron)**



Şəkil 18.3. **Рисунок 18.3.** **Figure 18.3.**

General view of primitive streak and surrounding structures. Stain: hematoxylin-eosin.

1. Light zone
2. primitive (Hensen's) node
3. germ of mesoderm
4. primitive pit
5. primitive streak

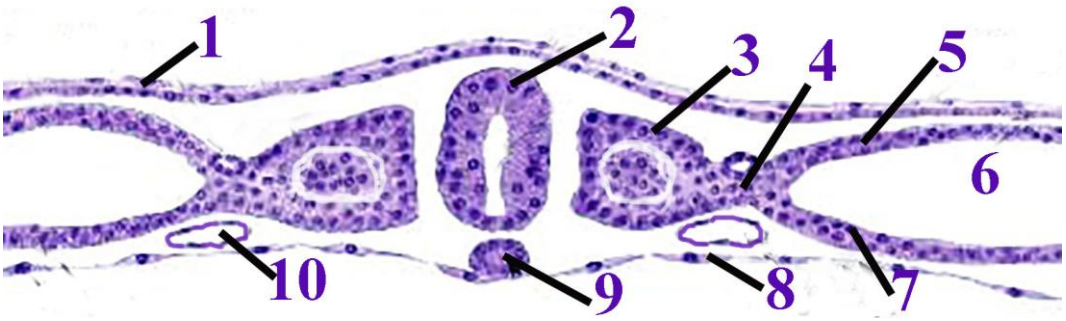


Şəkil 18.4. **Рисунок 18.4.** **Figure 18.4.**

Schematic representation the formation of embryonic layers

1. **amnioblast**
2. **epiblast**
3. **primitive streak**
4. **ectoderm surrounding of yolk sac**
5. **mesoderm**
6. **last endoderm**
7. **migrated cells**

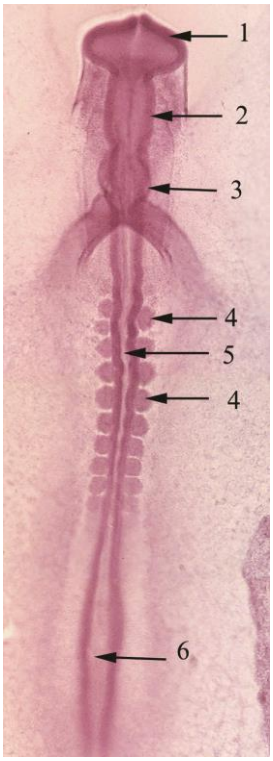
Rüşeymin ox orqanlarının formalaşması. Ektodermanın differensasiyası. 19



Şəkil 19.1. **Рисунок 19.1.** **Figure 19.1.**

Microscopic picture of transitional section of axial organs of chicken embryo.
Stain: ferric hematoxylin.

1. dermal ectoderm;
2. neural tube;
3. somite;
4. intermediate mesoderm (nephrotom);
5. parietal mesoderm layer (somatopleura);
6. coelom (secondary body space).
7. visceral mesoderm layer (splachnopleura);
8. endoderm;
9. notochord;
10. blood vessels

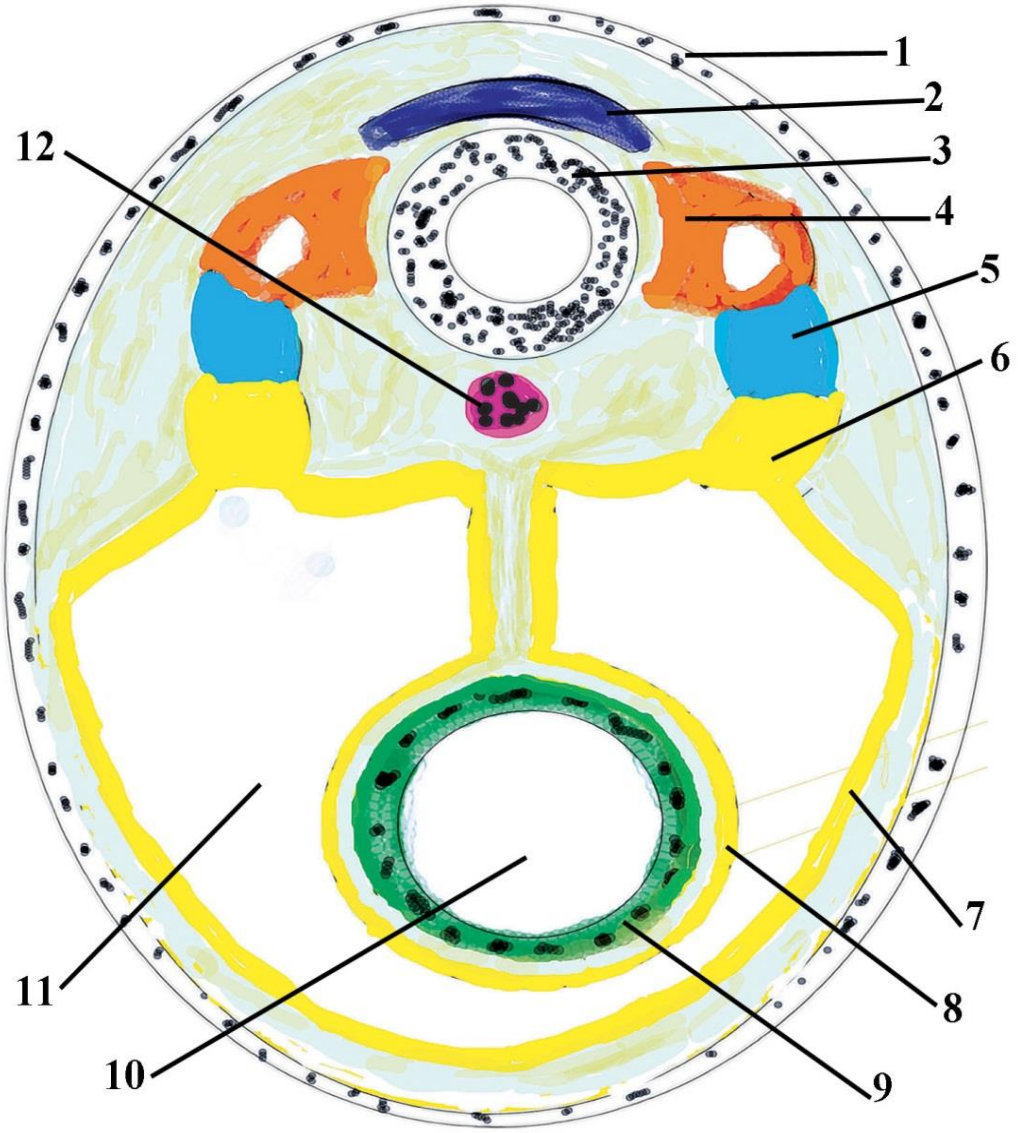


Şəkil 19.2. **Рисунок 19.2.** **Figure 19.2.**

Total slide of chicken embryo after 31 hours of incubation. Stain: hematoxylin-eosin.

1. proencephalon
2. mesencephalon
3. rhombencephalon
4. somites
5. neutal tube
6. remnant of primitive streak

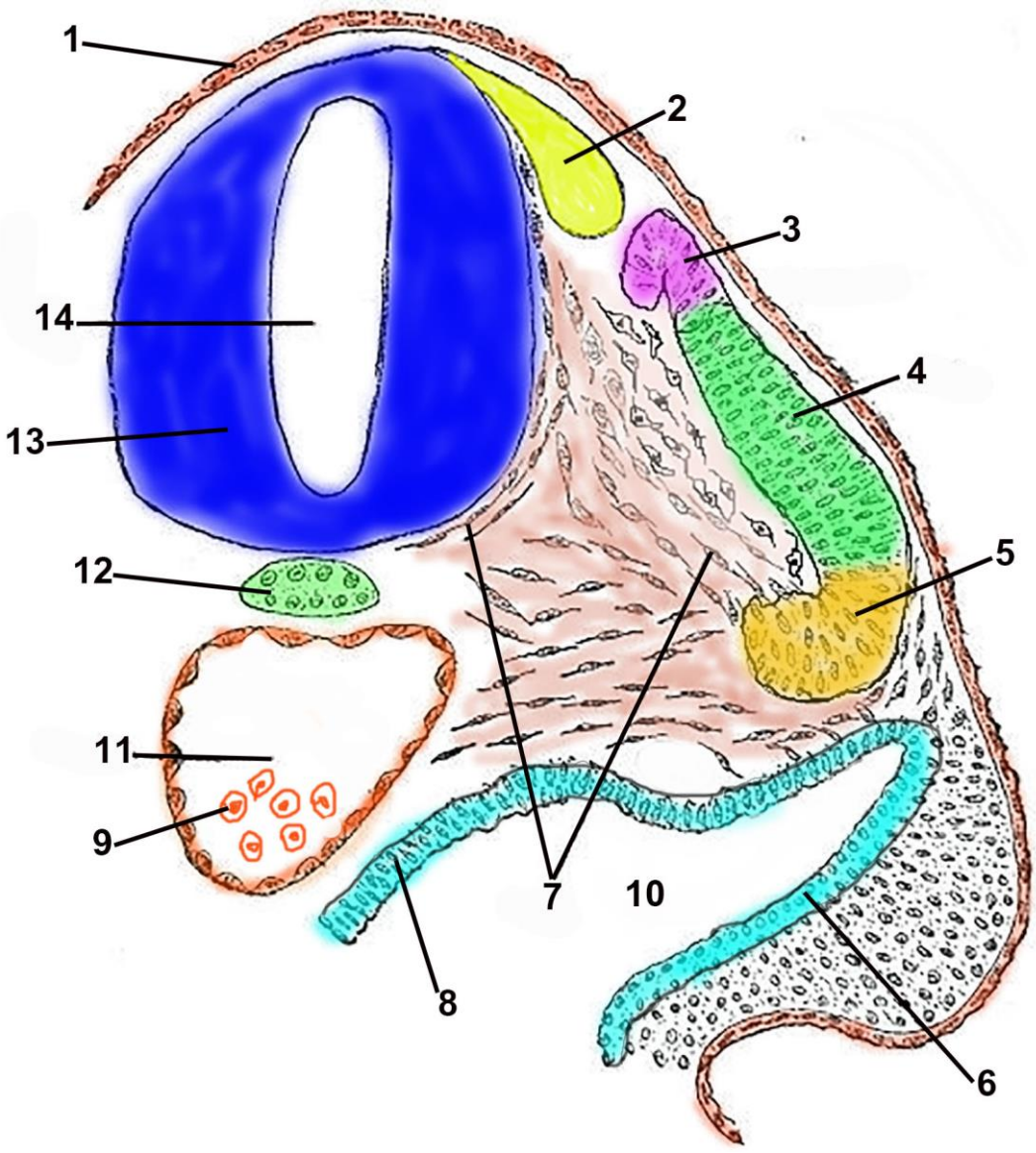
Mezodermanın və entodermanın differensasiyası. 20



Şəkil 20.1. **Рисунок 20.1.** **Figure 20.1.**

Schematic picture of transverse section of axial organs

1. **dermal ectoderm**
2. **neural crest cell**
3. **neural tube**
4. **somite**
5. **intermediate mesoderm**
6. **lateral mesoderm**
7. **parietal mesoderm layer (somatopleura)**
8. **visceral mesoderm layer (splachnopleura)**
9. **epithelial lining of primary gut**
10. **lumen of primary gut**
11. **coelom (secondary body space)**
12. **notochord**

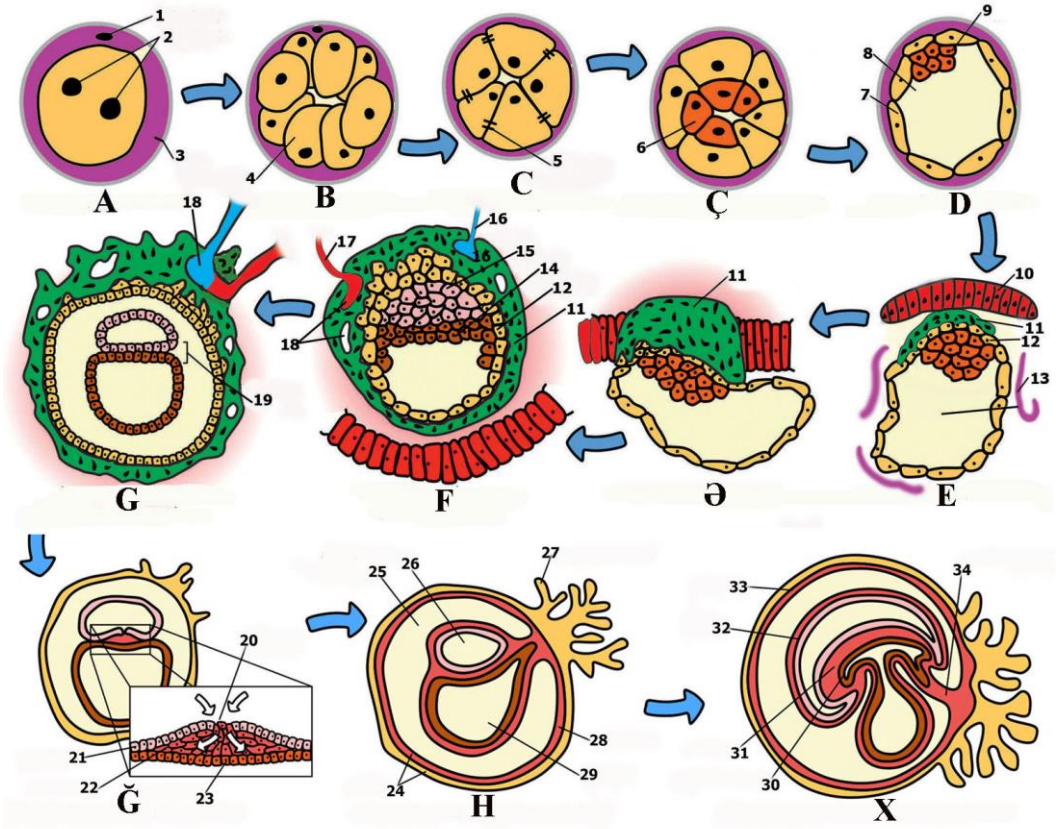


Şəkil 20.2. **Рисунок 20.2.** **Figure 20.2.**

Differentiation somits and surrounding structures.
1.dermal ectoderm, 2. Neural crest cell 3. Dorsomedial region of the somite 4. dermatome 5. Ventrolateral region of the somite 6. somatopleura 7. sclerotome 8. splachnopleura, 9. erythroblast 10. coelom 11. lumen of dorsal aorta 12. notochord 13. Neural tube 14. Lumen of neural tube

İnkişafın 4-8 həftələrində baş verən proseslərin qısa səciyyəsi.

21

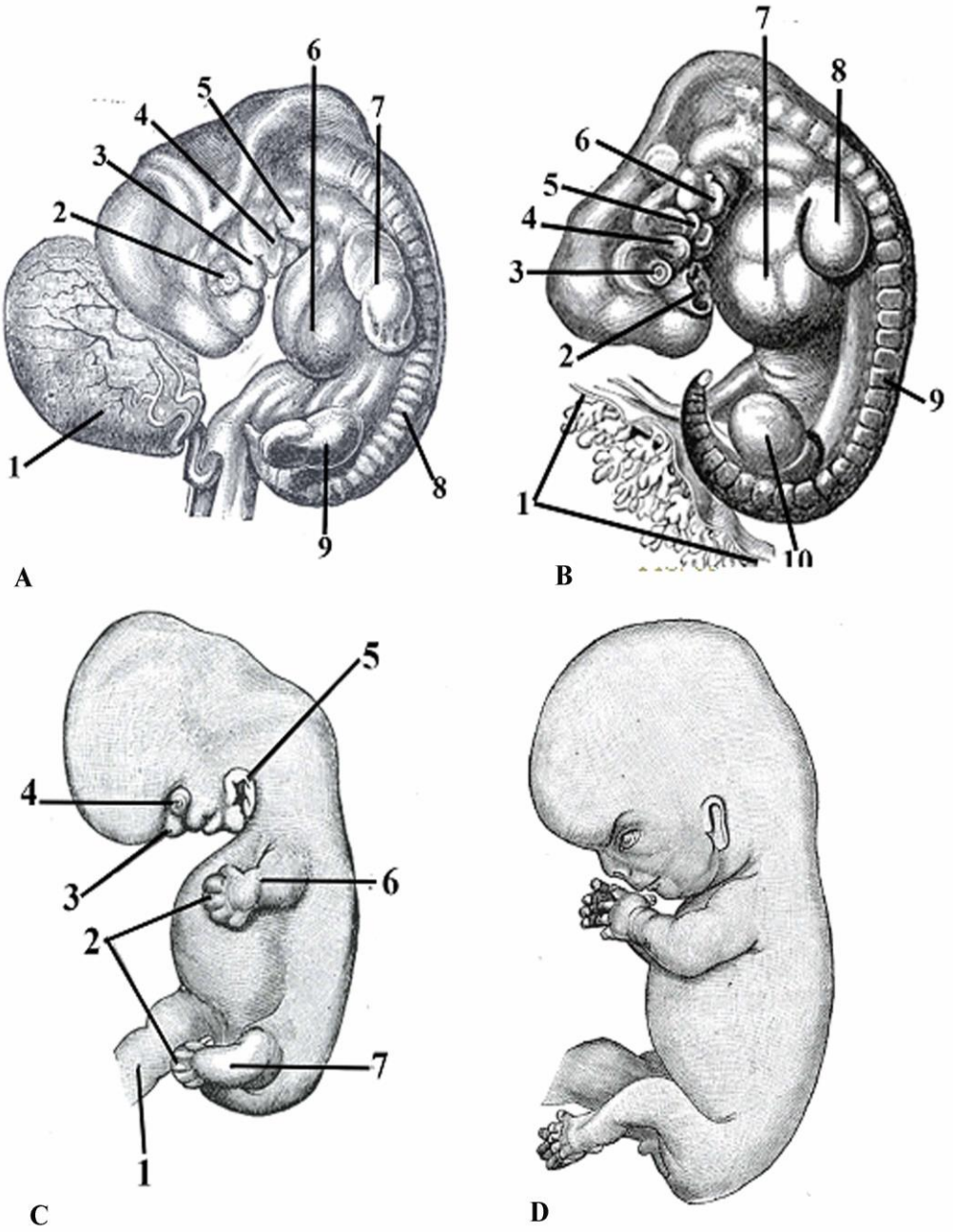


Şəkil 21.1. **Рисунок 21.1.** **Figure 21.1.**

Schematic view of development stage in human embryo

A. fertilization; B. cleavage; C. formation tight junction; Ç. Differentiation; D. formation blastocoel cavity; E. adhesion stage; Ə. Implantation; F. differentiation of inner and outer cellular mass; G. formation of embryonic disk; Ğ. formation of mesoderm; H. developing mesoderm; X. enlarged amniotic cavity.

1. **polar bodies**
2. **pronucleus**
3. **zona pellucida**
4. **blastomere**
5. **tight junction**
6. **inner cell**
7. **trophoblast**
8. **blastocyst cavity**
9. **inner cell mass – embryoblast**
10. **endometrium**
11. **syncytiotrophoblast**
12. **cytotrophoblast**
13. **degenerating zona pellucida**
14. **hypoblast**
15. **epiblast**
16. **uterus vein**
17. **uterus arteries**
18. **space for circulating maternal blood**
19. **embryonic disk**
20. **primitive streak**
21. **ectoderm**
22. **mesoderm**
23. **endoderm**
24. **chorion**
25. **extraembryonal coelom**
26. **amniotic cavity**
27. **villi**
28. **extraembryonal mesoderm**
29. **yolk sac**
30. **gut**
31. **blastocoel**
32. **trophoblast cell**
33. **wall of amniotic cavity**
34. **umbilical cord**



Şəkil 21.2. **Рисунок 21.2.** **Figure 21.2.**

Embryo at the 4, 5, 6, 8 week.

A An embryo at the 3 – 4 week
1 yolk sac
2 optic vesicle
3 maxillary prominence
4 mandibular arch
5 sublingual arch
6 heart bulge
7 bud of the upper limb
8 somits
9 bud of the lower limb

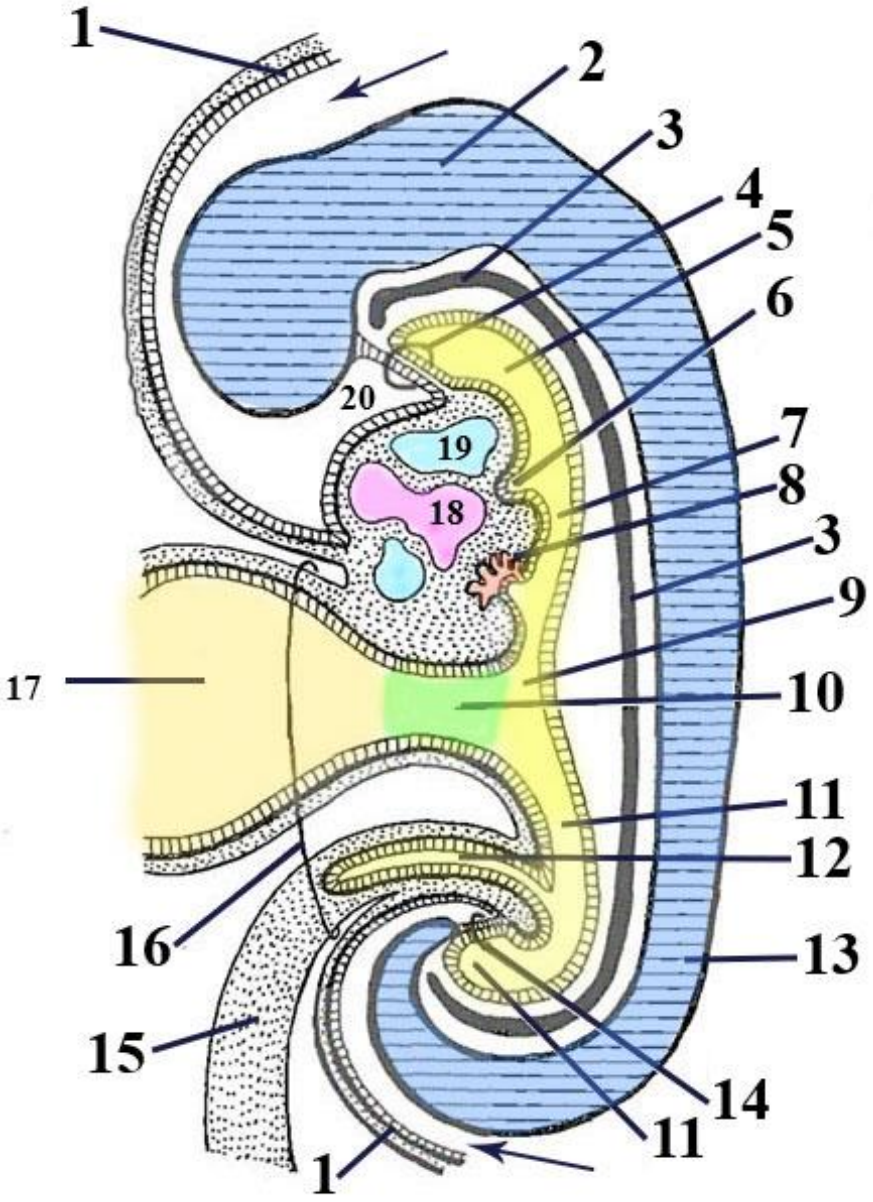
B An embryo at the 5 week
1 chorion
2 nasal prominences
3 optic vesicle
4 maxillary prominence
5 mandibular arch
6 sublingual arch
7 heart
8 bud of the upper limb
9 somits
10 bud of the lower limb

C. An embryo at the 6 week
1. umbilical cord 2. the terminal portion of the limb, 3. nose 4. eye 5. auricle 6. upper limb, 7. lower limb

D. An embryo at the 8 week

Rüşeymxarici orqanlar. Döl dövrünün qısa xarakteristikası

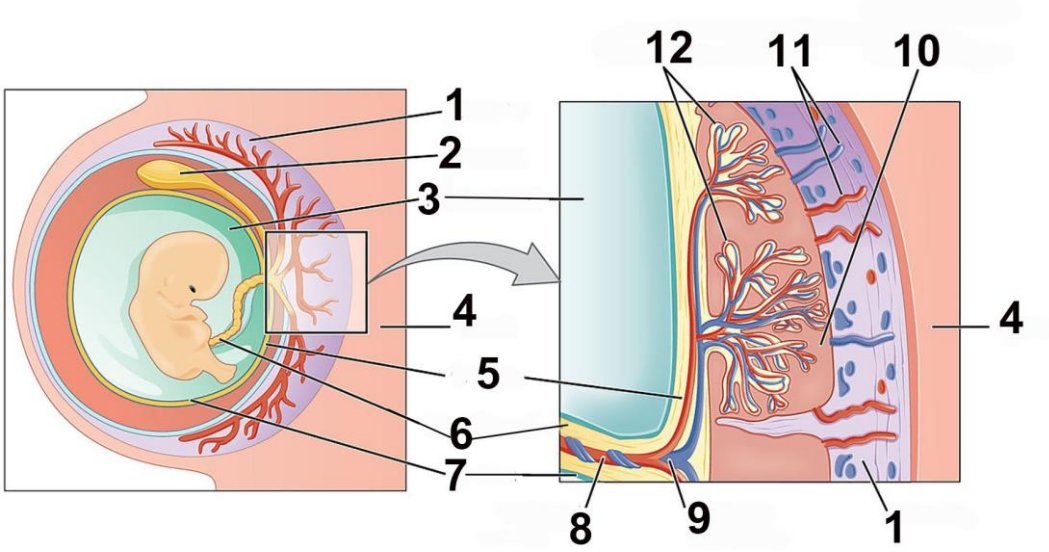
22



Şəkil 22.1. **Рисунок 22.1.** **Figure 22.1.**

Lateral view of a human embryo at 28 days.

1 amnion
2 cranial part of neural tube
3 notochord
4 oropharyngeal membrane
5 gut tube
6 respiratory diverticulum
7 foregut
8 liver bud
9 midgut
10 yolk sac
11 hindgut
12 allantois
13 caudal part of neural tube
14 cloacal membrane
15 connecting stalk
16 umbilical ring
17 yolk sac
18 heart bulge
19 source of pericardium
20 stomadeum



Şəkil 22.2. **Рисунок 22.2.** **Figure 22.2.**

Extraembryonic organs.
1 placenta
2 yolk sac
3 amniotic fluid
4 uterus
5 chorion
6 umbilical cord
7 amnion
8 umbilical vein
9 umbilical artery
10 maternal blood in intervillus space
11 uterus artery and vein
12 villi of chorion

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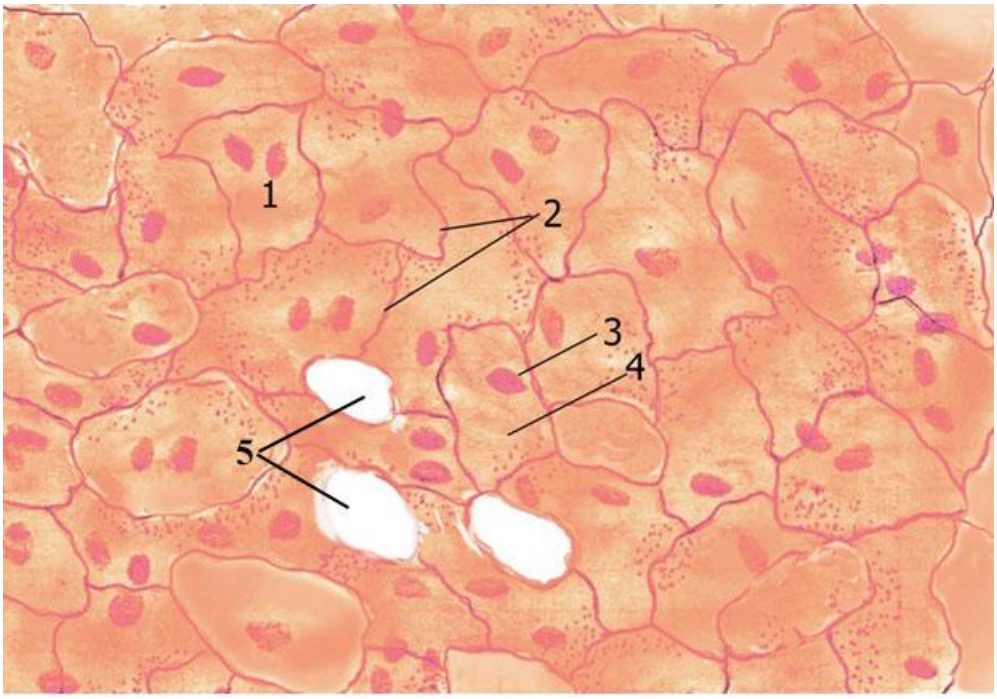
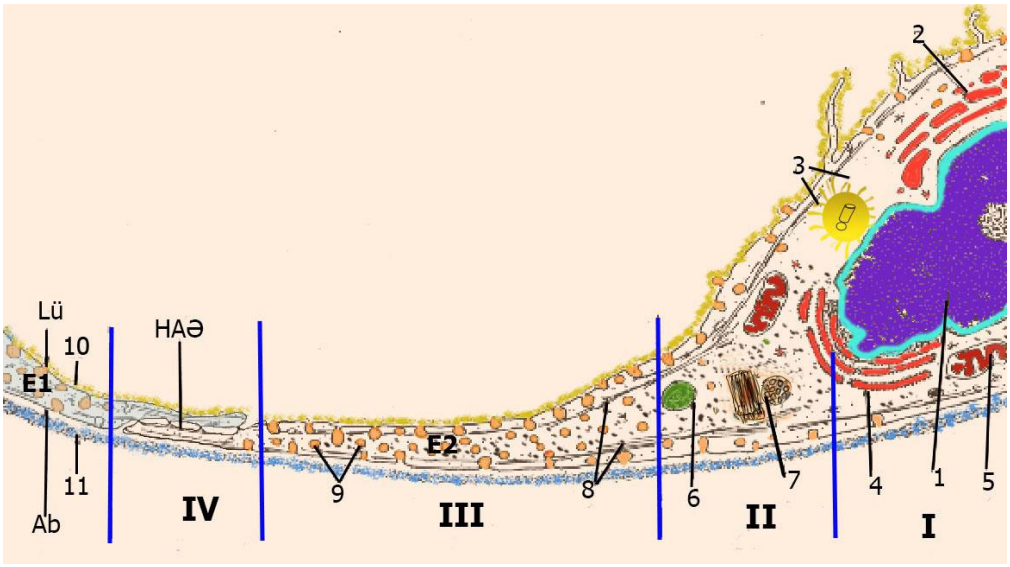
II diaqnostikum.	23
Örtük epiteli. Təkqatlı epitel toxuması. Hüceyrələrarası əlaqələr.	24



Şəkil 24.1. Рисунок 24.1. Figure 24.1.
Simple squamous epithelium (mesothelium) of omentum. Stain: silvering.

1. epithelial cells
2. cell border
3. nucleus.
4. Cytoplasm
5. stomata



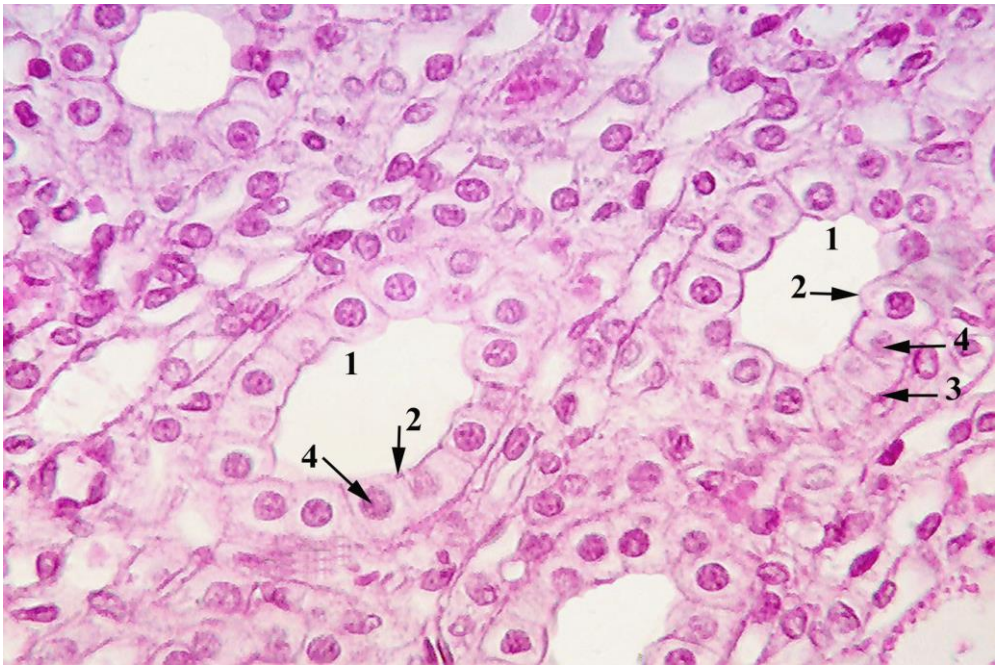
Şəkil 24.2. **Рисунок 24.2.** **Figure 24.2.**

Simple squamous epithelium (endothelium). Schem.

I. central part; **II.** Paracentral part; **III.** Peripheral part; **IV.** Intercellular junction region.

AB – abluminal surface; LÜ – luminal surface; HAƏ – intercellular junction.

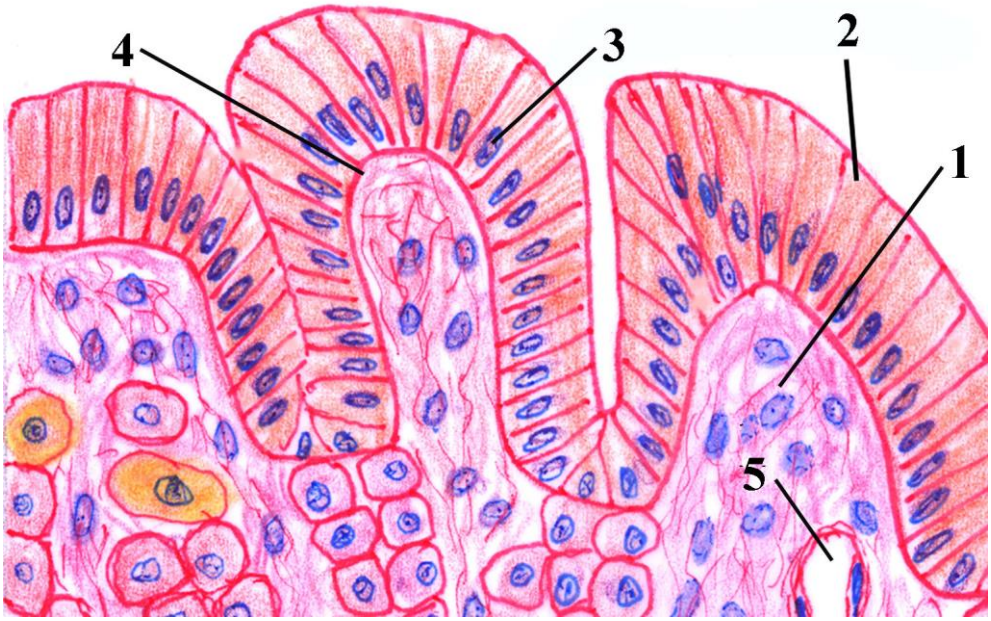
1. nucleus; 2. Golgi apparatus; 3. centrosome; 4. RER; 5. mitoxondrion; 6. lysosome; 7. multitubulated body; 8. cytoskeleton elements; 9. pinocytotic vesicles; 10. glycocalyx; 11. basement membrane



Şəkil 24.3. **Рисунок 24.3.** **Figure 24.3.**

Simple cuboidal epithelium of convoluted tubules of kidney. Stain: hematoxylin-eosin.

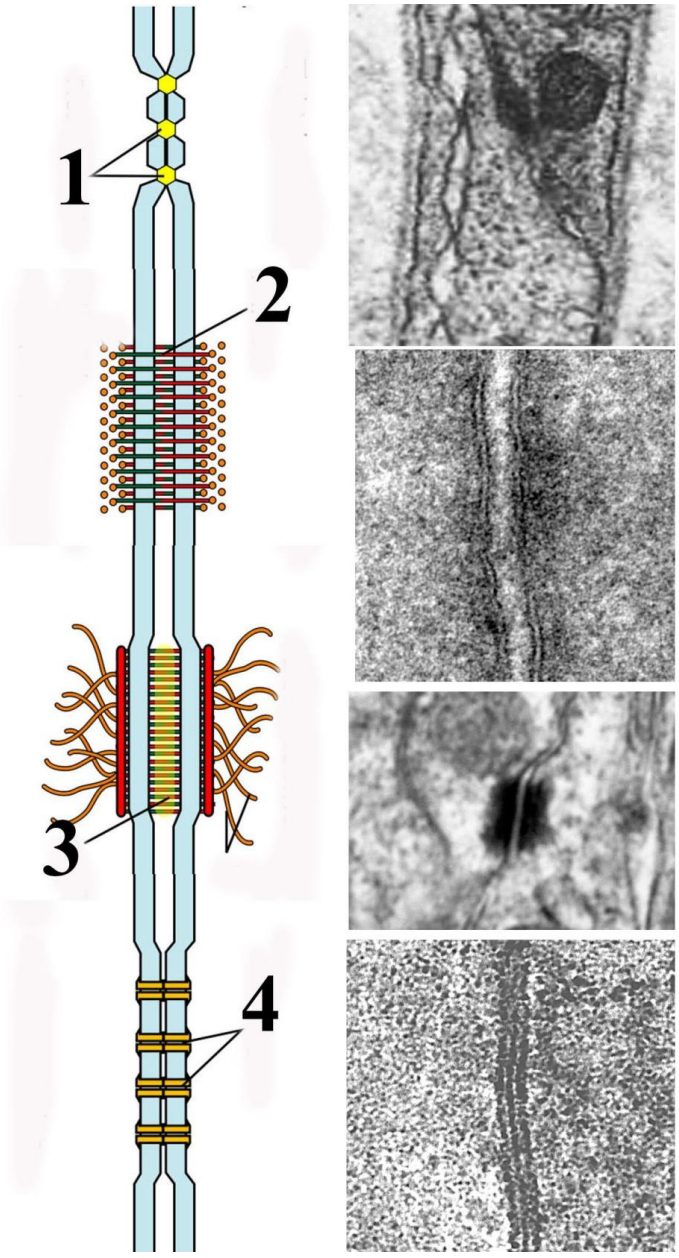
1. lumen of tubule
2. apical part of cell
3. basal part of cell
4. nucleus.



Şəkil 24.4. **Рисунок 24.4.** **Figure 24.4.**

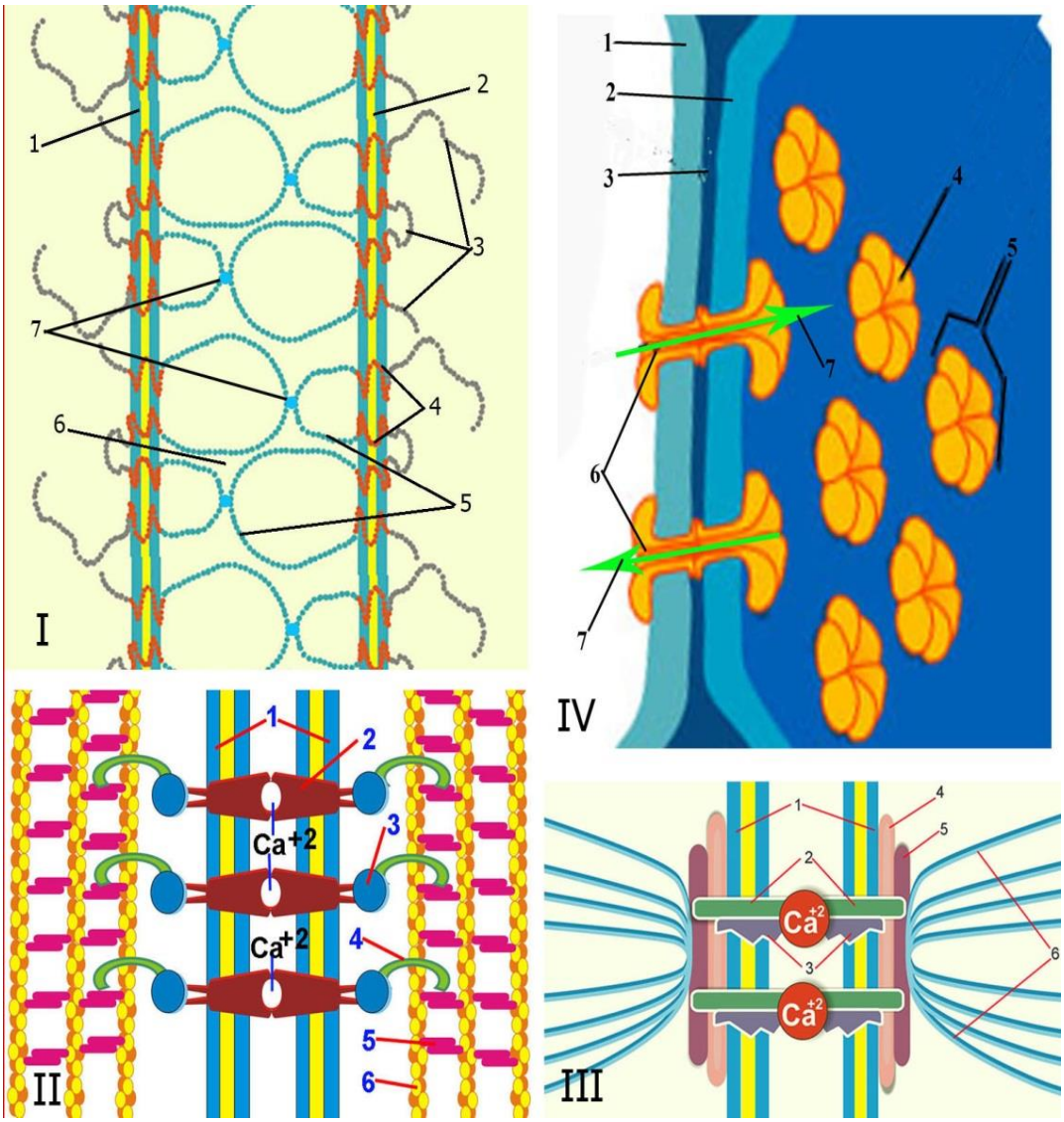
Schematic drawing of histological structure of the simple columnar epithelium.
Stain: hematoxylin-eosin.

1. Lamina propria
2. Cytoplasm of columnar epithelial cell
3. Nucleus of columnar epithelial cell
4. Basement membrane
5. Blood vessels



Şəkil 24.5. **Рисунок 24.5.** **Figure 24.5.**

Intercellular junction
1. zonula occludent 2. zonula adherens 3. desmosome 4. communicating junction (nexus)



Şəkil 24.6. **Рисунок 24.6.** **Figure 24.6.**

Schematic illustration of intercellular junction

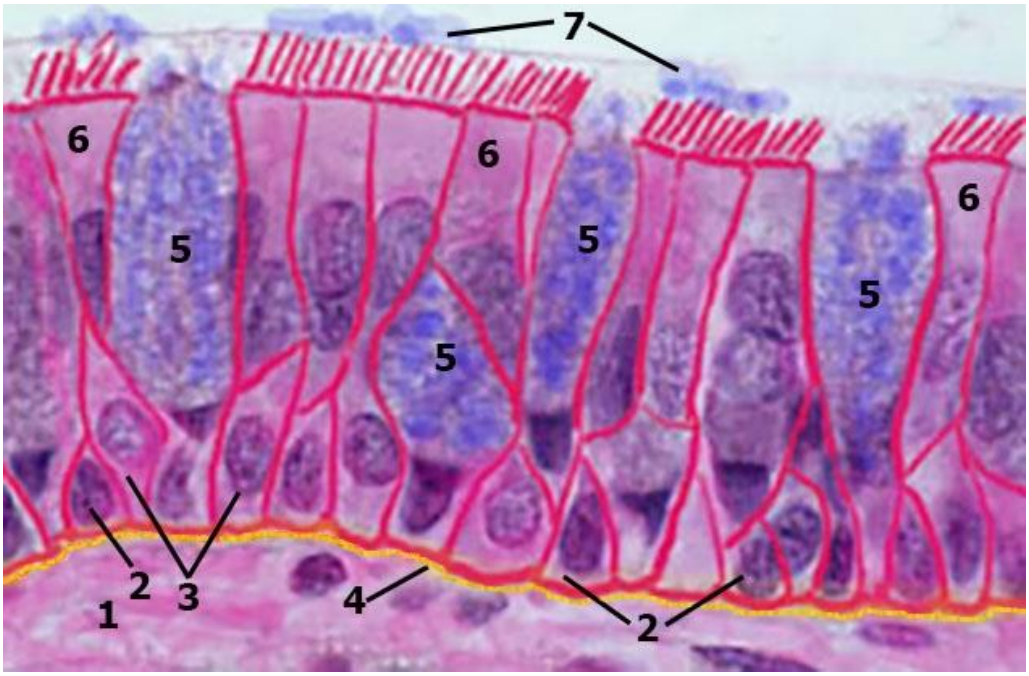
I tight junction: 1 plasma membrane of first cell 2 plasma membrane of second cell 3 cytoplasmic part of protein occludin 4 intramembranous part of occludin 5 loops of occludin 6 space between two cell 7 junction of loops occludin “kissing point”

II adhesive junction: 1 plasma membrane of two cells 2 E cadherin 3 cathenin 4 vinculin 5 α – actinin 6 actin

III desmosome: 1 plasma membrane of two cells 2 desmoglein 3 desmocollin 4 placofillin and placoglobin 5 desmoplagin 6 intermediate filaments

IV nexus: 1 plasma membrane of first cell 2 plasma membrane of second cell 3 space between two cell 4 connexin monomers 5 connexon 6 hydrophilic channel 7 arrow shown direction within channel

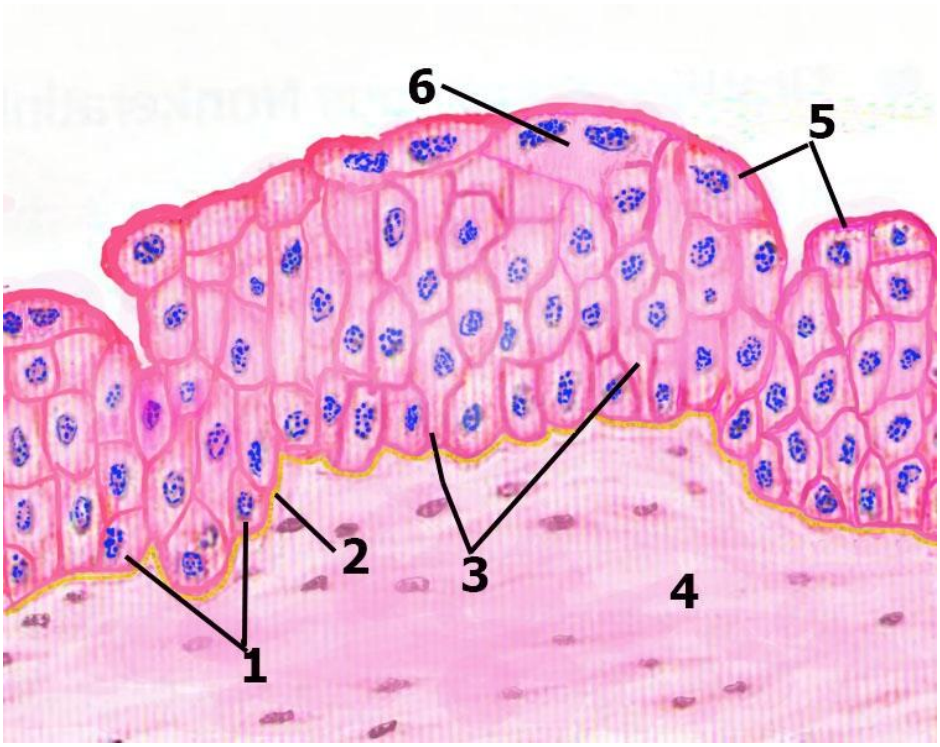
Çoxqatlı epitel toxuması. 25



Şəkil 25.1. **Рисунок 25.1.** **Figure 25.1.**

Pseudostratified columnar cliated epithelium in the mucosa of trachea

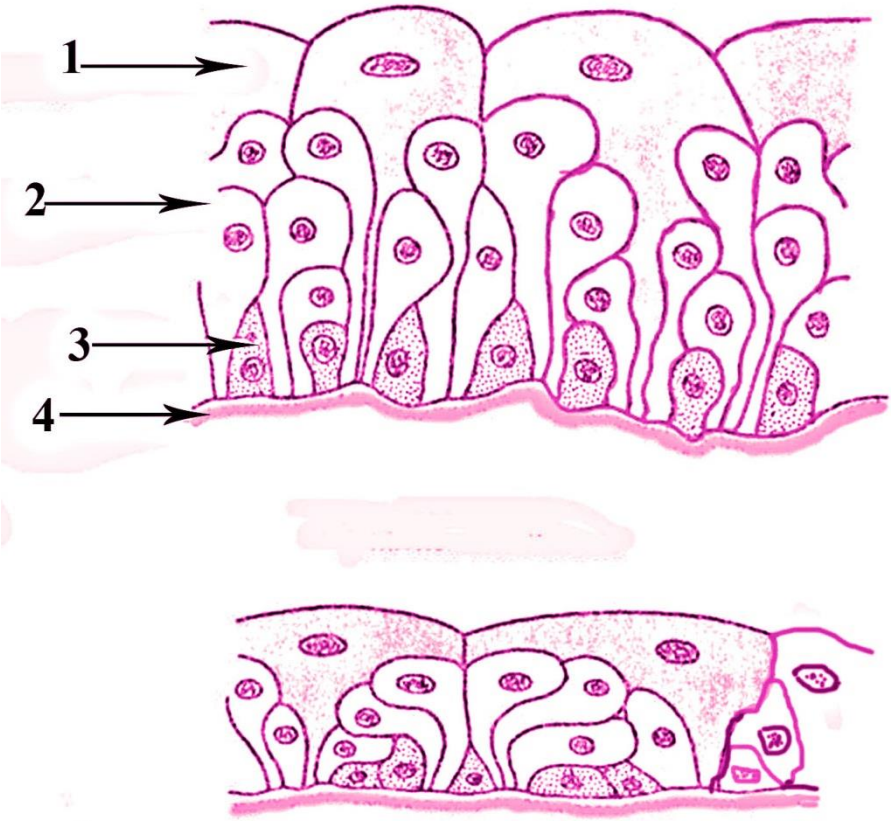
1- loose connective tissue
2- short intercalated epithelial cells
3- long intercalated epithelial cells
4- basement membrane
5- goblet cell
6- ciliated cell
7- mucus



Şəkil 25.2. **Рисунок 25.2.** **Figure 25.2.**

Transitional epithelium (Urothelium)

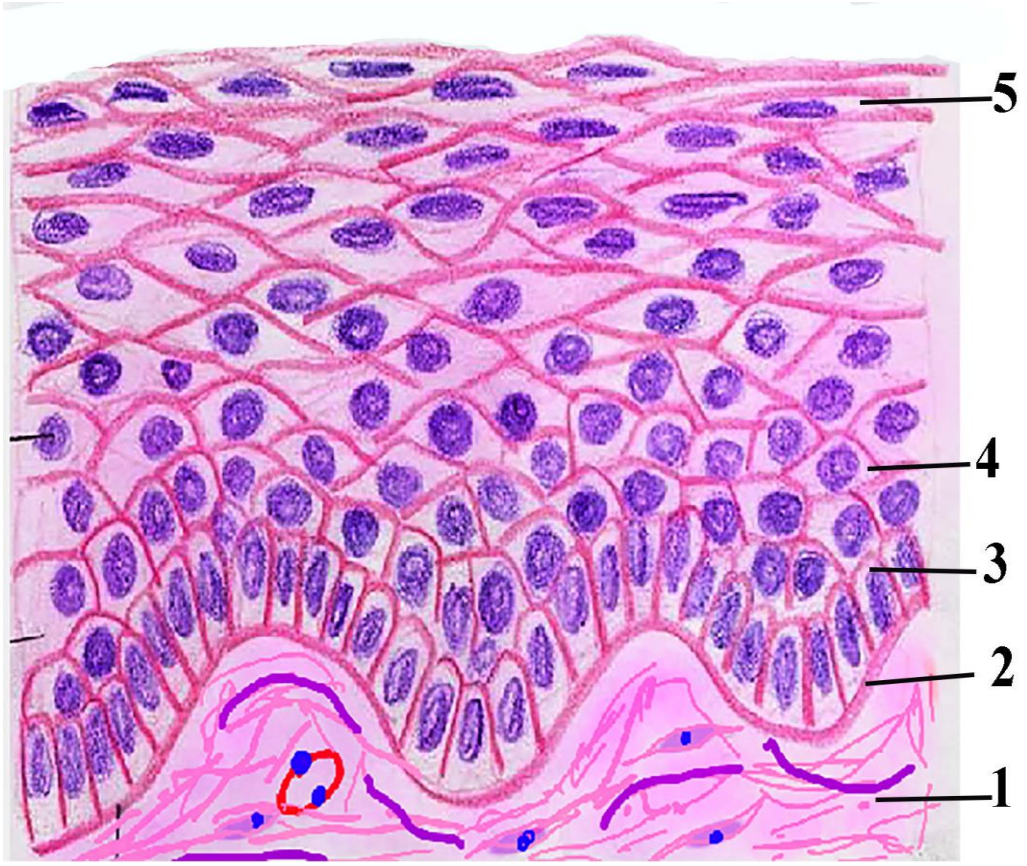
1 basal layer
2-basement membrane
3-intermadiate layer
4-Lamina propria
5-Superficial layer
6-binuclear cells



Şəkil 25.3. **Рисунок 25.3.** **Figure 25.3.**

Transitional epithelium (Urothelium) in the unstretched (up) and stretched (down) urinary bladder.

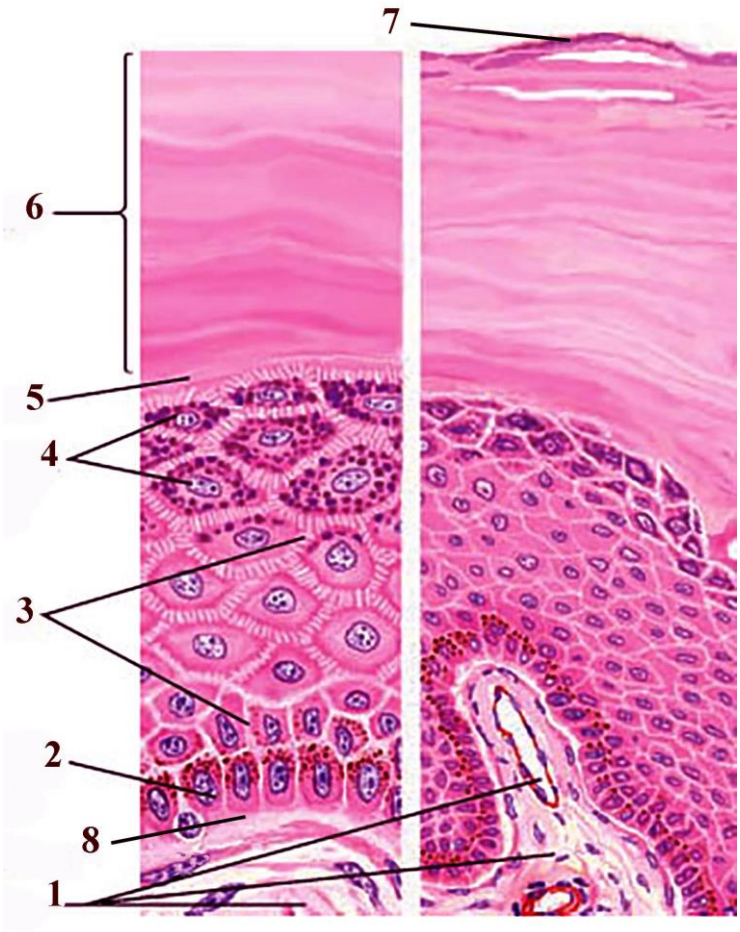
1- Superficial layer
2- Intermediate layer
3-Basal layer
4-Basement membrane



Şəkil 25.4. **Рисунок 25.4.** **Figure 25.4.**

Schematic picture of stratified squamous nonkeratinized epithelium

1- connective tissue elements
2- Basement membrane
3- Basal layer
4- Intermediate layer
5- Superficial layer



Şəkil 25.5. Рисунок 25.5. Figure 25.5.

Microscopic structure of stratified squamous keratinized epithelium (skin of finger)

1-Dermal papilla

2- stratum basale

3 Stratum spinosum

4- Stratum granulosum

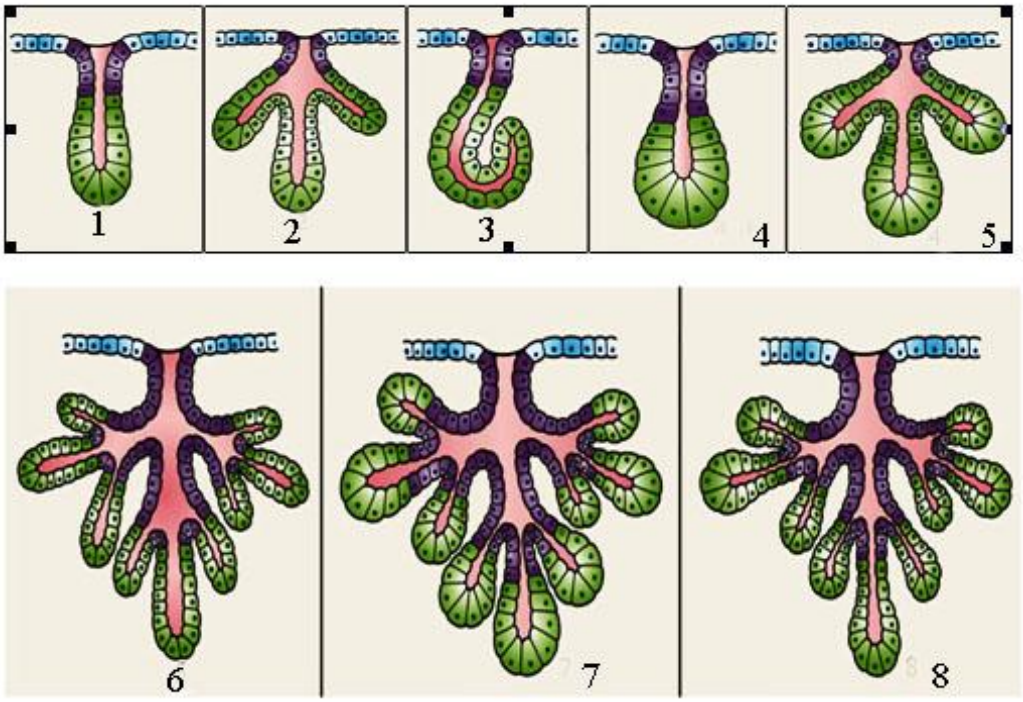
5- Stratum lucidum

6- Stratum corneum

7- Stratum corneum cell which sloughed off.

8- Basement membrane

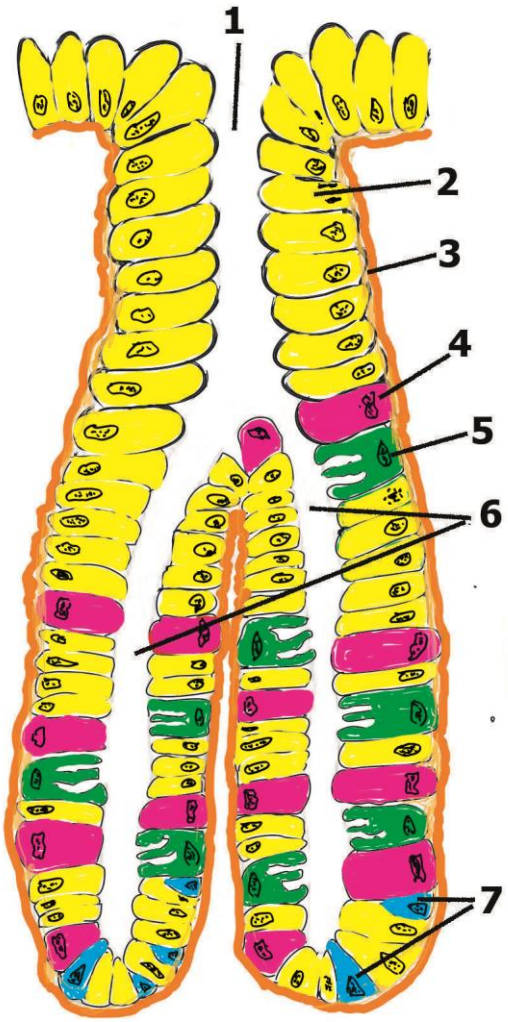
Sekretor epitel. Ekzokrin vəzilər. 26



Şəkil 26.1 Рисунок 26.1 Figure 26.1

Classification of multicellular epithelial glands

1 simple tubular gland
2 simple branched tubular gland
3 Simple coiled tubular gland
4 Simple asinar (alveolar) gland
5 Simple branched asinar (alveolar) gland
6 Compound tubular gland
7 compound alveolar (asinar) gland
8 Compound mixed tubular alveolar gland



Şəkil 26.2 Рисунок 26.2 Figure 26.2

Simple branched tubular gland (gastric gland in the fundus of stomach)

1-Gastric pits

2-mucus secreting cells in the neck of gland

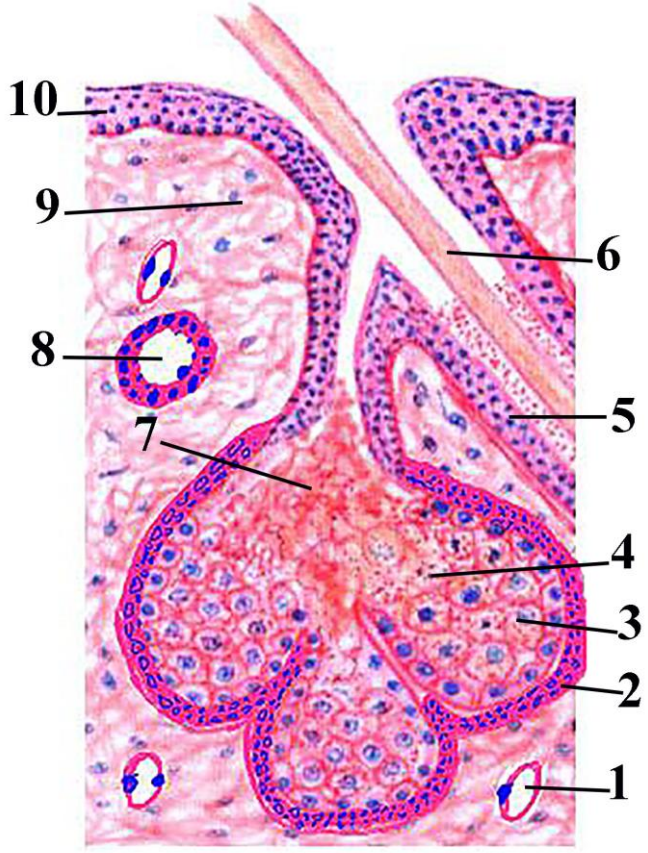
3-Basal lamina

4- Basal chief cells

5-Parietal cell

6-Lumen of secretory portion

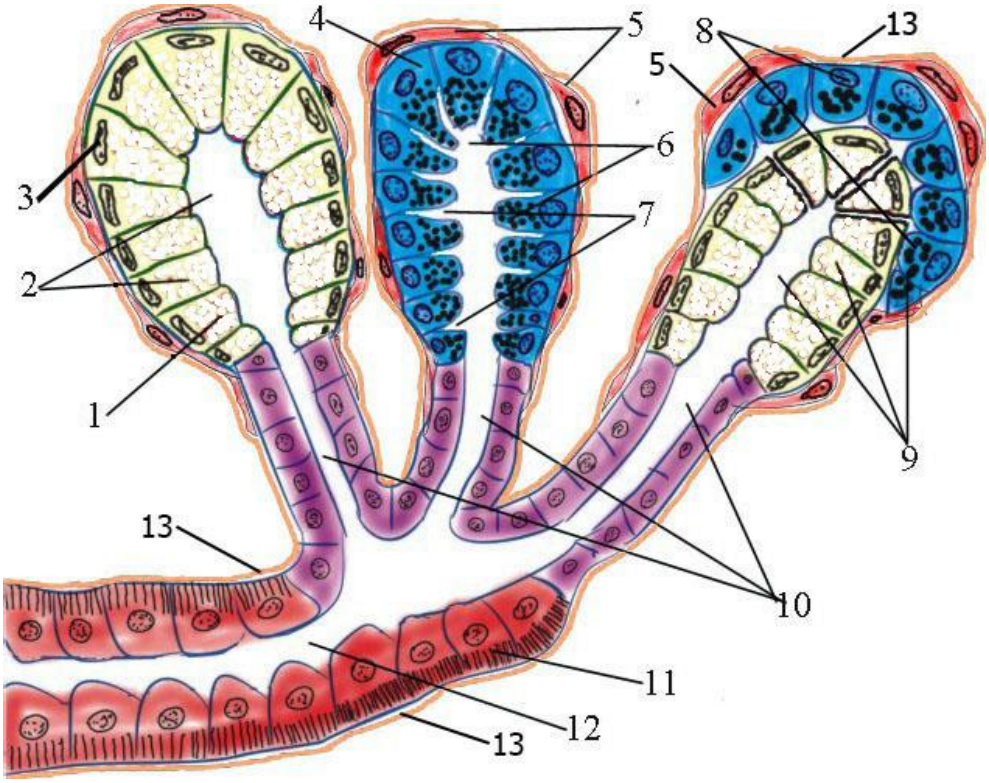
7-Enteroendocrine cell



Şəkil 26.3 Рисунок 26.3 Figure 26.3

Histological slide of sebaceous gland and surrounding structure.

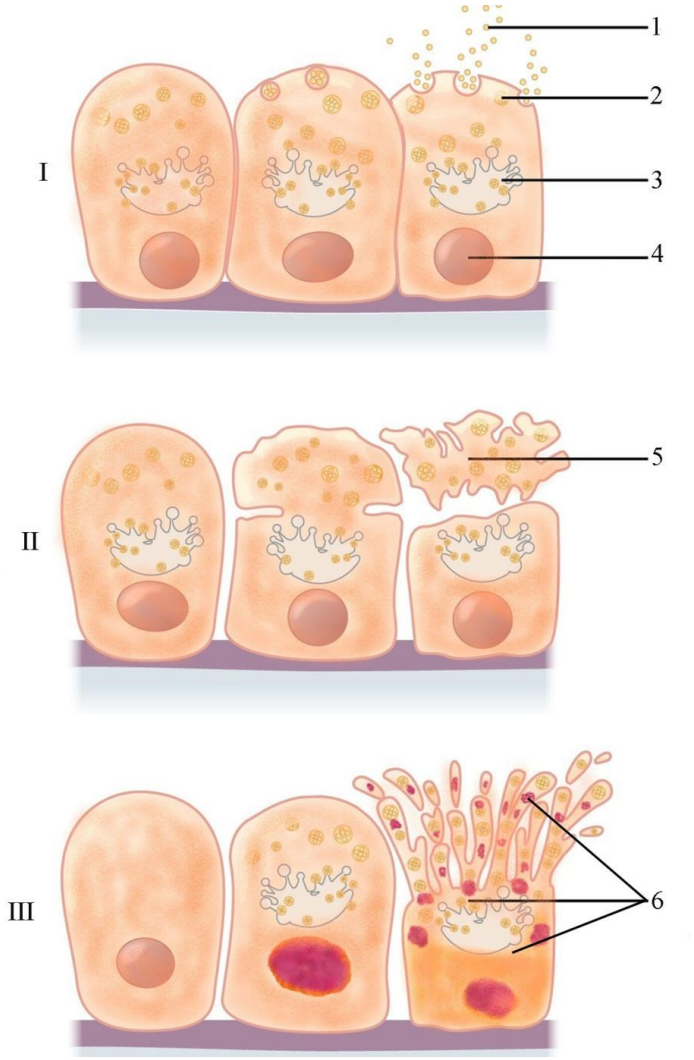
1 blood vessels
2 stem cells resting on the basement membrane
3 sebocytes
4 Degenerating sebocytes
5 External root sheath
6 Cortex of hair shaft
7 Product of sebaceous gland – sebum
8 Duct of sweet gland
9 Connective tissue elements
10 epidermis



Şəkil 26.4 Рисунок 26.4 Figure 26.4

Schematic structures of the serous, mucous and seromucous (mixed) exocrine glands.

1. mucous granules; 2. terminal secretory portion of the mucous gland; 3.nucleus of the mucous cell; 4. serous cell; 5. myoepithelial cell; 6. terminal secretory portion of the serous gland; 7. intercellular canals; 8. serous demilunes; 9. terminal secretory portion of the mixed gland ; 10. lumen of intercalated duct; 11. striated duct; 12. lumen of striated duct; 13. basal lamina.



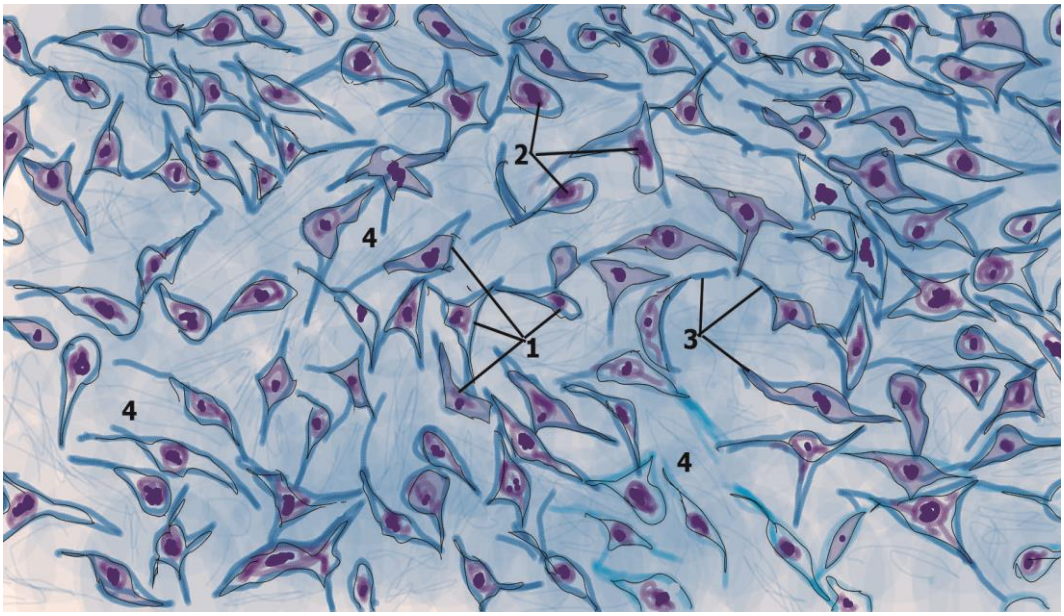
Şəkil 26.5 Рисунок 26.5 Figure 26.5

Types of secretion based on releasing of secretory products.

I. merocrine ; **II.** apocrine; **III.** holocrine.

1. secretion; 2. secretory vesicles; 3. Golgi complex; 4. nucleus; 5. the apical portion of the cell released together with secretory product; 6. mature cell becomes the secretory product as result of destruction .

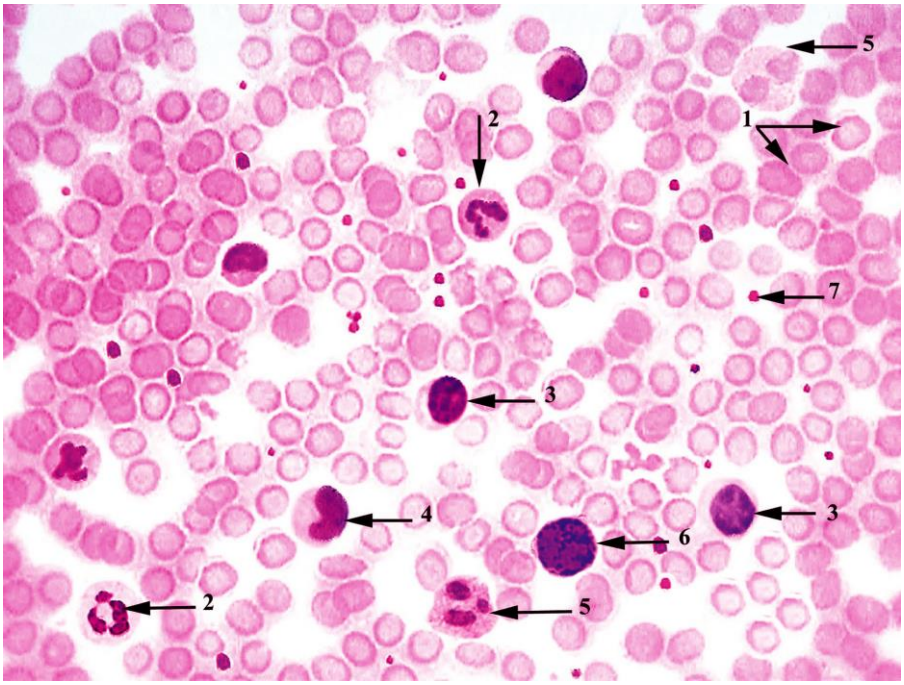
Mezenxim. Mezenxim törəmələri. Qan. Limfa. | 27



Şəkil 27.1. **Рисунок 27.1.** **Figure 27.1.**

Mesenchyme - embryonic connective tissue in chicken embryo. Stain: ferrous hematoxyline.

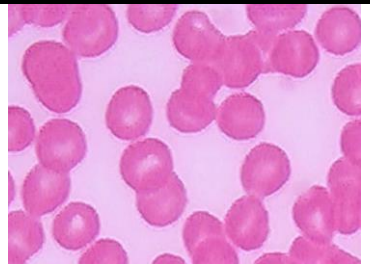
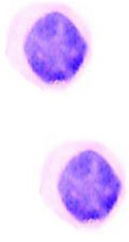
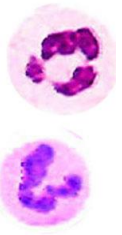
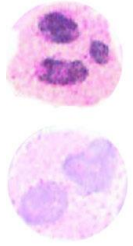
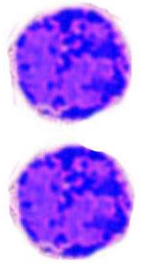
1. mesenchymal cells 2. Nuclei of mesenchymal cells 3. Processes of mesenchymal cells 4. Ground substance

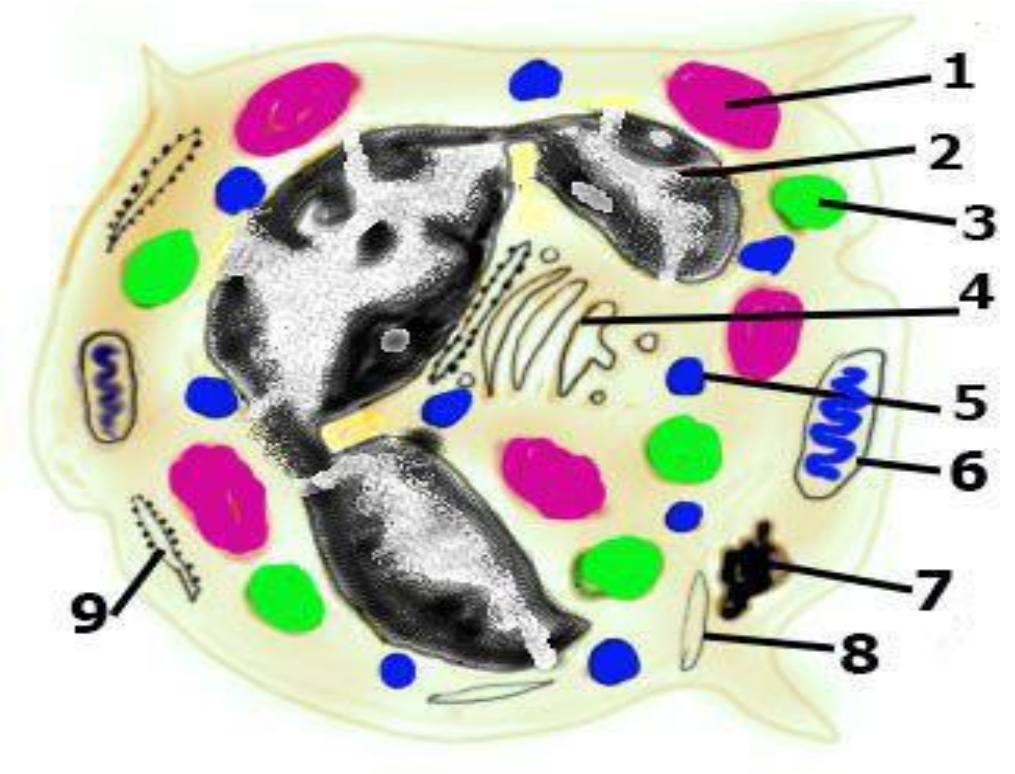


Şəkil 27.2. **Рисунок 27.2.** **Figure 27.2.**

Smear of human blood. Reconstruction. Stain Giemsa.

1. erythrocytes (red blood cells)
2. neutrophil
3. lymphocyte
4. monocyte
5. eosinophil
6. basophil
7. platelet (thrombocyte).

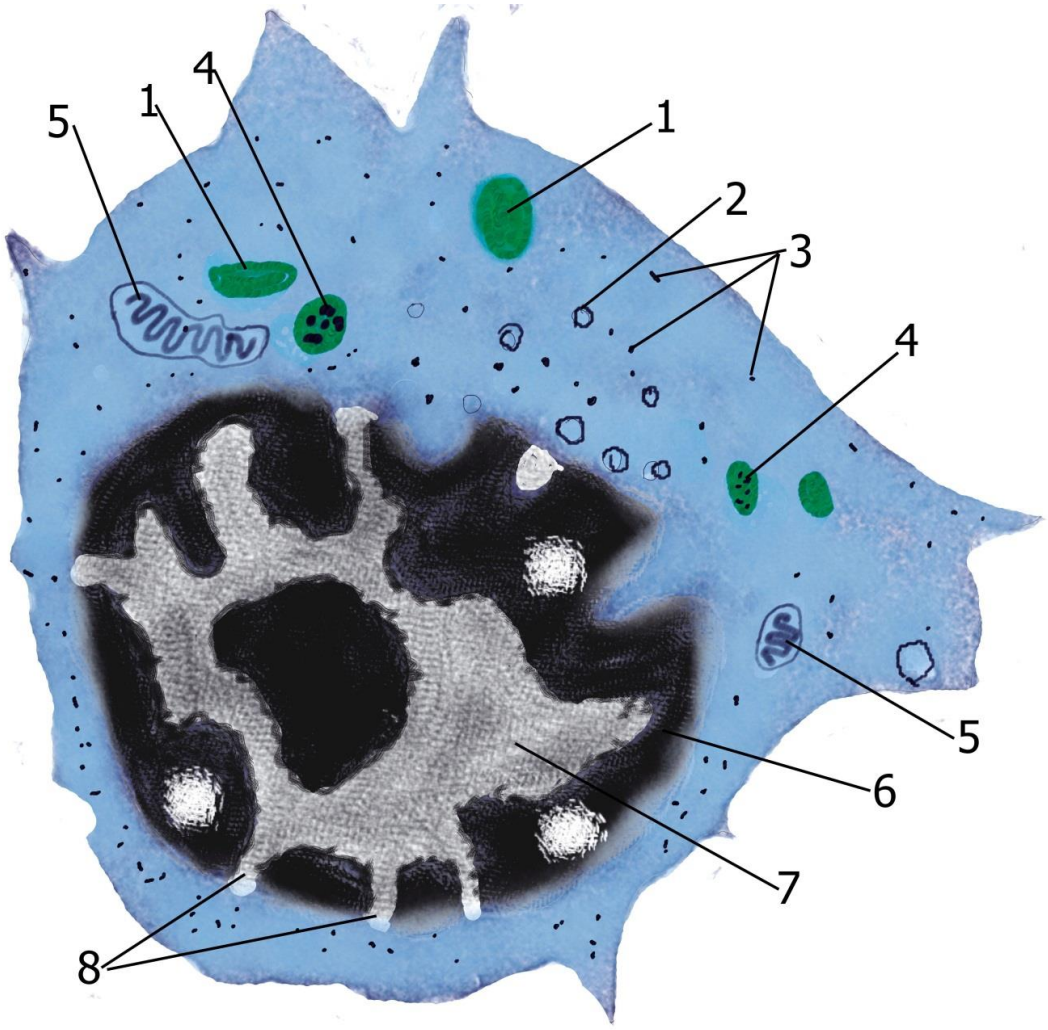
							
Cell type	Erythrocyte	Lymphocyte	Neutrophil	Eosinophil	Basophil	Monocyte	Platelet
Size	6.5 – 7.7 mkm	6-15 mkm	14-16 mkm	12-17 mkm	14-16 mkm	16-20 mkm	1.5-3.5 mkm
Number per litre	$3.9 – 6.5x10^{12}$	$0-0.1x10^{9}$	$2-7.5x10^{9}$	$1.3-3.5x10^{9}$	$0-0.44x10^{9}$	$0.2-0.8x10^{9}$	$150-400x10^{9}$
Approximate percentage	-	20-50%	40-75%	1-6%	<1%	2-10%	-
Duration of development	5-7 days	1-2 days	6-9 days	6-9 days	3-7 days	2-3 day	4-5 days
Lifespan of mature cells	120 days		From 6 hour till some days	8-12 days		From 1 month till some year	8-12 days



Şəkil 27.3. **Рисунок 27.3.** **Figure 27.3.**

Schematic illustration of neutrophil.

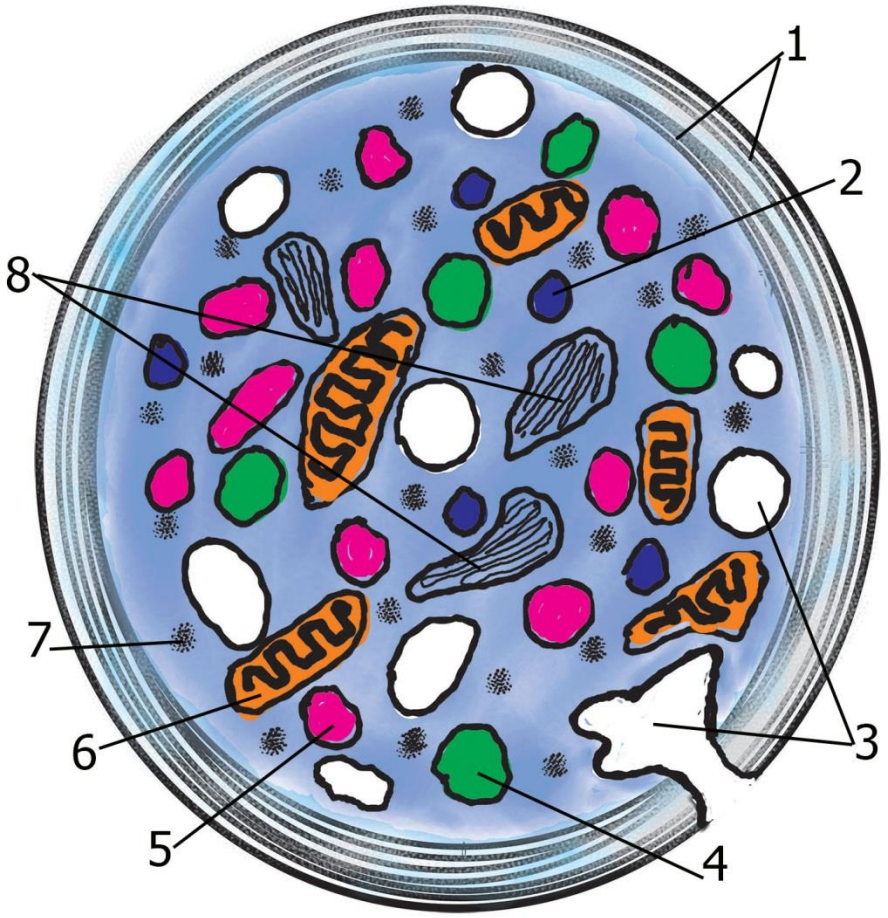
1. **Azurophilic or primary lysosomal granules**
2. **Nucleus**
3. **Specific or secondary granules**
4. **Golgi complex**
5. **tertiary granules**
6. **mitochondrion**
7. **residual body**
8. **smooth endoplasmic reticulum**
9. **rough endoplasmic reticulum**



Şəkil 27.4. **Рисунок 27.4.** **Figure 27.4.**

Schematic structure of lymphocyte

1. primary lysosome; 2. vesicles; 3. Ribosome; 4. secondary lysosome; 5. Mitochondrion; 6. Heterochromatin; 7. Euchromatin; 9. nuclear pores.

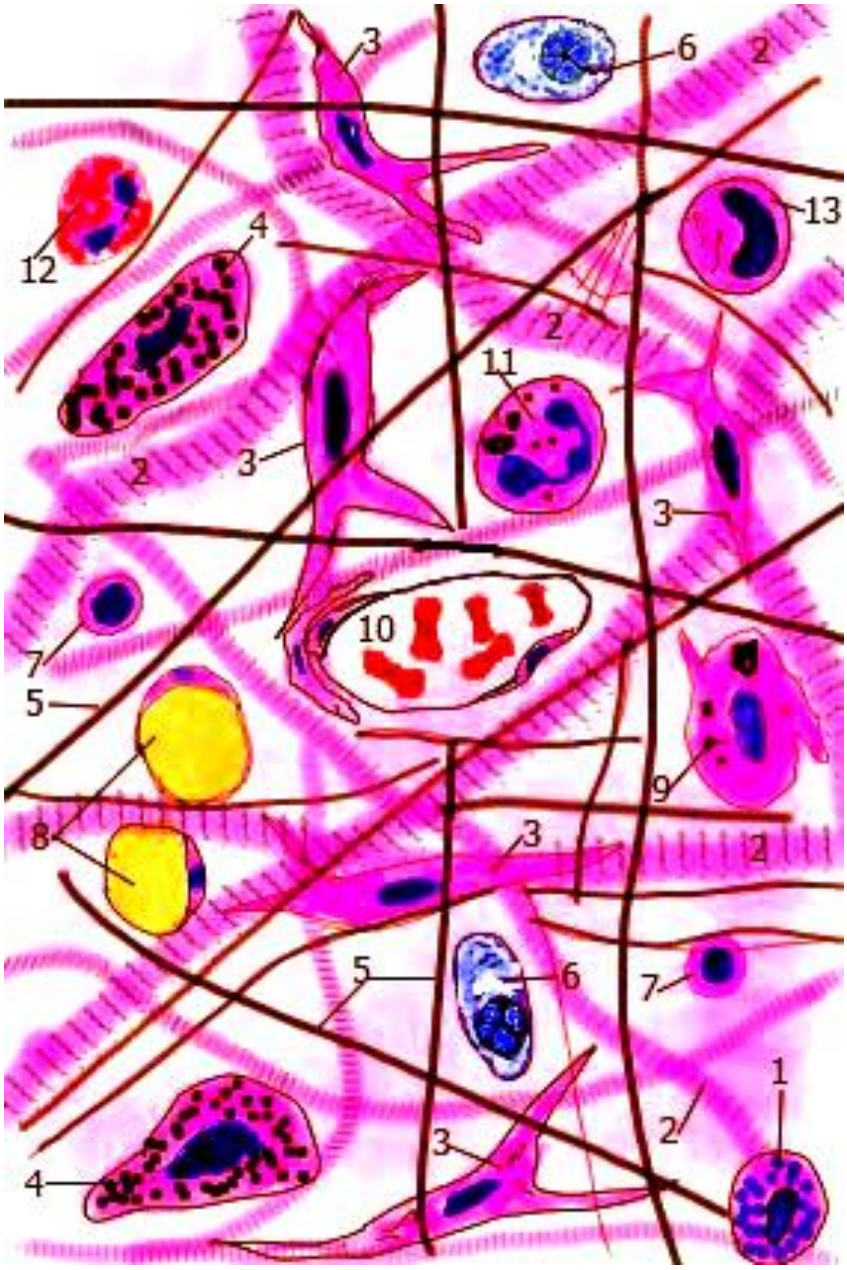


Şəkil 27.5. **Рисунок 27.5.** **Figure 27.5.**

Schematic structure of platelets in cross section

1. bundles of microtubules (hyalomere)
2. λ – granules
3. surface opening (connecting) system
4. α – granules
5. δ – granules
6. mitochondrion
7. glycogen
8. dense tubular system

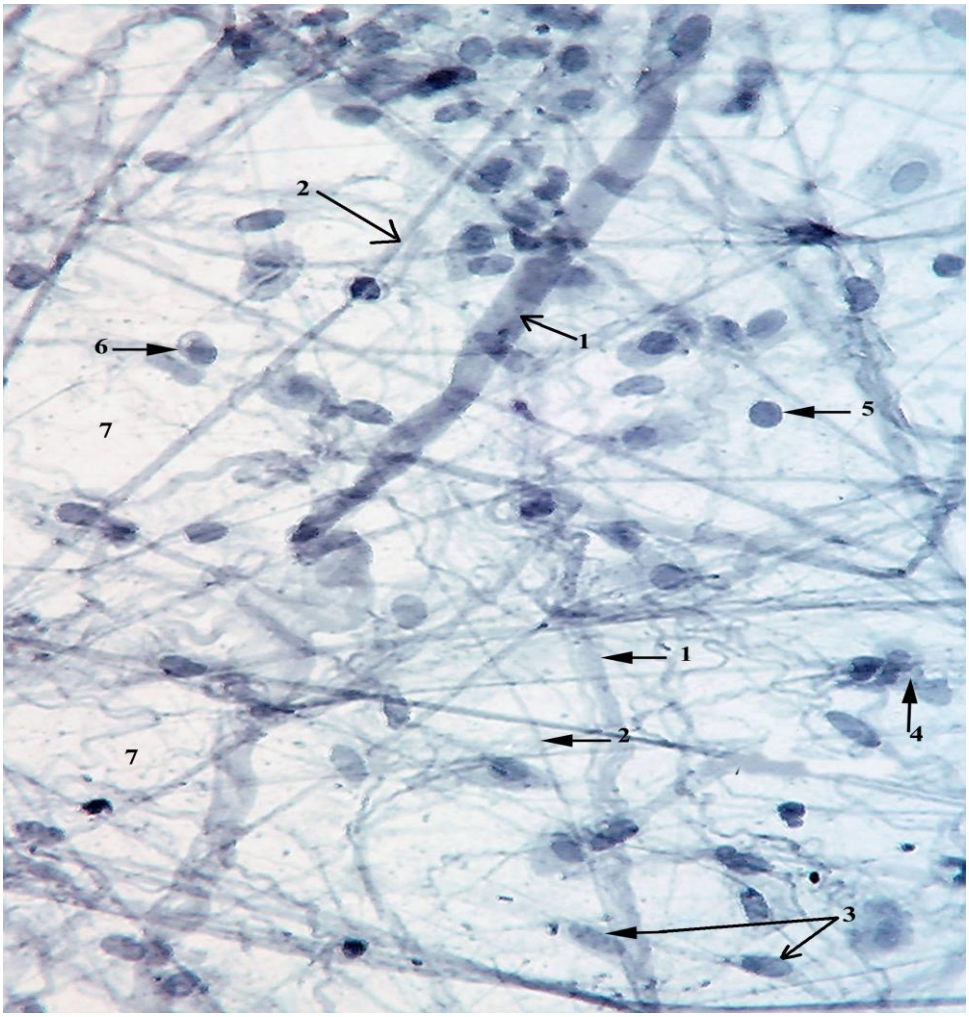
Kövşək lifli birləşdirici toxuma. 28



Şəkil 28.1. **Рисунок 28.1.** **Figure 28.1.**

Schematic illustration of loose connective tissue.

1. **basophils**
2. **collagen fibers**
3. **fibroblasts**
4. **mast cell**
5. **elastic fibers**
6. **plasma cell**
7. **lymphocyte**
8. **adipocytes**
9. **macrophage**
10. **blood capillaries**
11. **neutrophils**
12. **eosinophils**
13. **monocytes**

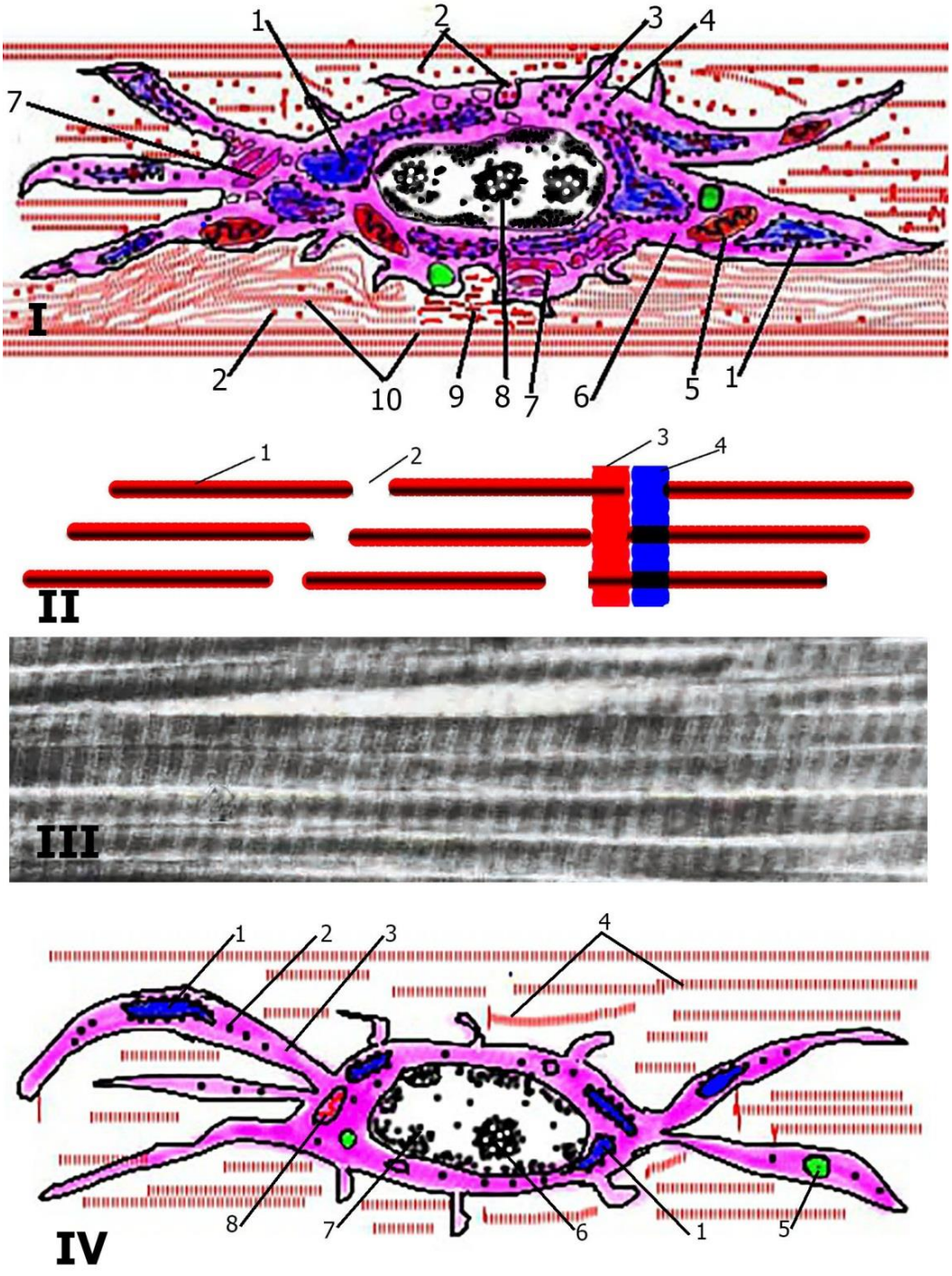


Şəkil 28.2. **Рисунок 28.2.** **Figure 28.2.**

Histological slide of loose connective tissue.

Stain: ferrous hematoxylin

1. **bundles of collagen fibers**
2. **elastic fibers**
3. **fibrocyte**
4. **macrophage**
5. **lymphocyte**
6. **plasma cell**
7. **ground substance**



Şəkil 28.3. **Рисунок 28.3.** **Figure 28.3.**

I schematic illustration of fibroblast and surrounding structures.

1 rough endoplasmi8c reticulum
2 ground substance
3 polyribosomes
4 ribosomes
5 mitochondrion
6 cytosol
7 Golgi apparatus
8 nucleolus
9 tropocollagen molecules
10 collagen fibres

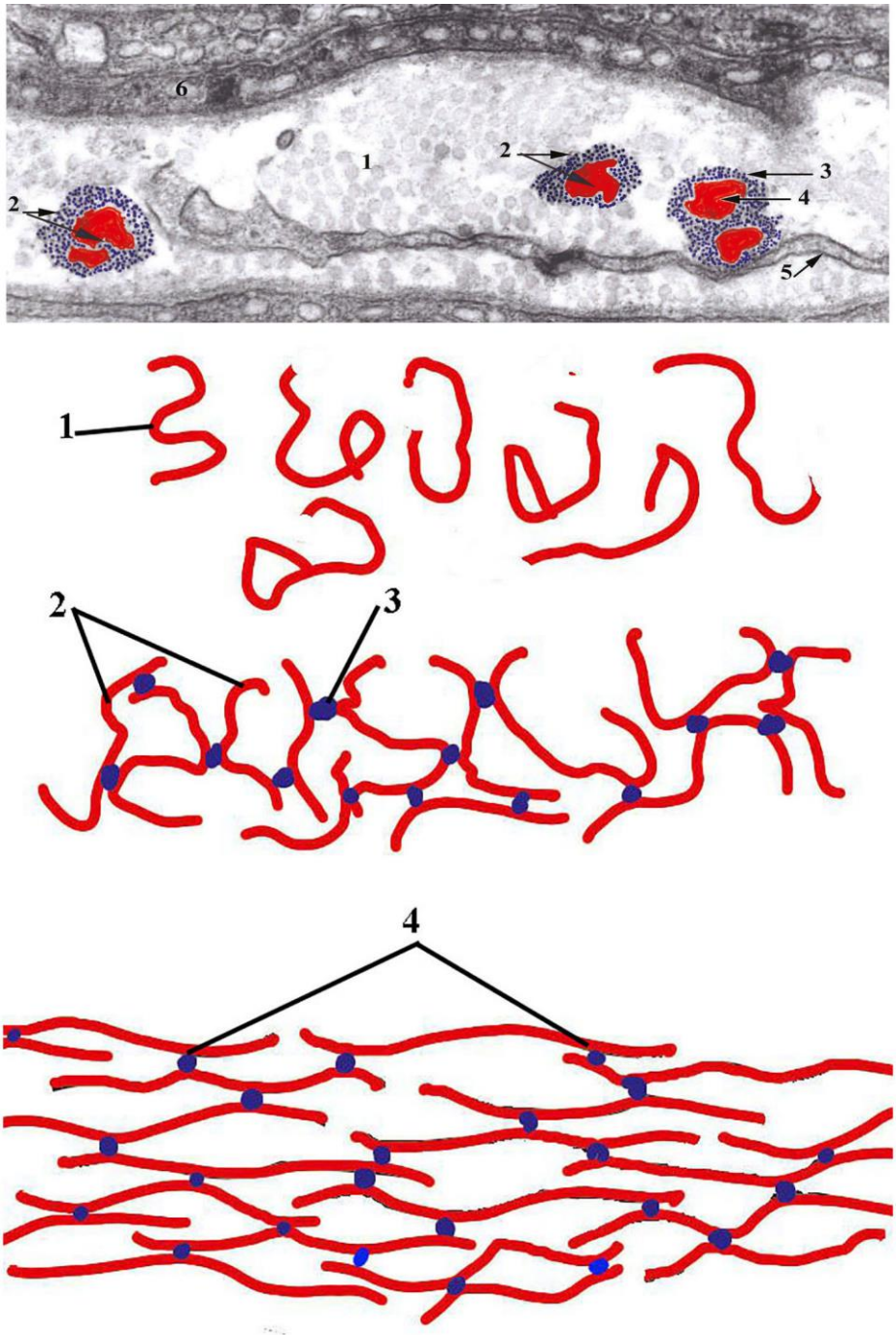
II interaction between collagen molecules

1 collagen molecules
2 hold region between two collagen molecules
3 light region
4 Dark overlap region

III electron microscopic structure of collagen fibers

IV Fibrocyte and surrounding structures

1 rough endoplasmic reticulum
2 ribosomes
3 cytosole
4 collagen fibres
5. lysosome
6. nucleolus
7 nucleus
8 mitochondrion



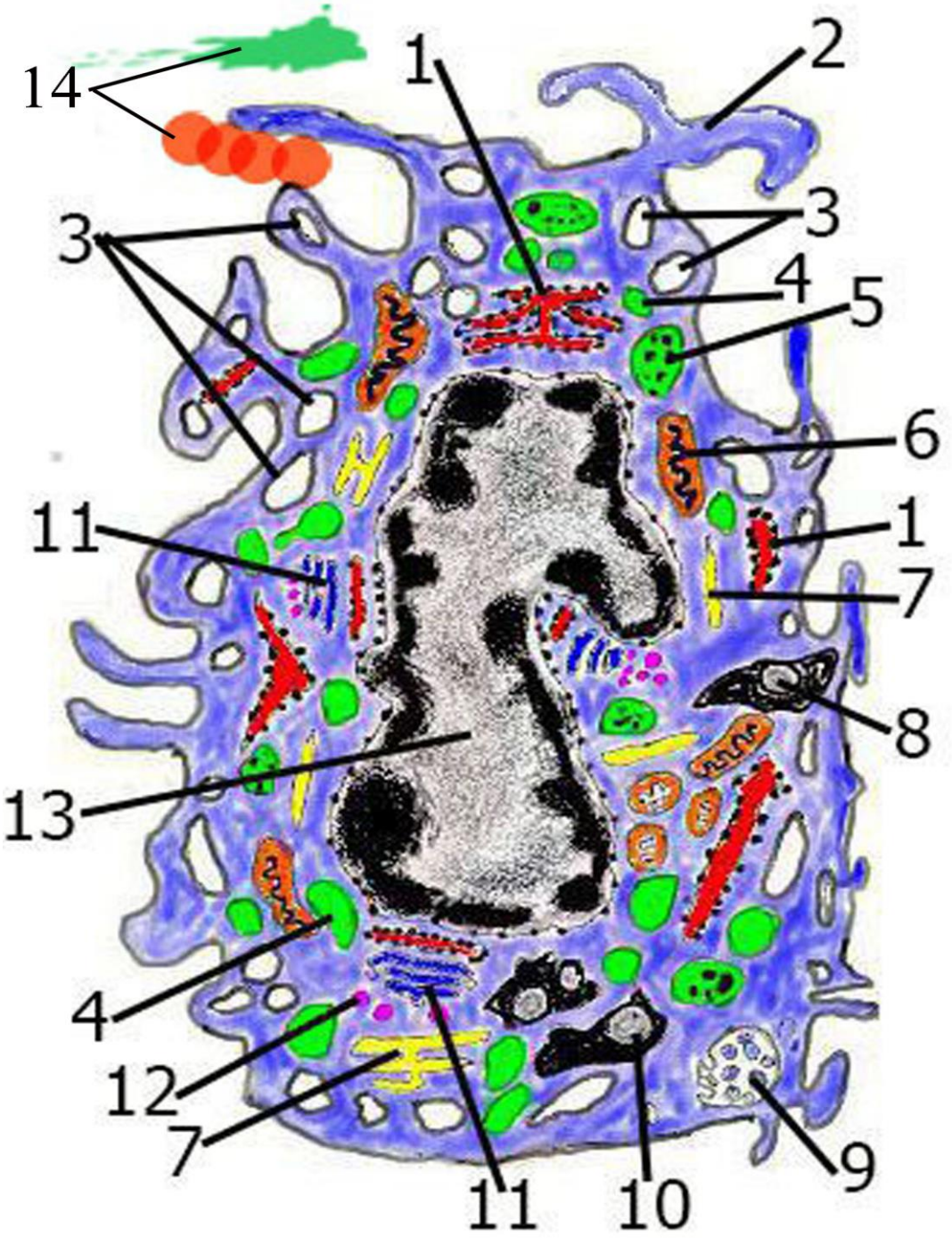
Şəkil 28.4. **Рисунок 28.4.** **Figure 28.4.**

Electron microscopic structure of collagen and elastic fibers in cross section (up)

1. Bundle of collagen fibers
2.elastic fibers
3 microfibrils
4.core of elastic fibers
5. fibrocyte
6. perineural cells

Schematic illustration of elastic fibers in different position (down)

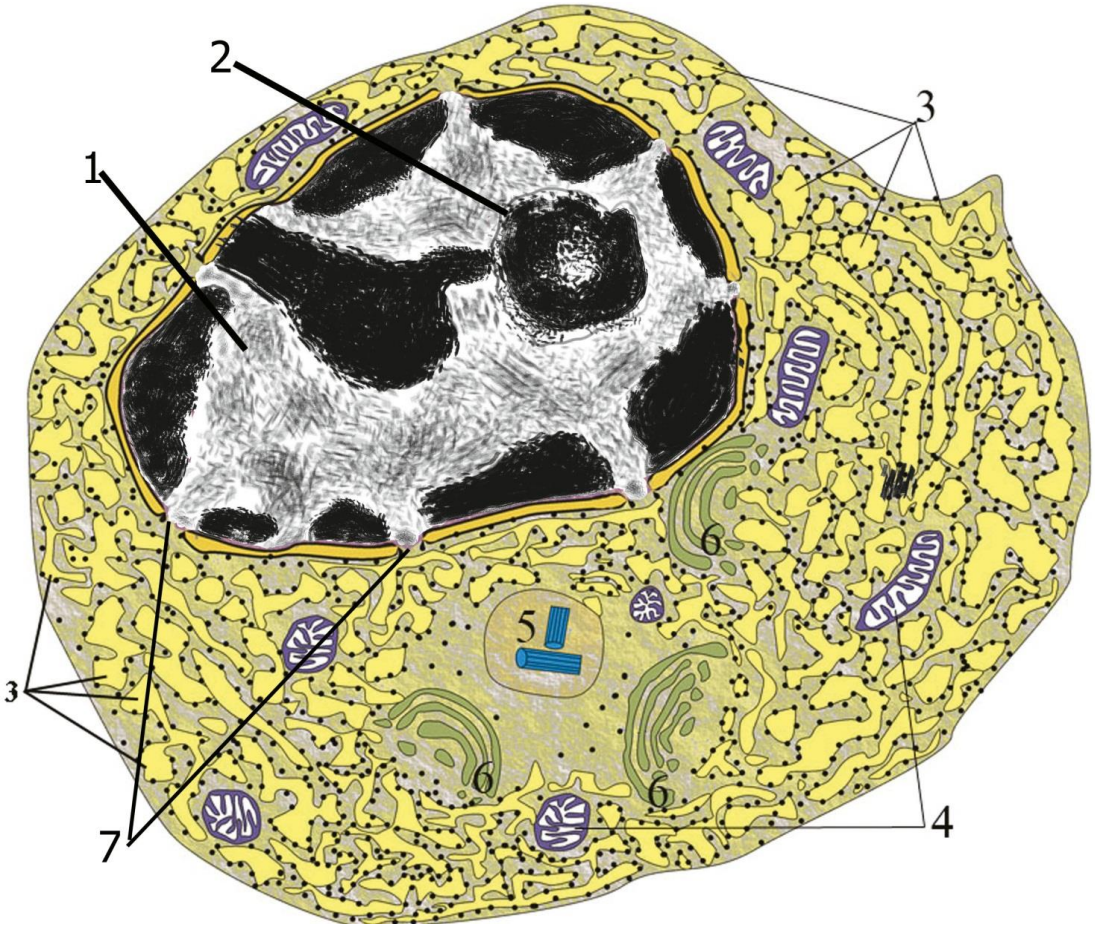
1. elastin protein
2. elastic fibers in relaxing position
3. transverse action containing lysin and prolysin amino acids between elastic fibers
4. stretching elastic fibers



Şəkil 28.5. **Рисунок 28.5.** **Figure 28.5.**

Schematic illustration of macrophage

1 rough endoplasmic reticulum
2 pseudopodia
3 vesicles
4 primary lysosomes
5 secondary lysosomes
6 mitochondrion
7 Golgi apparatus
8 residual body
9 multivesicular body
10 phago lysosomes
11 smooth endoplasmic reticulum
12 secretory vesicles
13 nucleus
14 bacteria , virus antigens

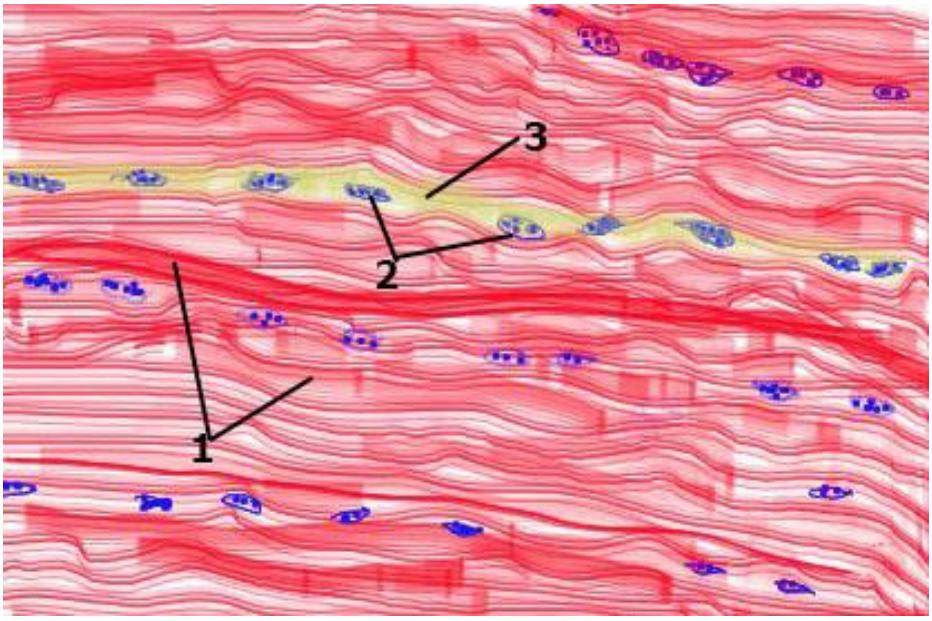


Şəkil 28.6. **Рисунок 28.6.** **Figure 28.6.**

Schematic illustration of plasma cell

1. Nucleus 2. Nucleolus 3. Rough endoplasmic reticulum
4. Mitochondria 5. centrosome 6. Golgi apparatus 7. Nuclear pores

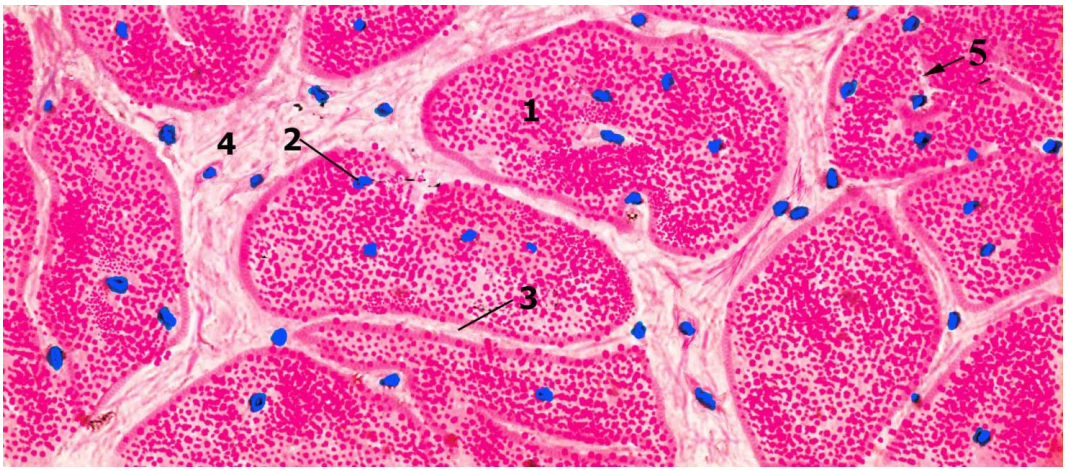
Sıx lifli və spesifik xassəli birləşdirici toxumalar. 29



Şəkil 29.1. Рисунок 29.1. Figure 29.1.

Dense regular connective tissue. Schematic illustration of tendon in longitudinal section.

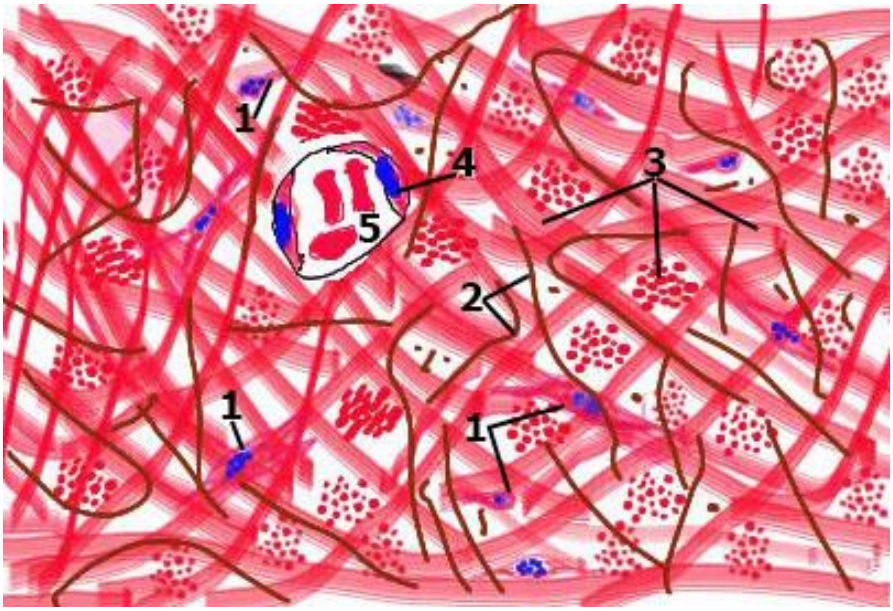
1. Bundles of collagen fibers 2. Nucleus of fibrocyte 3. Connective tissue elements



Şəkil 29.2. **Рисунок 29.2.** **Figure 29.2.**

Schematic illustration of dense regular connective tissue, cross section of tendon. Stain: hematoxyline-eosin.

1. bundle of collagen fibers 2. Nucleus of fibrocyte
3. Connective tissue elements that surround primary tendon bundles; 4. connective tissue elements that surround secondary tendon bundles 5 endotendon



Şəkil 29.3. **Рисунок 29.3.** **Figure 29.3.**

Dense irregular connective tissue

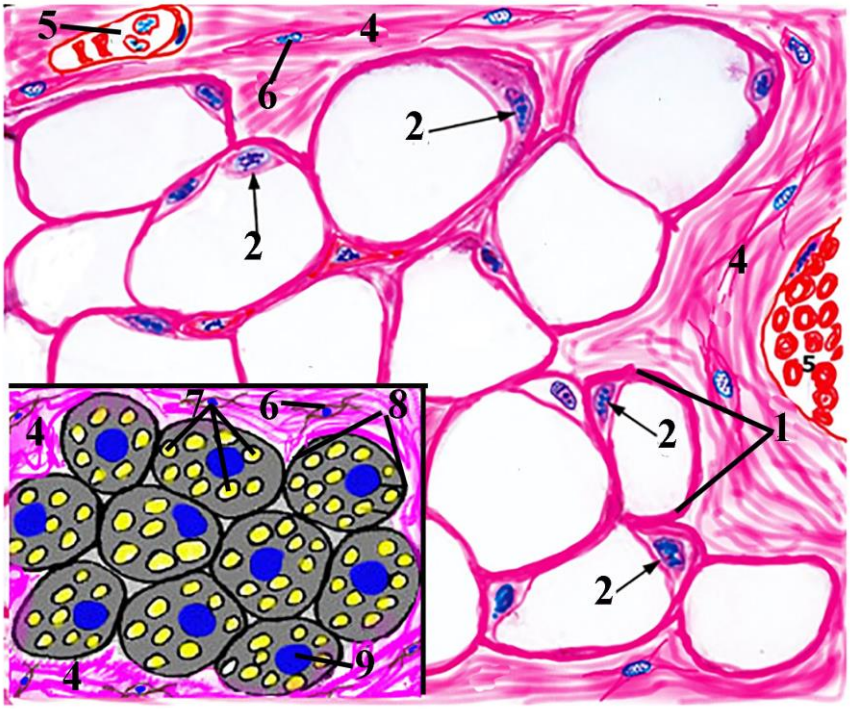
1 fibroblast

2 elastic fibers

3 collagen fibers

4 endothelial cells

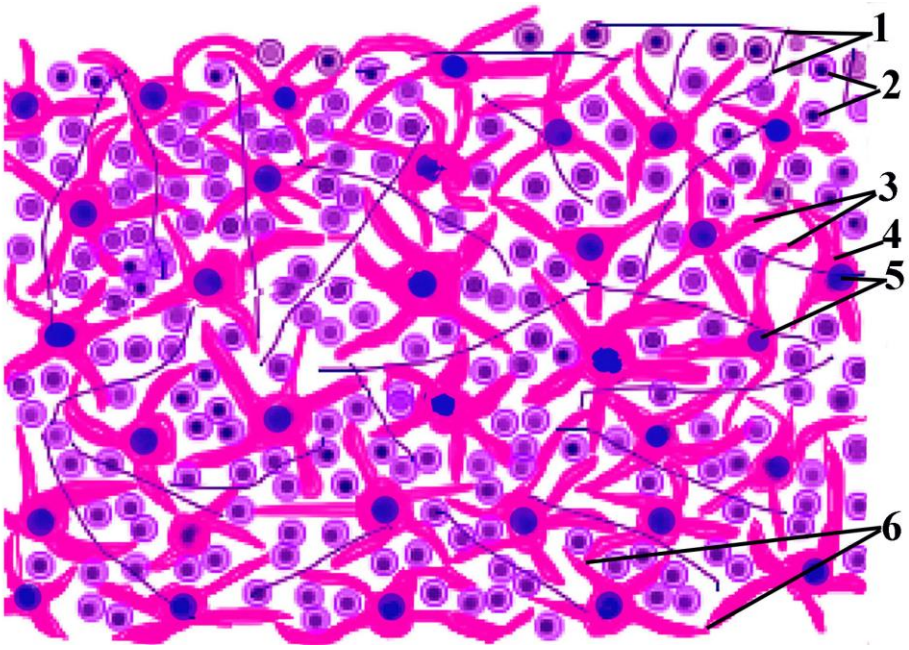
5 blood vessels



Şəkil 29.4. **Рисунок 29.4.** **Figure 29.4.**

Histological structure of white and brown adipose tissue

1. Unilocular adipose cell; 2. Nucleus of unilocular adipose cell;
4. Connective tissue elements; 5. Blood vessels; 6. Fibrocyte.
7. lipid droplet in cytoplasm of multilocular adipose cell
8 multilocular adipose cell (brown adipose tissue) 9. nucleus of multilocular adipose cell

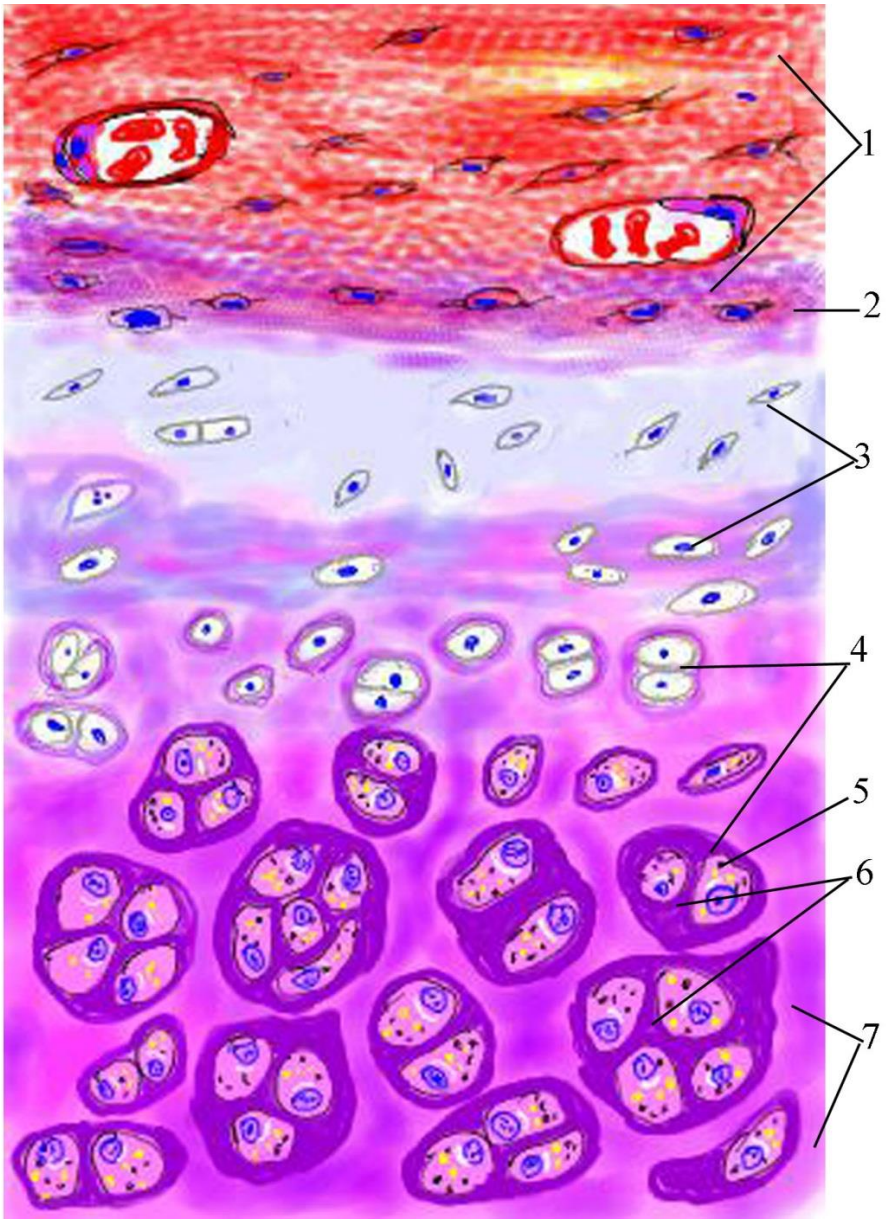


Şəkil 29.5. **Рисунок 29.5.** **Figure 29.5.**

Microscopic structure of reticular tissue.

1. reticular fibers 2. Lymphocytes 3. Processes of reticular cells
4 cytoplasm of reticular cells 5. Nucleus of reticular cells
6.interreticular cell junction (contact)

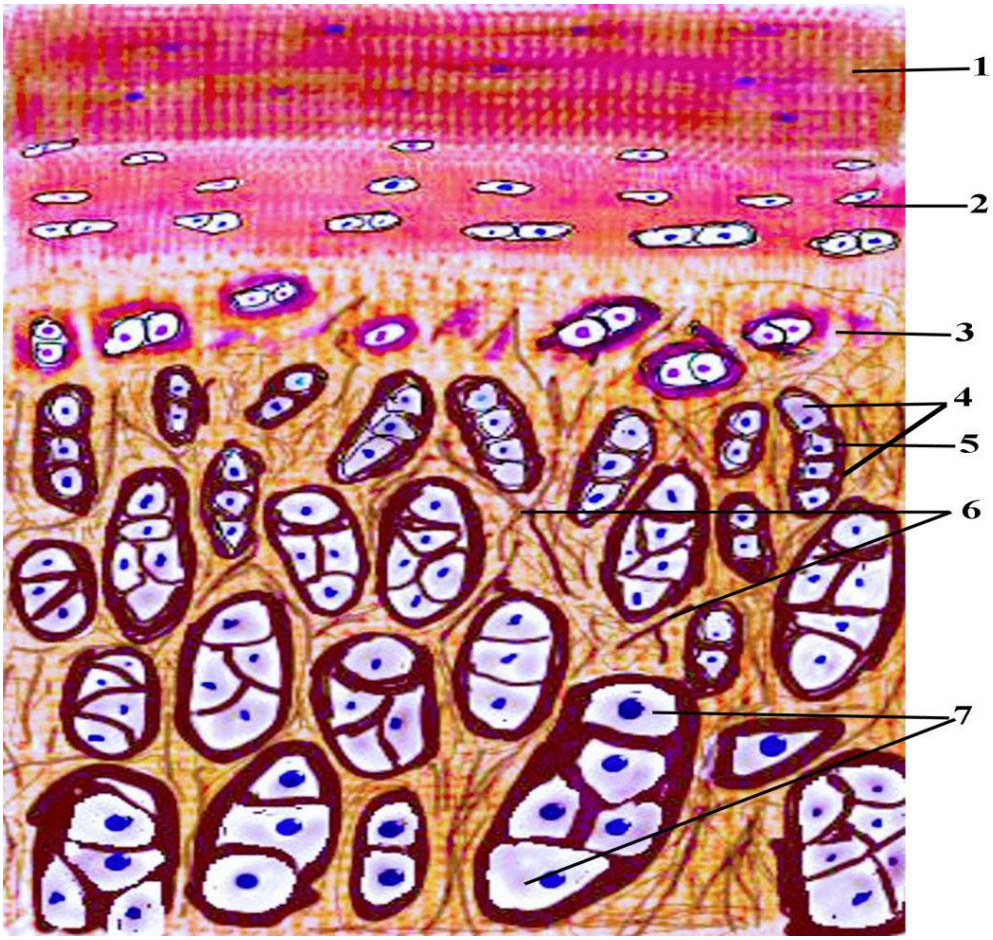
Qığırdaq toxuması. Xondrogenez. 30



Şəkil 30.1. **Рисунок 30.1.** **Figure 30.1.**

Schematic illustration of hyaline cartilage.

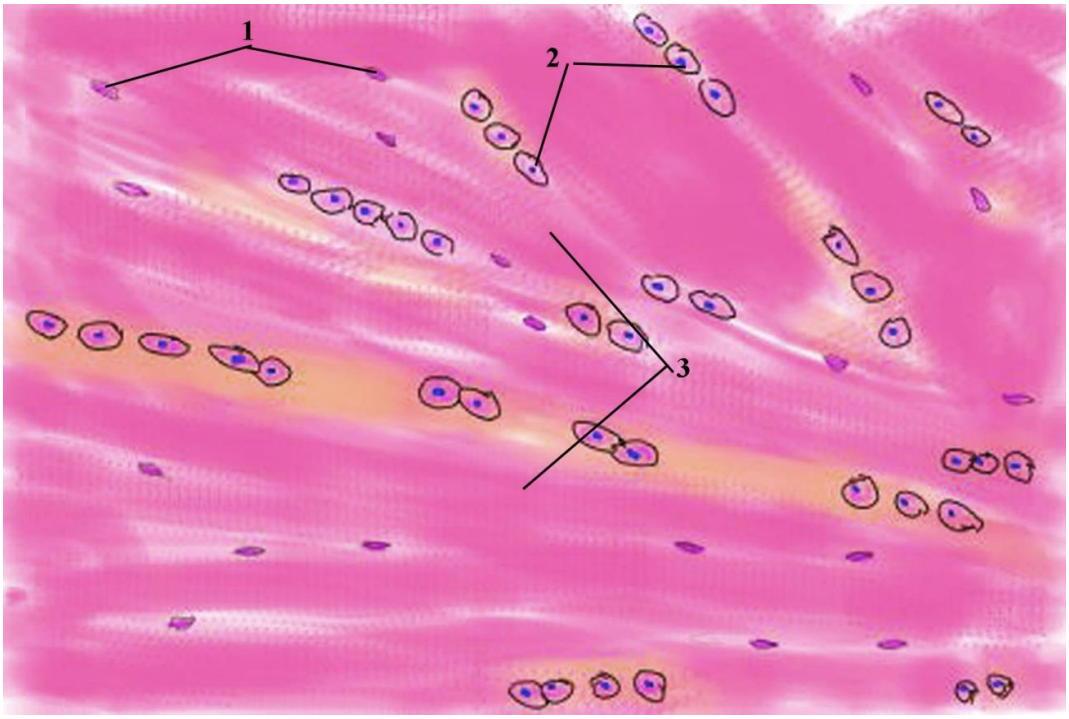
1. perichondrium
2. chondrogenic (inner cellular) layer
3. newly formed chondrocytes
4. isogenous groups
5. mature chondrocytes
6. territorial matrix
7. interterritorial matrix



Şəkil 30.2. **Рисунок 30.2.** **Figure 30.2.**

Schematic illustration of elastic cartilage.

1. Dense connective tissue elements
2. chondrogenic (cellular) layer
3. isogenous groups formed matrix
4. isogenous groups
5. capsular matrix
6. elastic fibers
7. chondrocytes

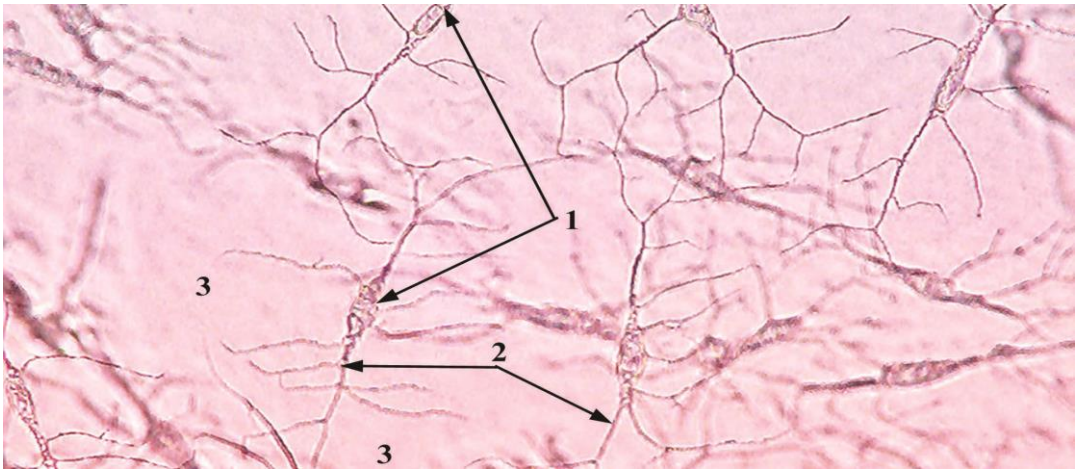


Şəkil 30.3. **Рисунок 30.3.** **Figure 30.3.**

Schematic illustration of fibrocartilage.

1. fibrocyte
2. central parts of chondrocytes
3. bundles of collagen fibers

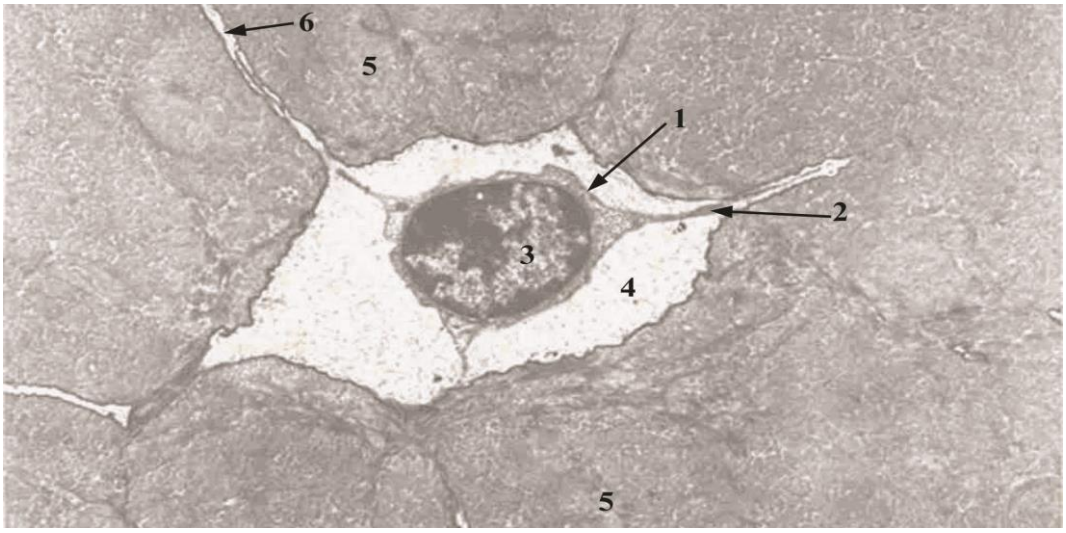
Sümük toxuması. 31



Şəkil 31.1. **Рисунок 31.1.** **Figure 31.1.**

Primary woven bone tissue. Unstained.

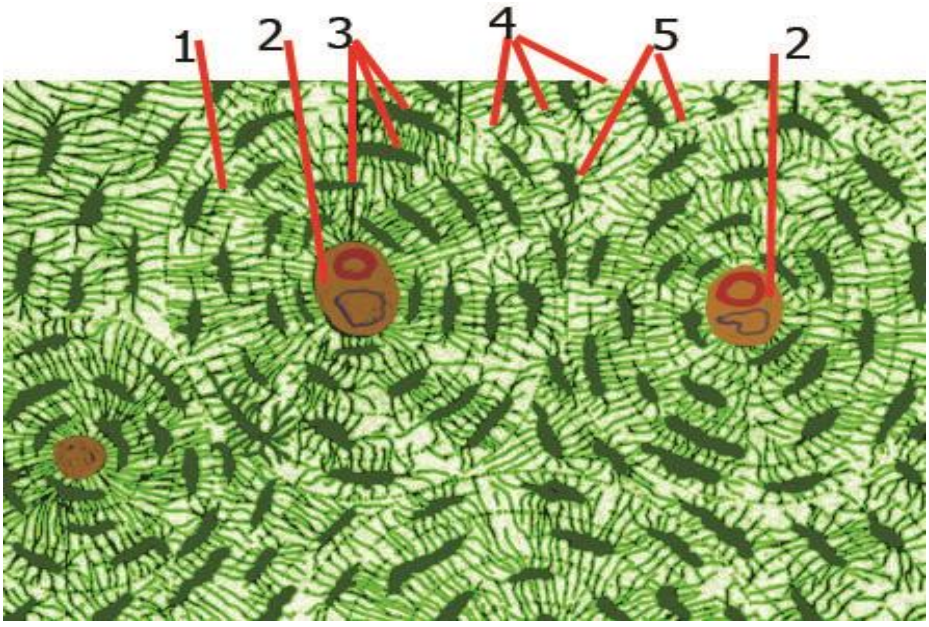
1. osteocytes
2. processes of osteocytes
3. extracellular matrix



Şəkil 31.2. **Рисунок 31.2.** **Figure 31.2.**

Electron micrograph of osteocyte.

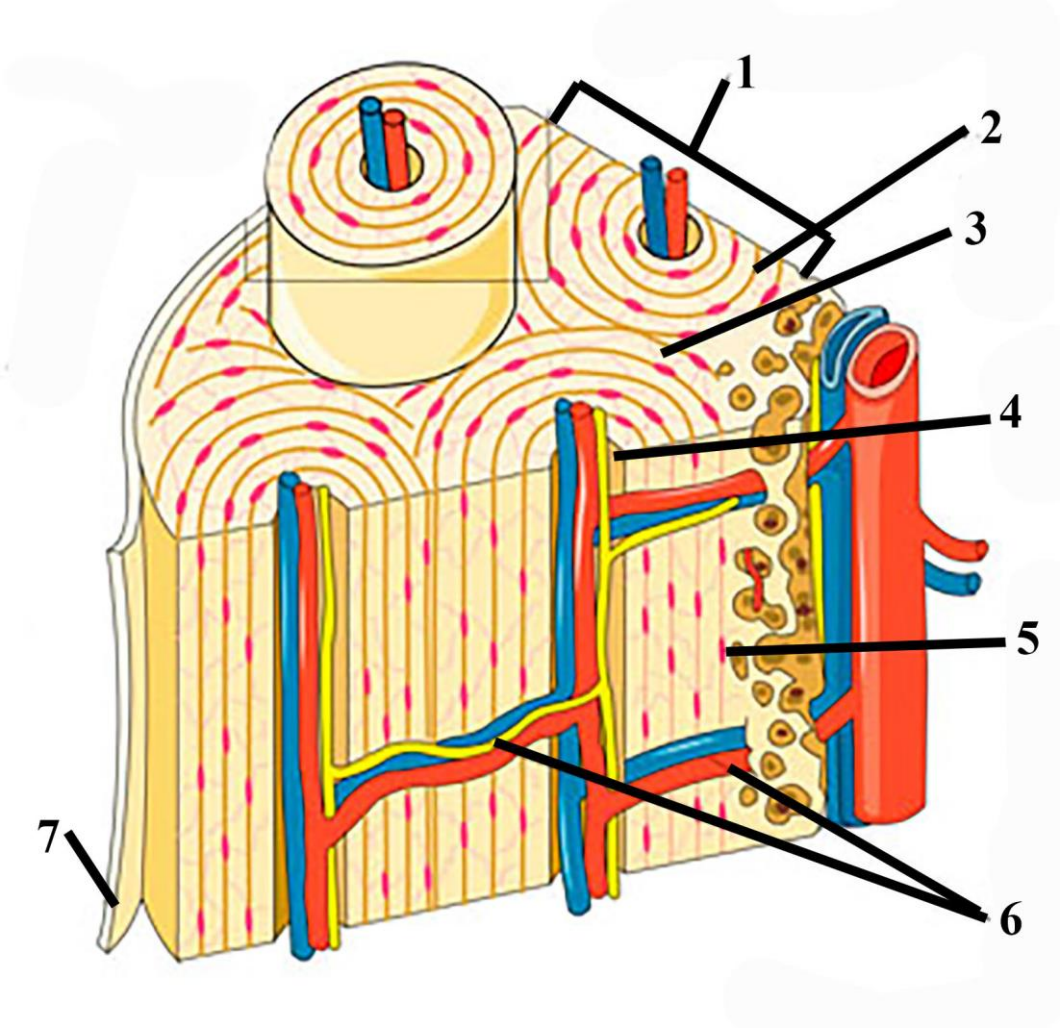
1. osteocyte
2. processes of osteocyte
3. nucleus of osteocyte
4. lacuna (cell nest)
5. decalcificated extracellular matrix
6. canaliculus of osteocyte



Şəkil 31.3. **Рисунок 31.3.** **Figure 31.3.**

Secondary lamellar bone tissue. In transitional section. Stain: picrofuchsine-thionine.

1. concentric Haversian lamellae
2. Haversian canal
3. osteocyte
4. interstitial lamellae
5. processes of osteocyte

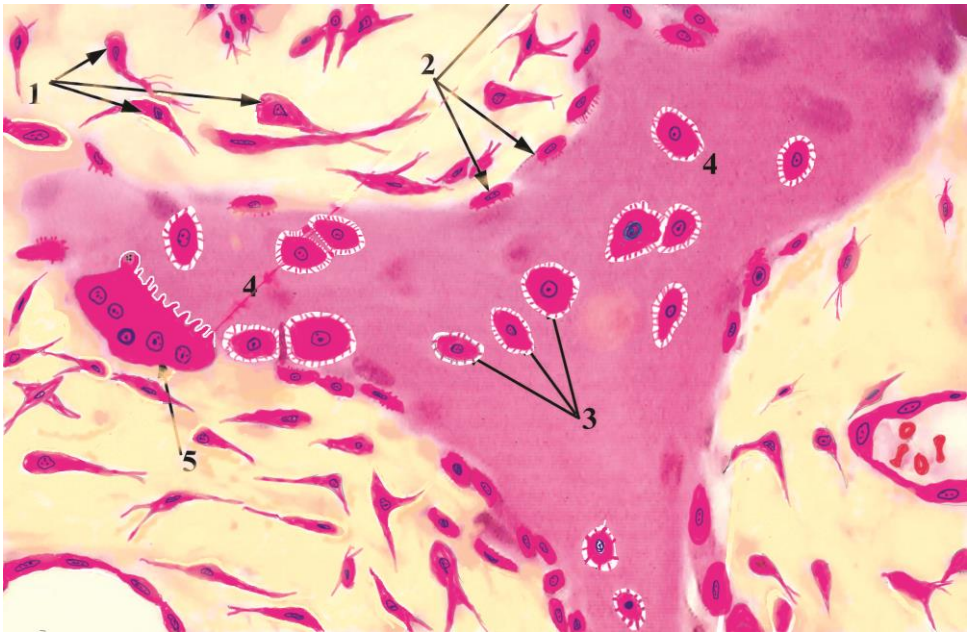


Şəkil 31.4. **Рисунок 31.4.** **Figure 31.4.**

Schematic illustration of the lamellar bone

1. Haversian system (osteon)
2. lacuna for osteocyte
3. consentric Haversian lamellae
4. Haversian canal
5. osteocyte
6. Volkmann’s canal
7. periosteum

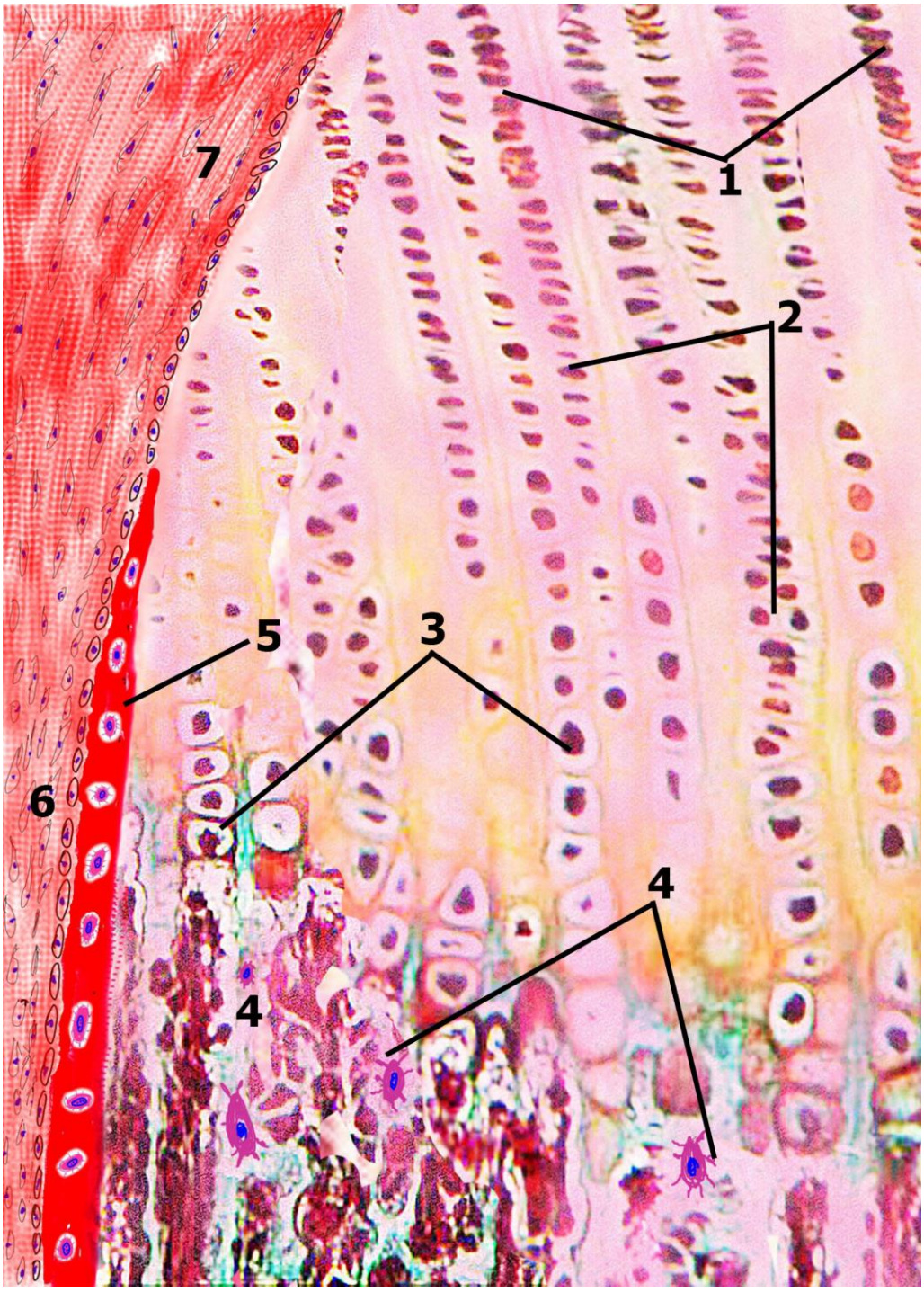
Osteohistogenez. 32



Şəkil 32.1. **Рисунок 32.1.** **Figure 32.1.**

Intramembranous ossification in mandibular bone of pig embryo. Stain: hematoxylin-eosin.

1. mesenchymal cells
2. osteoblasts
3. osteocytes
4. bone islet
5. osteoclast

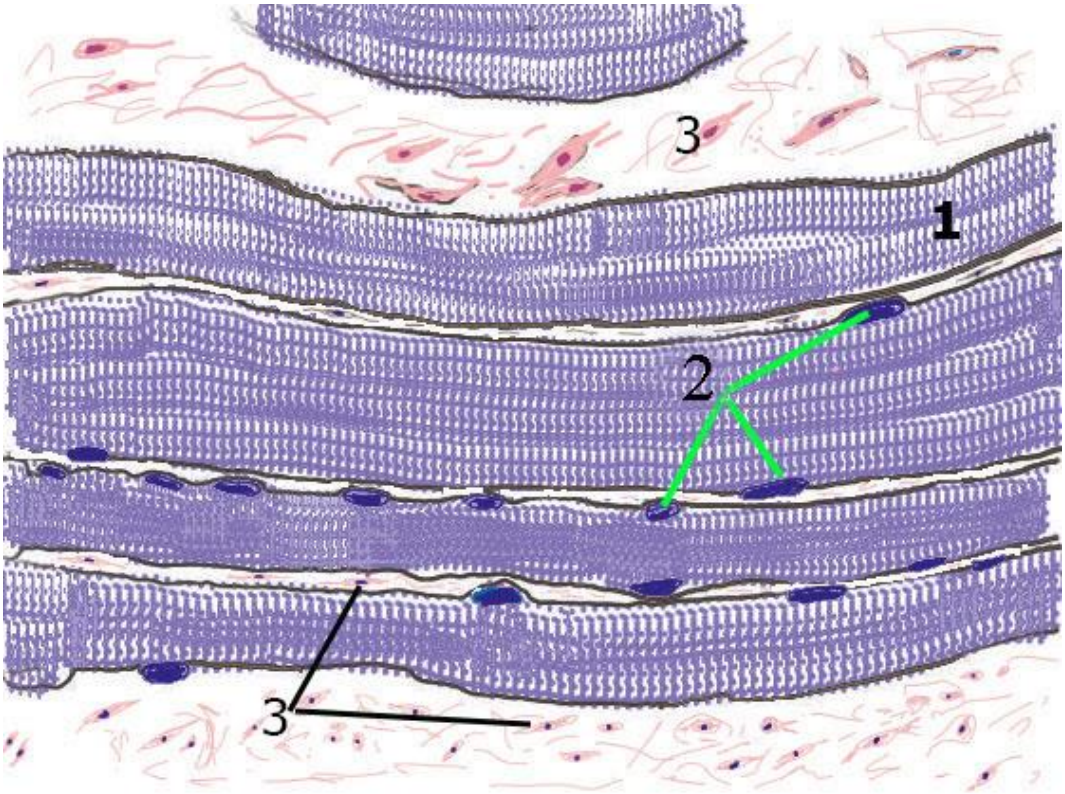


Şəkil 32.2. **Рисунок 32.2.** **Figure 32.2.**

Endochondral ossification in long bone of the pig embryo.
Stain: hematoxylin-eosin.

1. epiphyseal hyaline cartilage
2. proliferated chondrocytes
3. hypertrophied and destructed chondrocytes
4. endochondral bone lamellae
5. perichondral bone manjet
6. periosteum
7. perichondrium

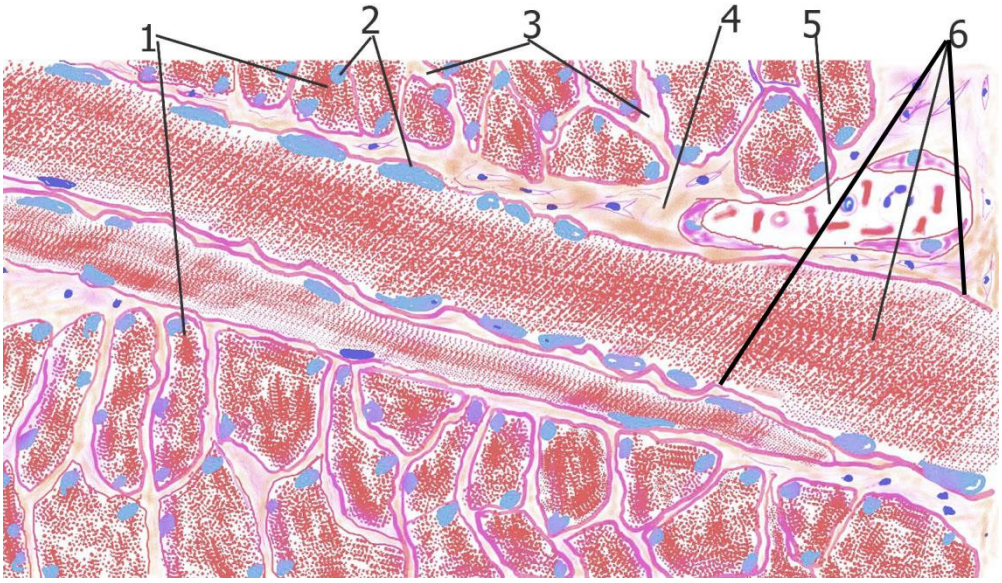
Eninəzolaqlı skelet əzələ toxuması. 33



Şəkil 33.1. **Рисунок 33.1.** **Figure 33.1.**

Structure of striated skeletal muscle fibers.
Stain: ferrous hematoxylin.

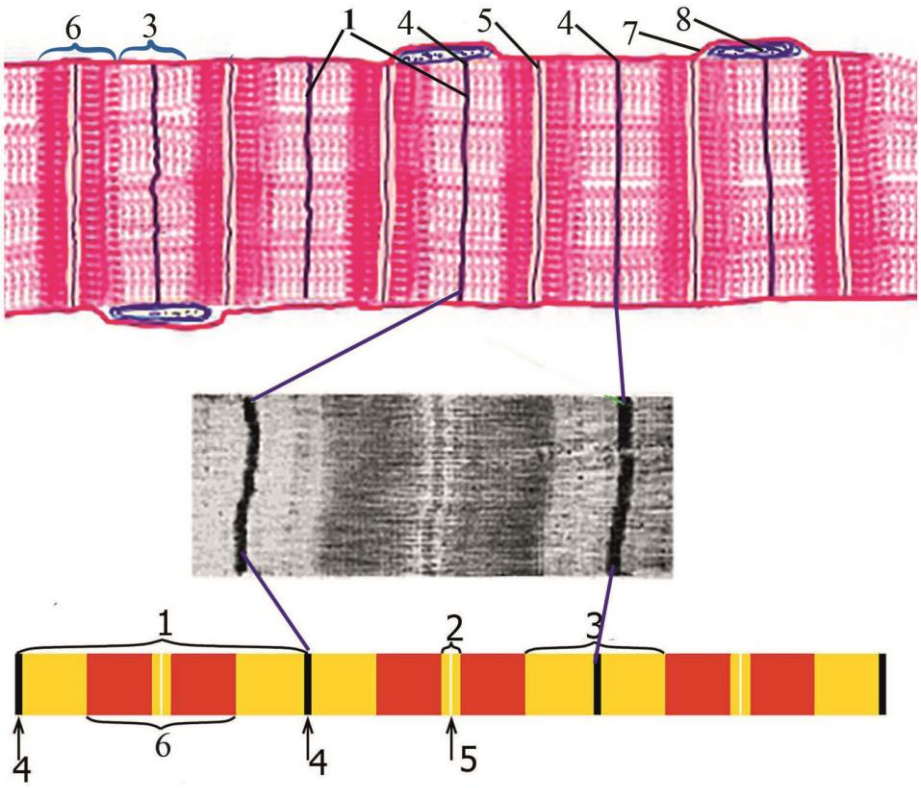
1. striated muscle fibers
2. nuclei
3. connective tissue elements.



Şəkil 33.2. **Рисунок 33.2.** **Figure 33.2.**

Striated skeletal muscle tissue. Longitidunal section of tongue. Stain: hematoxylin-eosin.

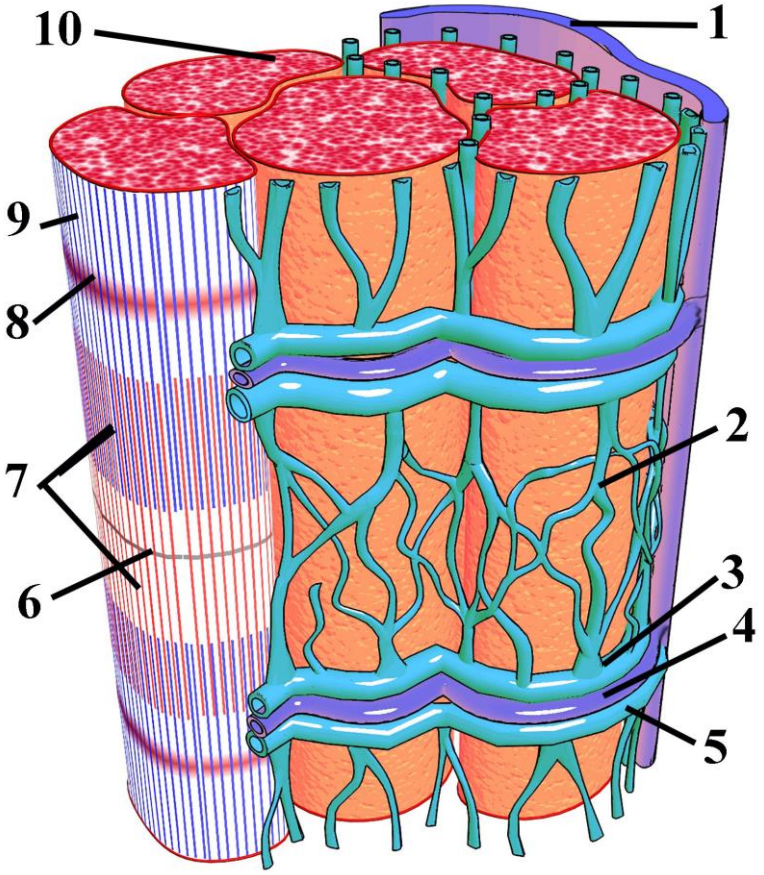
1. transverse section of muscle fiber
2. nucleus
3. endomysium
4. perimysium
5. blood vessel
6. longitudinal section of muscle fiber



Şəkil 33.3. **Рисунок 33.3.** **Figure 33.3.**

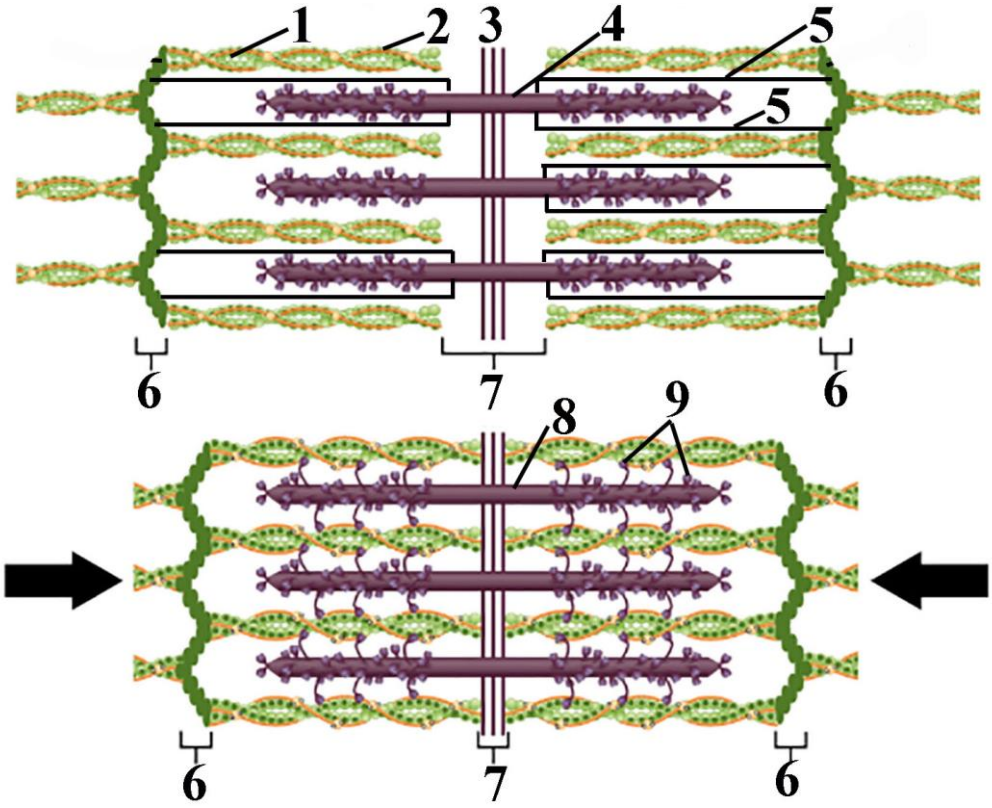
Schematic representation of striated muscle fiber (upper) and myofibril (lower), electron microscopic structure of myofibrils (middle).

1. sarcomer
2. H band
3. isotropic band (I band)
4. Z line
5. M line
6. anisotropic band (A band)
7. sarcolemma
8. nucleus



Şəkil 33.4. Рисунок 33.4. Figure 33.4.
Schematic representation of striated muscle fiber.

1. sarcolemma
2. tubules of sarcoplasmic reticulum
3. upper terminal cistern
4. T-tubules.
5. Lower terminal cistern
6. M line
7. anisotropic band
8. Z line
9. isotropic band
10. muscle fiber in cross section

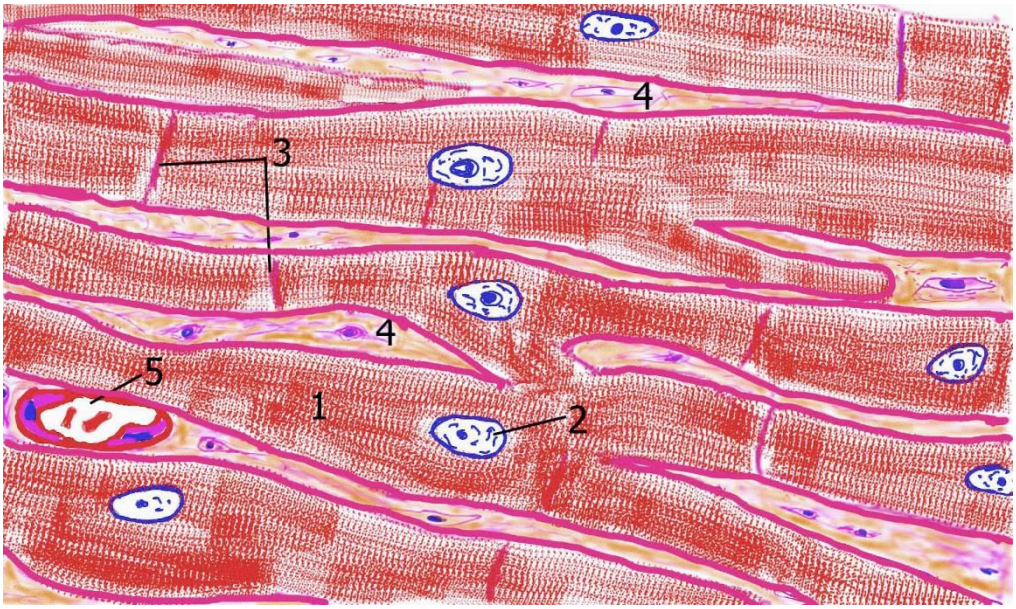


Şəkil 33.5. **Рисунок 33.5.** **Figure 33.5.**

Schematic representation of striated muscle fiber in relaxed (up) and contracted (down) position

1 actin 2 nebulin 3 M line 4 and 8 thick filament (myosin) 5 titin 6 Z line 7 H band 9 head of myosin

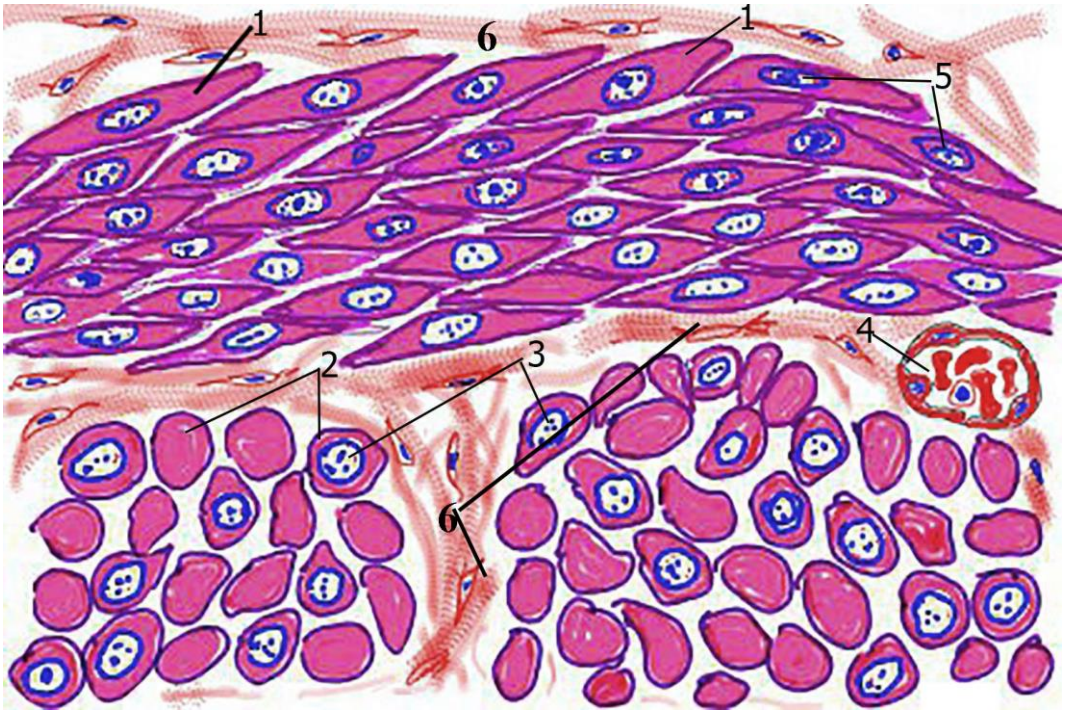
Ürək və saya əzələ toxumaları. 34



Şəkil 34.1 **Рисунок 34.1** **Figure 34.1**

Myocardium. Longitudinal section.
Stain: hematoxylin-eosin.

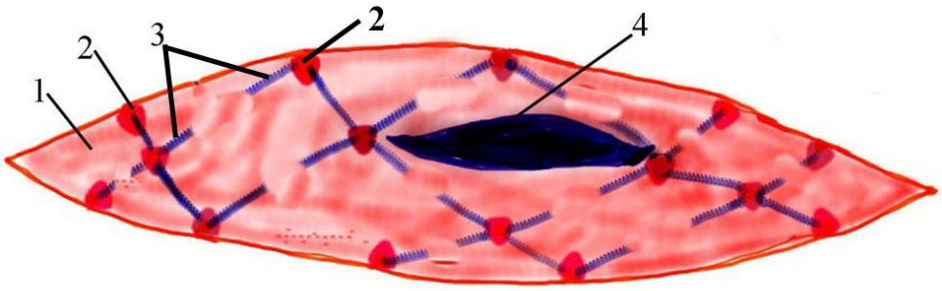
1. functional muscle fiber- cardiomyocytes
2. nucleus of cardiac muscle cell
3. intercalated disks
4. connective tissue elements
5. hemocapillary.



Şəkil 34.2. **Рисунок 34.2.** **Figure 34.2.**

Schematic picture of smooth muscle tissue in longitudinal (up) and cross (down) section.

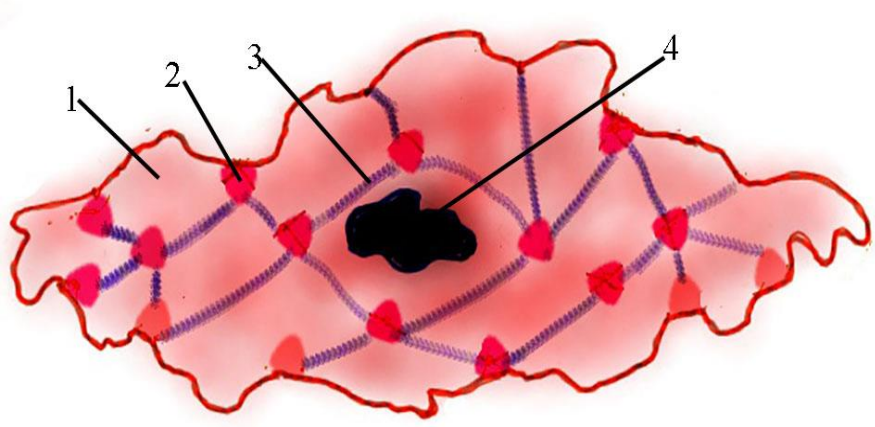
1. smooth muscle cells in longitudinal section
2. smooth muscle cells in cross section
3. nucleus of smooth muscle cells in cross section
4. blood vessels
5. nucleus of smooth muscle cells in longitudinal section
6. connective tissue elements



Şəkil 34.3. **Рисунок 34.3.** **Figure 34.3.**

Schematic diagram of rested smooth muscle cell.

1. cytoplasm
2. dense bodies
3. actin filaments
4. nucleus.

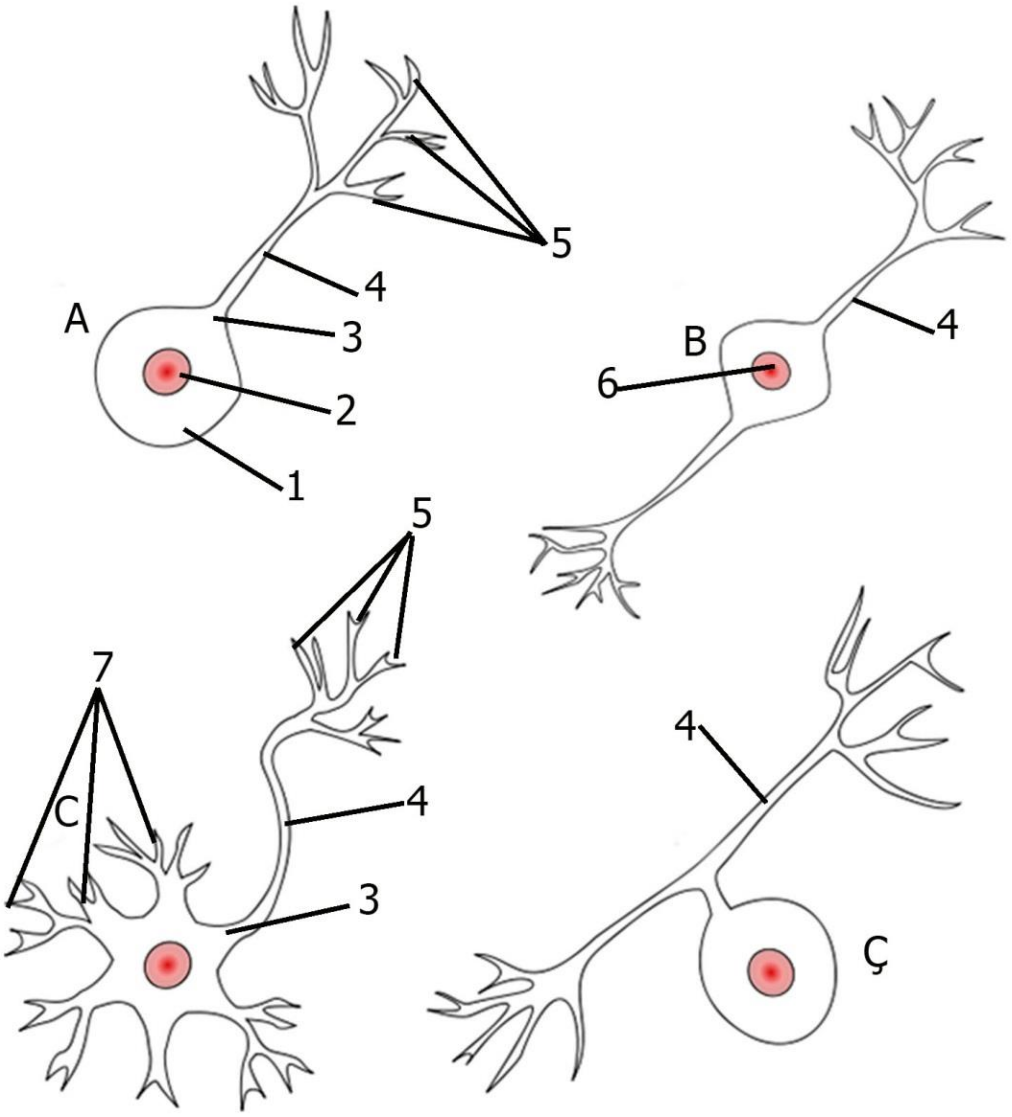


Şəkil 34.4. **Рисунок 34.4.** **Figure 34.4.**

Schematic diagram of contraction of smooth muscle cell.

1. **cytoplasm**
2. **dense bodies**
3. **interaction of actin myosin filaments**
4. **nucleus.**

Sinir toxuması. Neyrositlər. 35

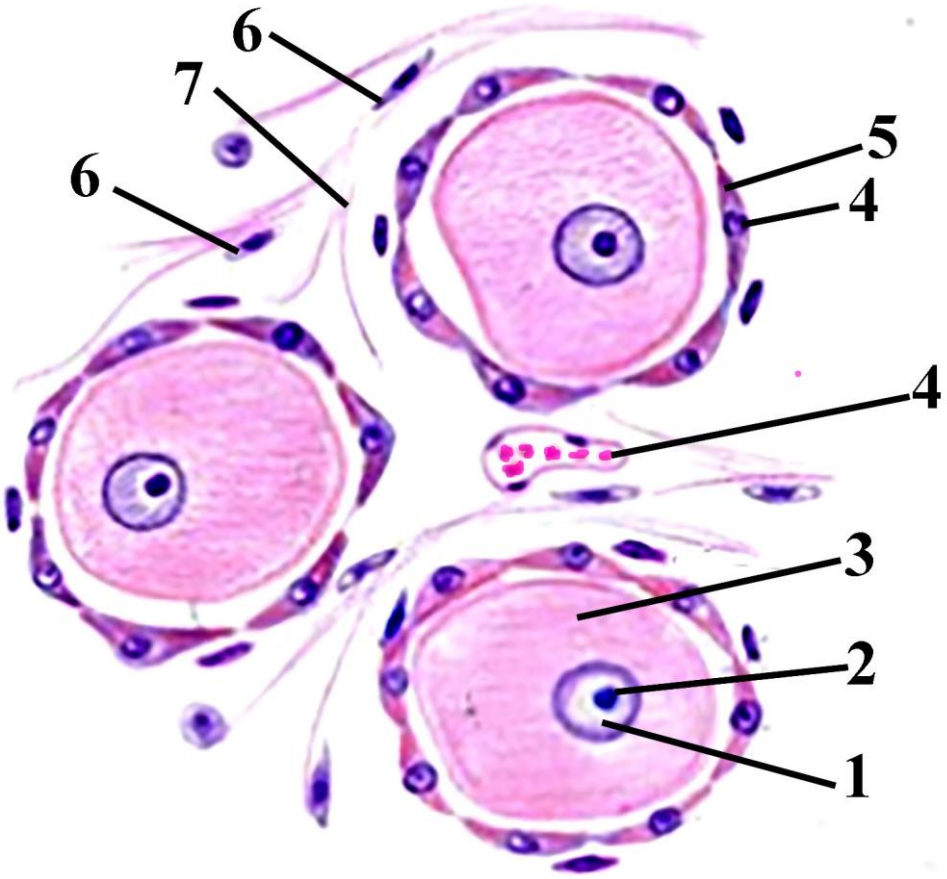


Şəkil 35.1. **Рисунок 35.1.** **Figure 35.1.**

Types of neuron according to their processes.

A unipolar neuron
B Bipolar neuron
C Multipolar neuron
Ç Pseudounipolar neuron

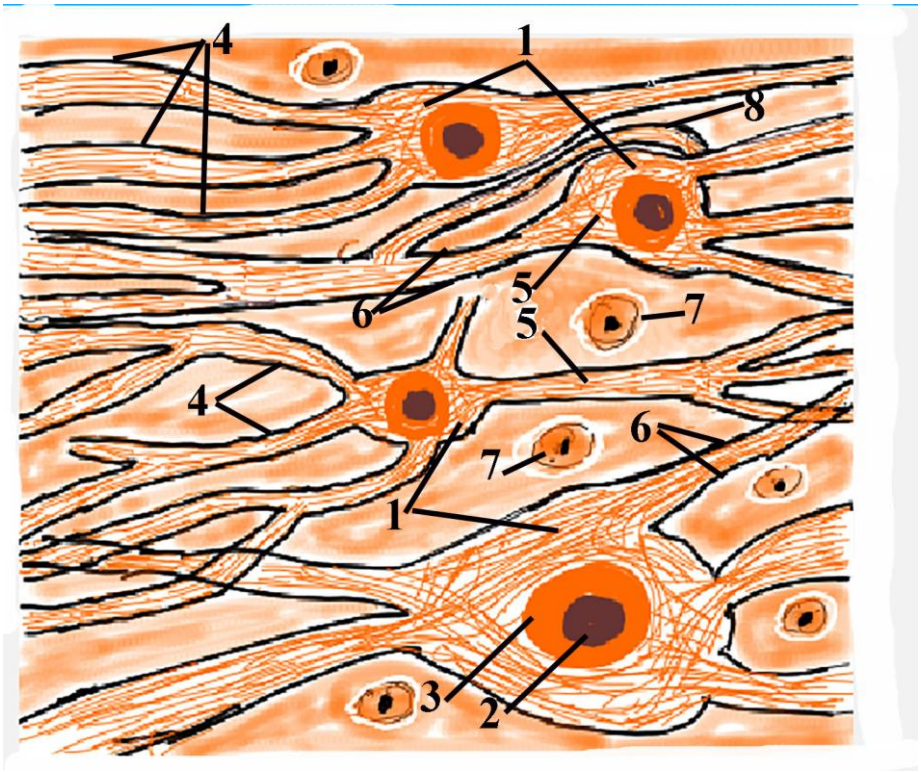
1. cell body of neuron
2. nucleus of neuron
3. axonal hillock
4. axon
5. telodendrites.
6. nucleolus
7. dendrites



Şəkil 35.2. **Рисунок 35.2.** **Figure 35.2.**

Schematic illustration of pseudounipolar neuron and surrounding structures in spinal ganglia

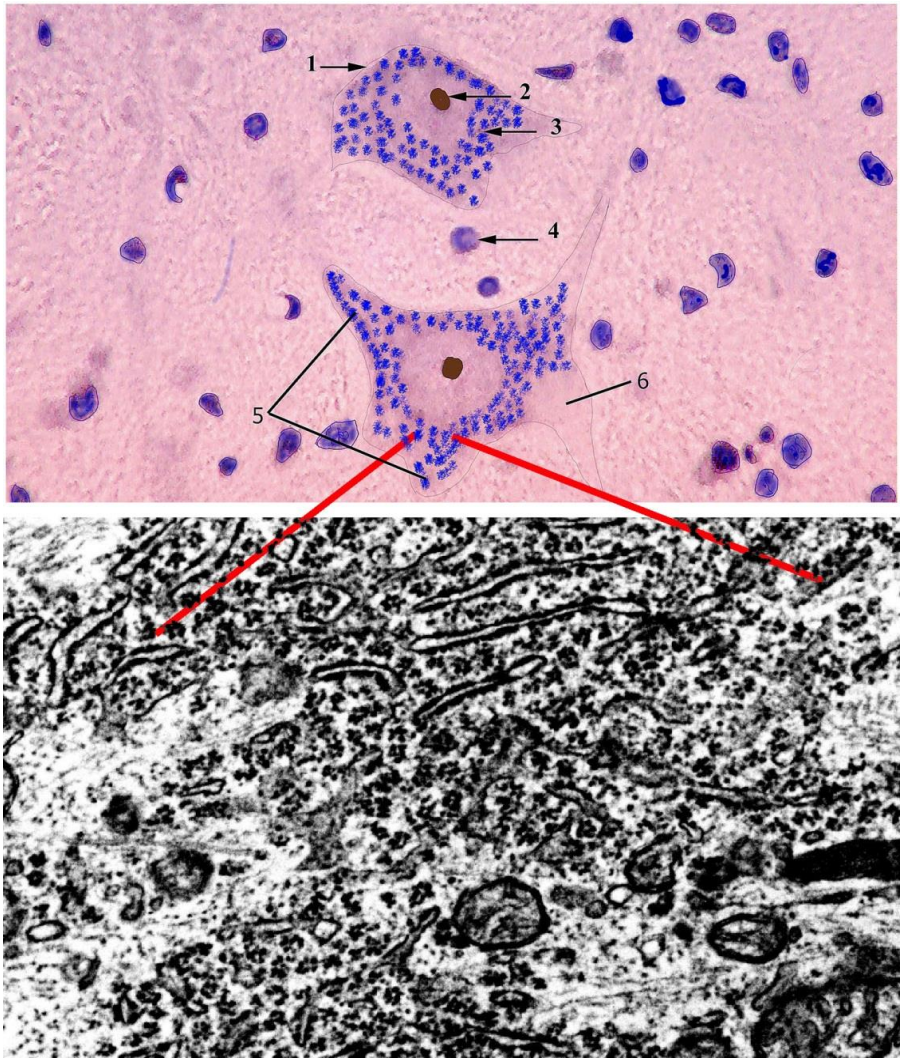
1 nucleus of neuron 2 nucleolus of neuron 3 cytoplasm of neuron 4 satellite glial cells (up) 4 blood vessels (down) 5 cytoplasm of satellite glial cell 6 fibrocyte 7 collagen fibers



Şəkil 35.3. **Рисунок 35.3.** **Figure 35.3.**

Schematic illustration neurofibrils in cell body and process of neurons

1 multipolar neuronal cell body 2 nucleolus of neuron 3 nucleus of neuron 4 dendrities 5 neurofibrils 6 axons 7 neuroglial cells 8 axonal collaterals

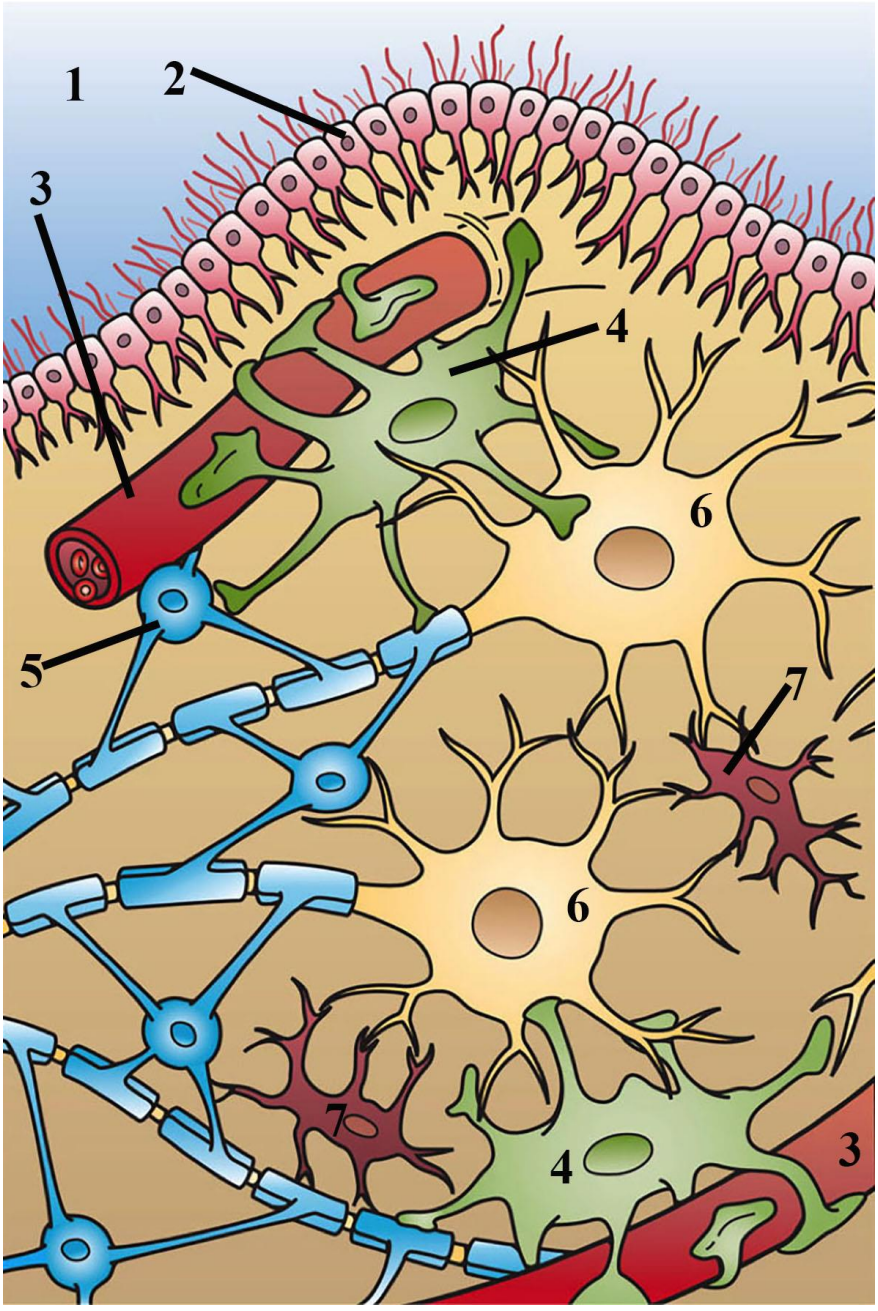


Şəkil 35.4. **Рисунок 35.4.** **Figure 35.4.**

Chromatophilic substance (Nissle body) inside of multipolar neurons located in anterior horn of spinal cord in upper illustration. Stain: toluidine blue. Lower illustration is electron micrograph.

1. Neuron; 2. Nucleus of neuron; 3. Chromophilic substance; 4. Nucleus of neuroglial cell; 5. Dendrites; 6. Axonal hillock.

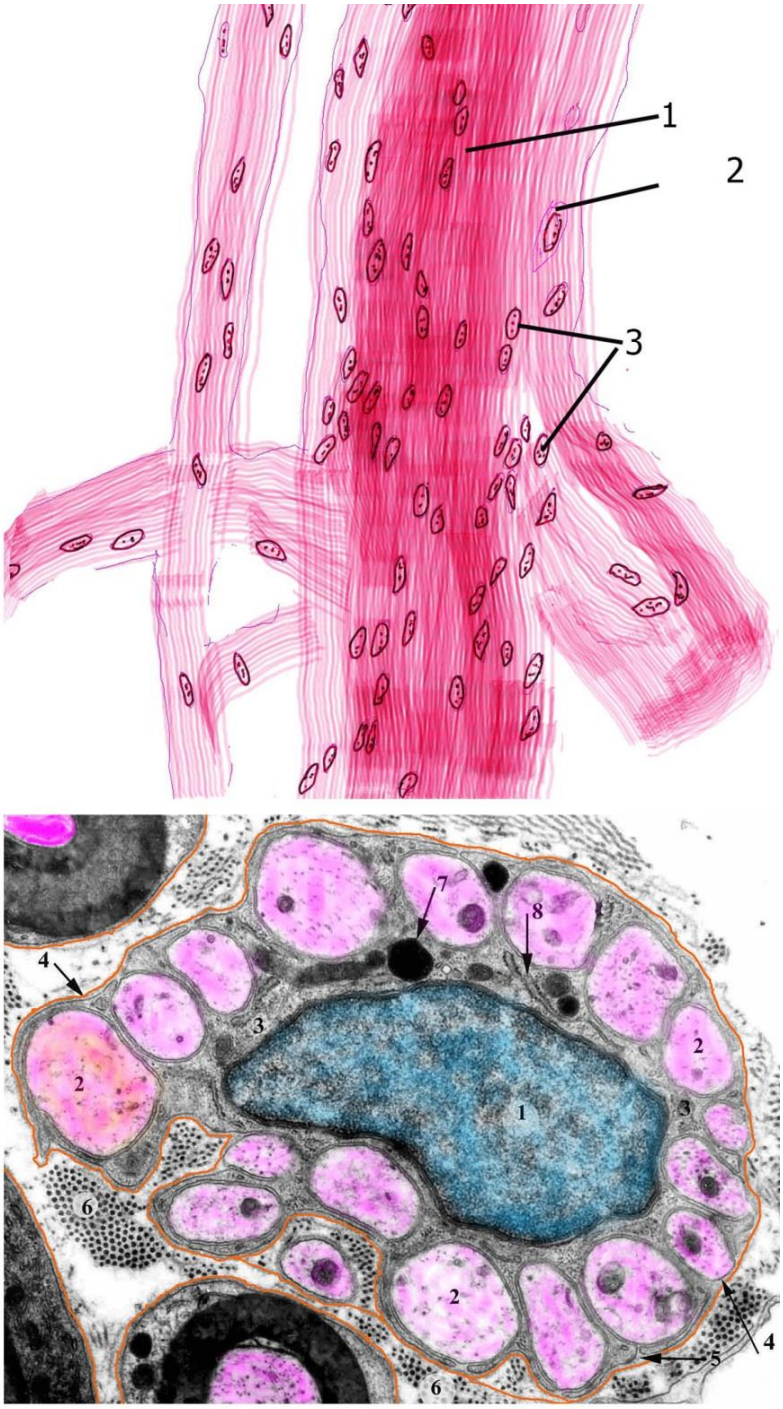
Qliositlər. Sinir lifləri. 36



Şəkil 36.1. **Рисунок 36.1.** **Figure 36.1.**

Schematic representation of neuro-glio-vazal relations of central nervous system.

1. Lumen of brain ventricle
2. ependymal cell
3. blood vessel
4. astrocyte
5. oligodendrocyte
6. neuronal cell body
7. microglial cell



Şəkil 36.2. **Рисунок 36.2.** **Figure 36.2.**

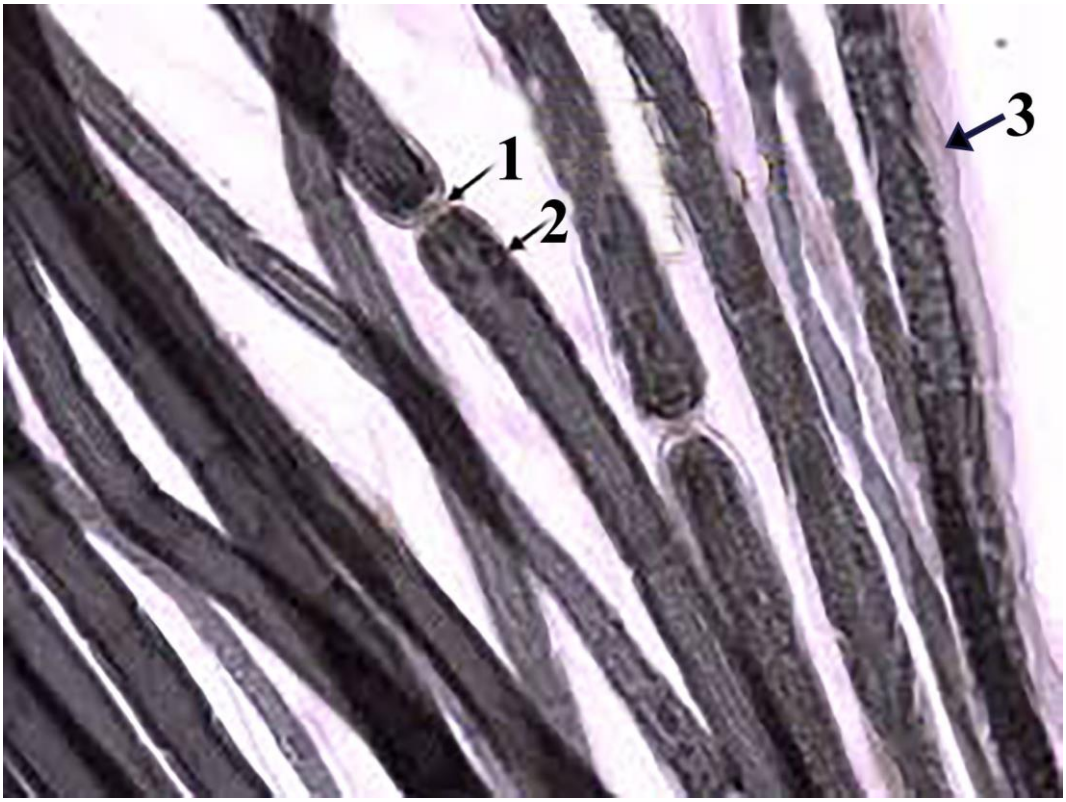
Nonmyelinated nerve fiber in peripheral nerve.

Upper illustration. Longitudinal section of unmyelinated nerve fiber on light microscope.

1. bundle of unmyelinated nerve fibers; 2. body of neurolemmocyte; 3. nucleus of neurolemmocyte.

Lower illustration. Cross section of unmyelinated nerve fiber in electron microscope.

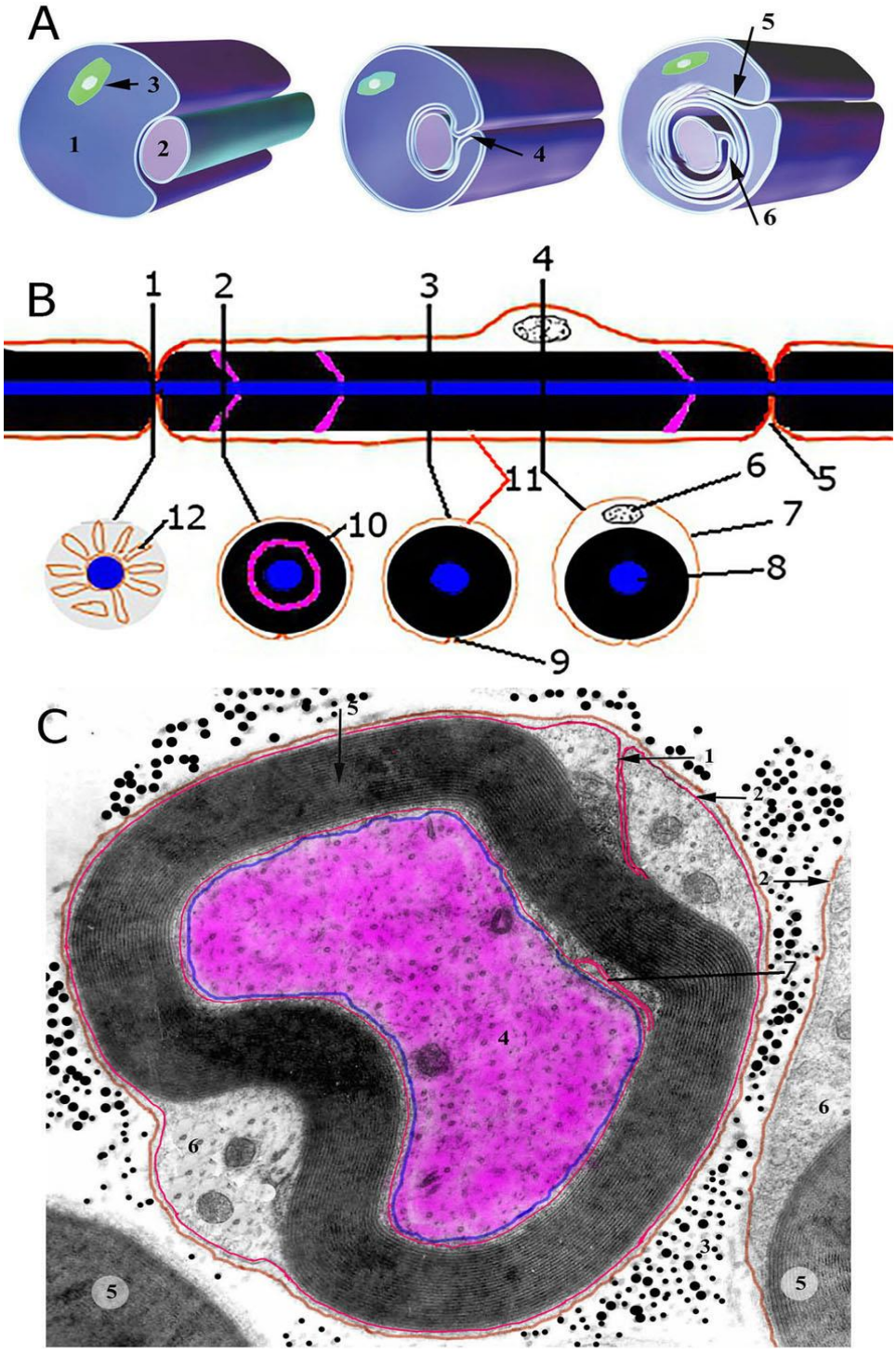
1. nucleus of neurolemmocyte; 2. process of nerve cell; 3. cytoplasm of neurolemmocyte; 4. basal lamina of neurolemmocyte; 5. mesaxon; 6. bundle of collagen fibers; 7. lysosome; 8. RER.



Şəkil 36.3. **Рисунок 36.3.** **Figure 36.3.**

Schematic illustration myelinated nerve fiber

1 node of Ranvier 2 segment of myelin 3 Schwann cell



Şəkil 36.4. **Рисунок 36.4.** **Figure 36.4.**

Myelinated nerve fiber in peripheral nerve.

A. Schematic illustration myelinated nerve fiber formation.

1. neurolemmocyte (Schwann cell); 2. axon; 3. nucleus of neurolemmocyte 4. mesaxon; 5. outer mesaxon 6. inner mesaxon.

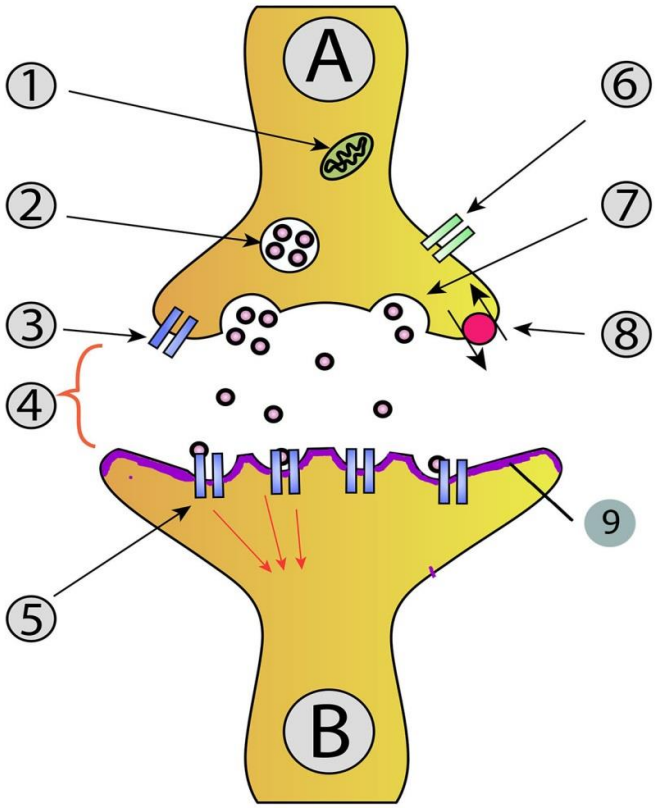
B. Schematic illustration myelinated nerve fiber in longitudinal and cross section.

1 and 5 part of myelinated nerve fiber related to node of Ranvier 2. clefts (incisures) of Schmidt-Lanterman in longitudinal section 3. internodal segment without nucleus; 4. internodal segment including nucleus; 6. nucleus of Schwann cell; 7. plasma membrane of Schwann cell; 8. Axon 9. outer mesaxon; 10. clefts (incisures) of Schmidt-Lanterman in cross section 11. cytoplasm of Schwann cell; 12. processes of Schwan cell.

C. Electron microscopic illustration of myelinated nerve fiber cross section.

1. outer mesaxon; 2. basal lamina of neurolemmocyte; 3. bundles of collagen fibers; 4. processes of nerve cell; 5. myelin coat; 6. cytoplasm of neurolemmocyte 7. inner mesaxon

Sinapslar. Sinir ucları. 37

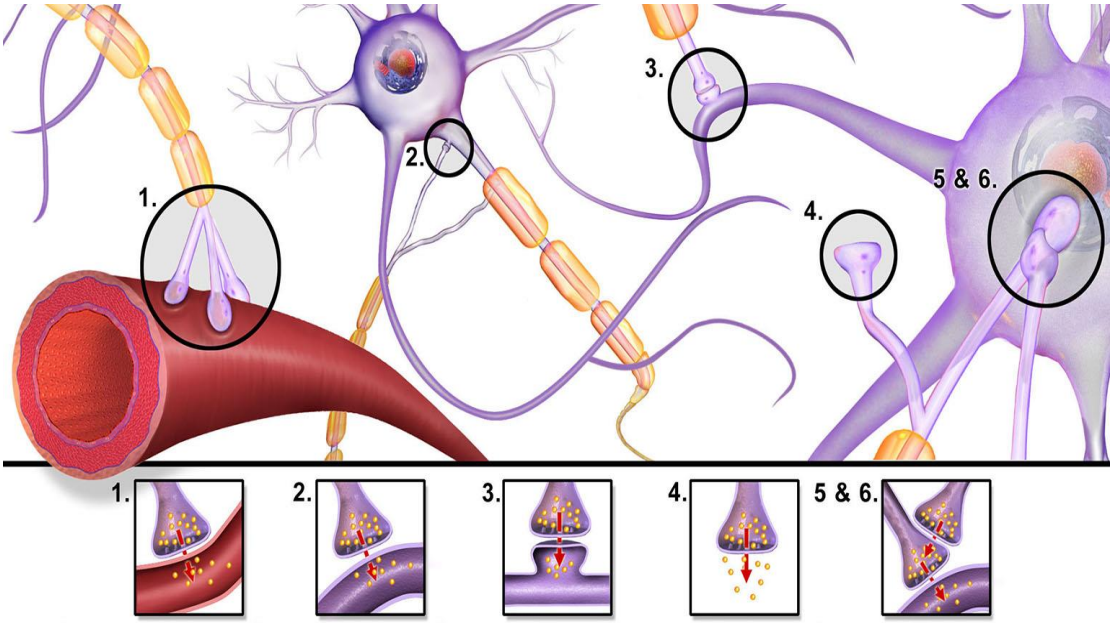


Şəkil 37.1. **Рисунок 37.1.** **Figure 37.1.**

Schematic representation of synapse

A presynaptic pole B postsynaptic pole

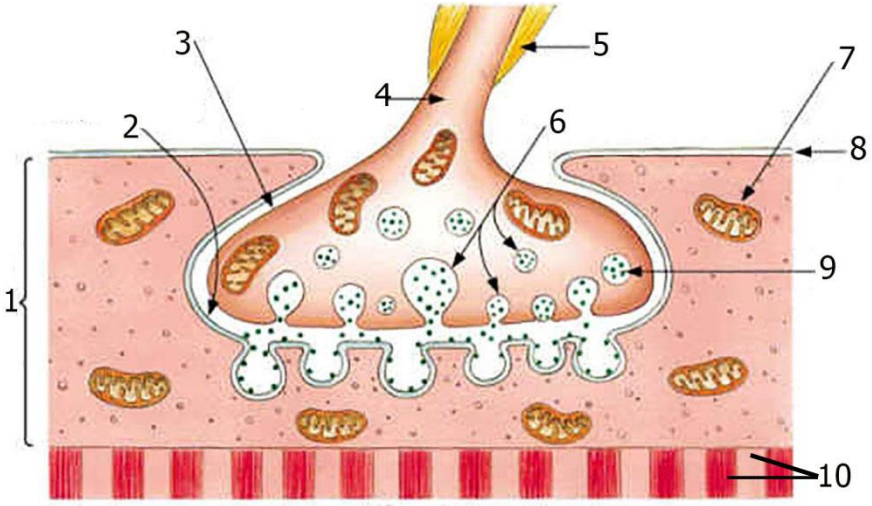
1 Mitochondrion 2 secretory vesicle 3 autoreceptor 4 synaptic cleft where released neuromediators 5 postsynaptic receptor activated by neuromediators 6 Ca^{2+} channel 7 exocytosis 8 recirculation of neuromediators 9 postsynaptic density



Şəkil 37.2. **Рисунок 37.2.** **Figure 37.2.**

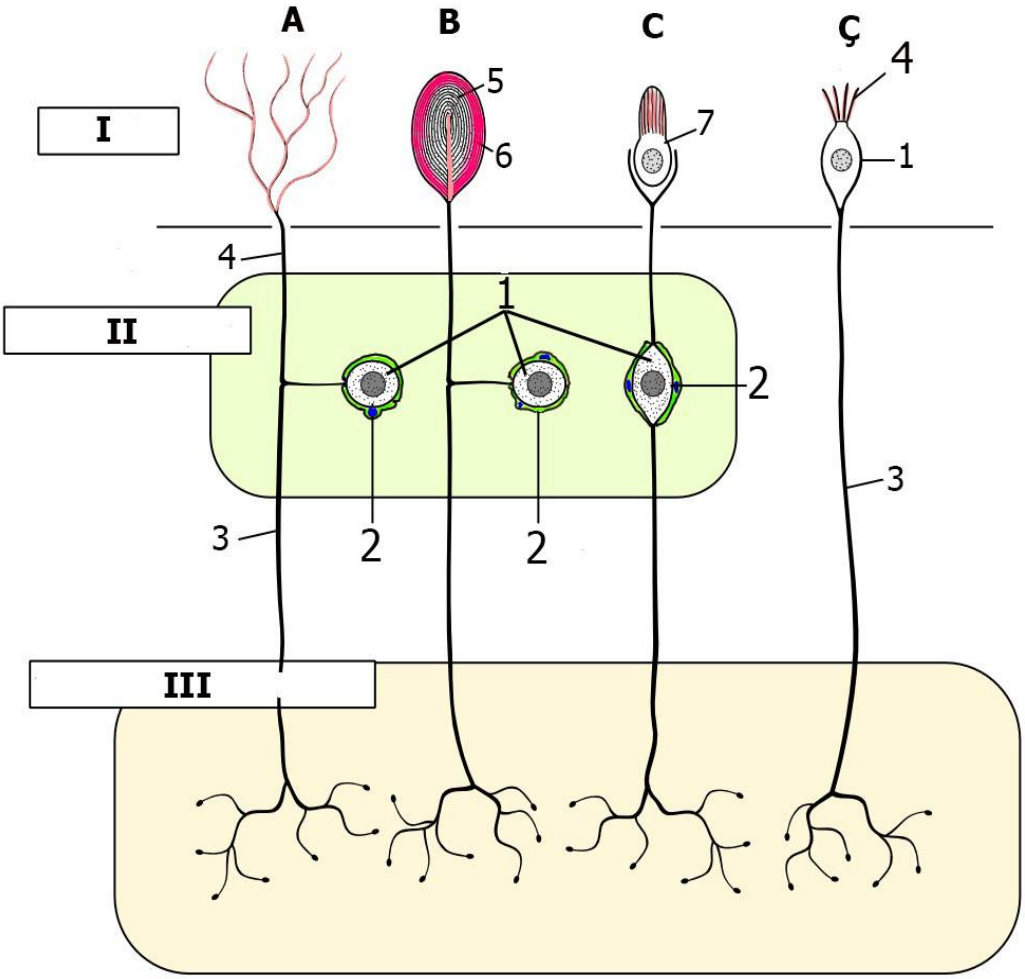
Types of synapses

1. neurovasal (axosecretory or neurosecretory) synapse; 2. axoaxonal; 3. axodendritic; 4. axoextracellular; 5 and 6. axopresynaptic and axosomatic



Şəkil 37.3. **Рисунок 37.3.** **Figure 37.3.**

Schematic illustration of neuro-muscular synapse.
1. sarcoplasm; 2. postsynaptic membrane; 3. presynaptic membrane; 4. axon; 5. myelin; 6. synaptic vesicle; 7. mitochondria; 8. sarcolemma; 9.neurotransmitter; 10. myofibril.



Şəkil 37.4. **Рисунок 37.4.** **Figure 37.4.**

Schematic illustrations of types reseptors and their interrelations.

I. Reseptors; II. Region of location of sensory neuron cell body; III. Area of synaptic contacts between terminal branches of sensory neuron and interneuron.

A. Free nerve ending; B. Capsulated nerve ending; C. Epiteliosensory nerve ending; Ç. Neurosensory nerve ending.

1. cell bodies of neurons; 2. glial cells; 3. axons; 4. dendrites; 5. inner layer of capsule; 6. outer layer of capsule; 7. sensory epitelial cell.

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Dərs vəsaitinin tərtibi zamanı istifadə olunmuş şəkillər, elektronoqramlar, sxemlər və cədvəllərin götürüldüyü ədəbiyyatların

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