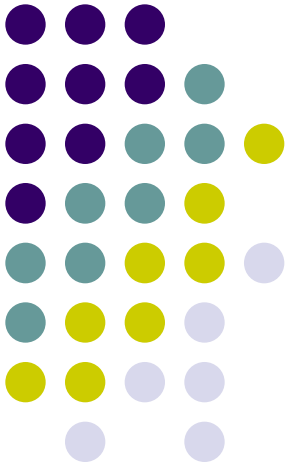
TALLINNA TERVISHOIU KÕRGKOOL

# Tsütoloogia

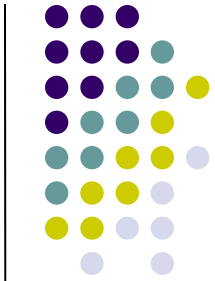
2020



# Rakk *(cellula, cytus)*

- On organismi põhiline struktuurne ja funktsionaalne ühik, millel on olemas kõik elu iseloomustavad tunnused: **ainevahetus, liikuvus, erutuvus ja paljunemine**.
- Sarnase ehituse ja talitlusega rakud koos nende poolt produtseeritud rakuvaheainega moodustavad kudesid
- Koed moodustavad elundeid
- Elund on organismi osa, millel on kindel kuju, ehitus ja asetus ja ta täidab temale omast funktsiooni
- Elundsüsteem koosneb ehituse, talitluse ja arenemise poolest sarnastest elunditest

# Rakk



- Kujult võivad rakud olla lamedad, kuubikujulised, käävjad, jätketega varustatud
- Vaatamata rakkude suurele erinevusele kuju ja suurusele poolest on raku ehituse põhistruktuur ühesugune: põhilisteks osadeks on tuum ja tsütoplaasma koos organellidega, mis on ümbritsetud plasmamembraani poolt.

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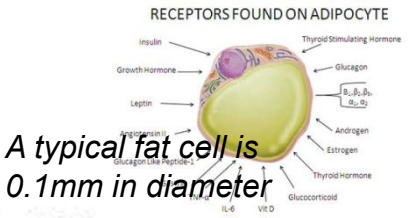
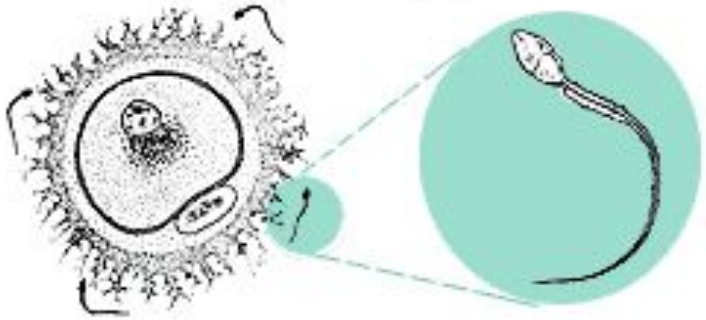
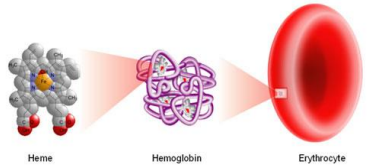
- Raku suurus ja kuju sõltub koeliigist, asukohast selles ning raku elu- ja töötsüklist

125-150µm (10mm); 60µm; 10-15cm; 50µm;

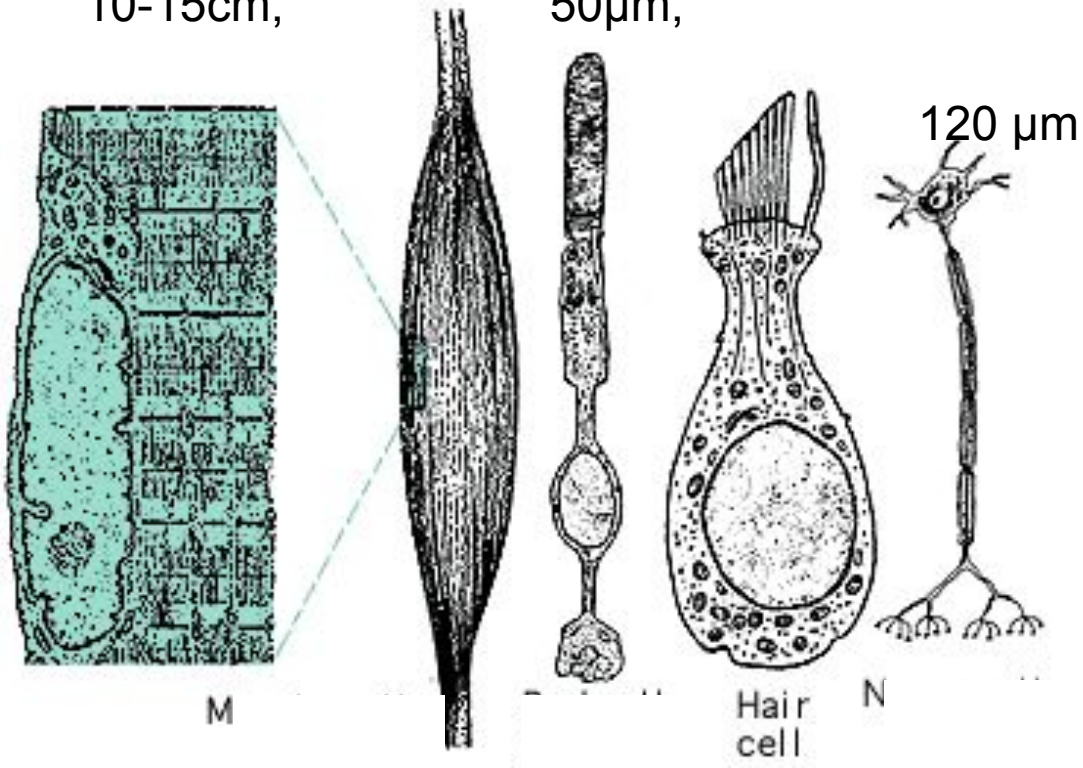



*A typical fat cell is 0.1mm in diameter*

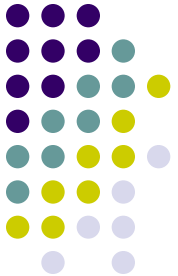





7,5 µm



# Raku ehitus



- 1. Plasmamembraan,

mis ümbritseb väljastpoolt rakku

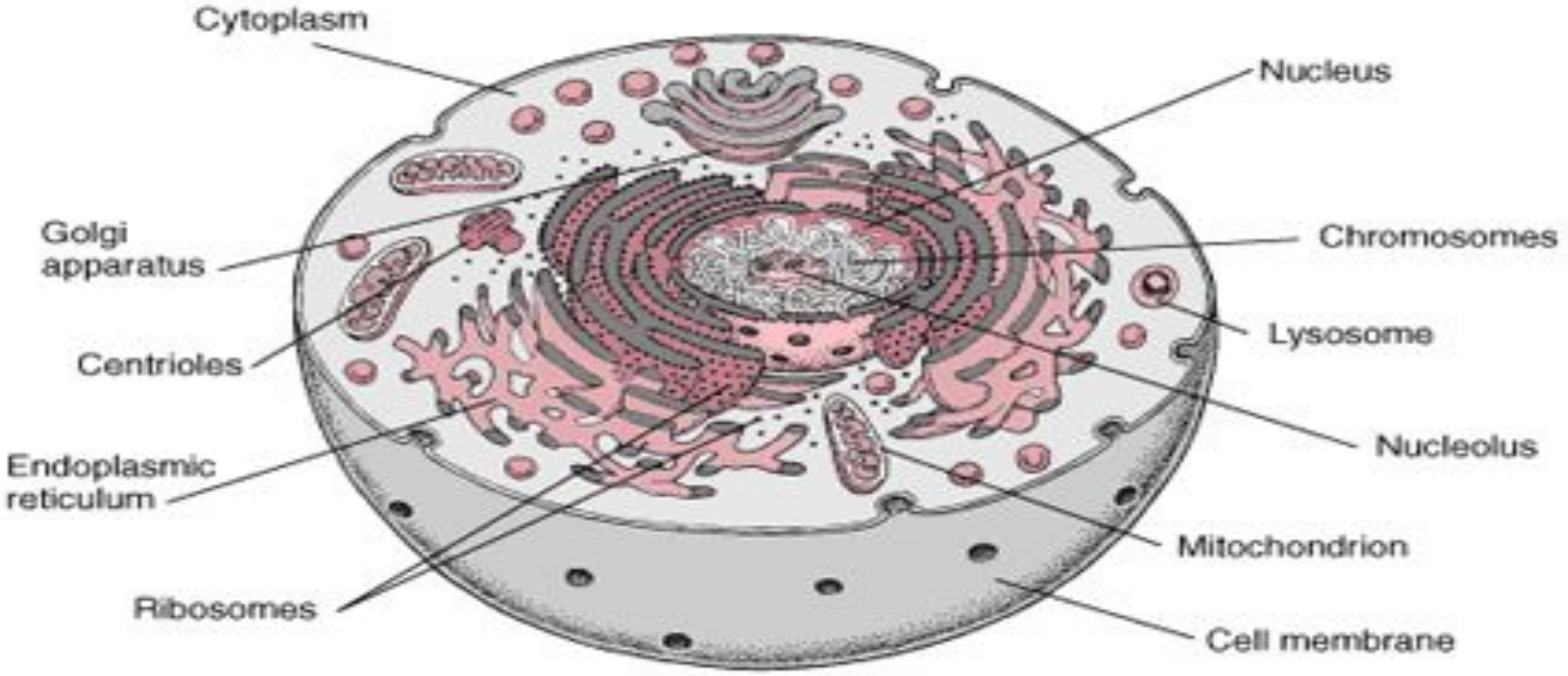
- 2. Tsütoplasma,

mis koosneb läbipaistvast põhitsütoplasmast
(vesilahus, mis sisaldab vees lahustunud elektrolüüte, metaboliite, RNA, sünteesitud proteiine)

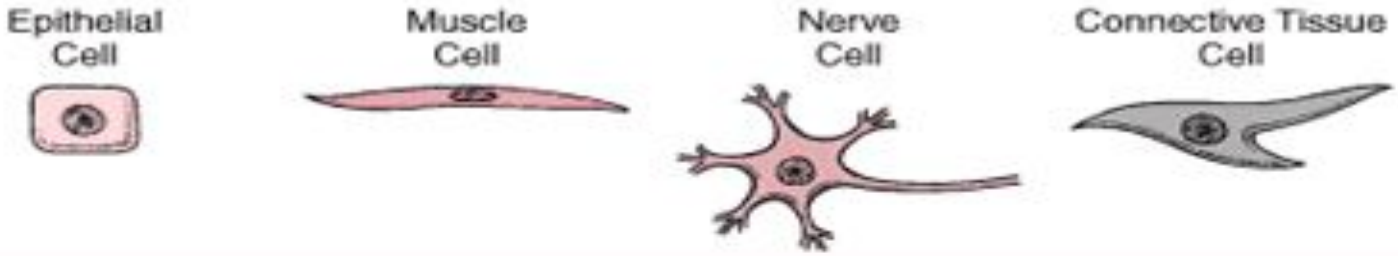
- 3.organellid ja/või inklusioonid
- 4. Rakutuum

contains chromosomes, which are the cell's genetic material, and a nucleolus, which produces ribosomes. The cytoplasm consists of a fluid material and organelles, which could be

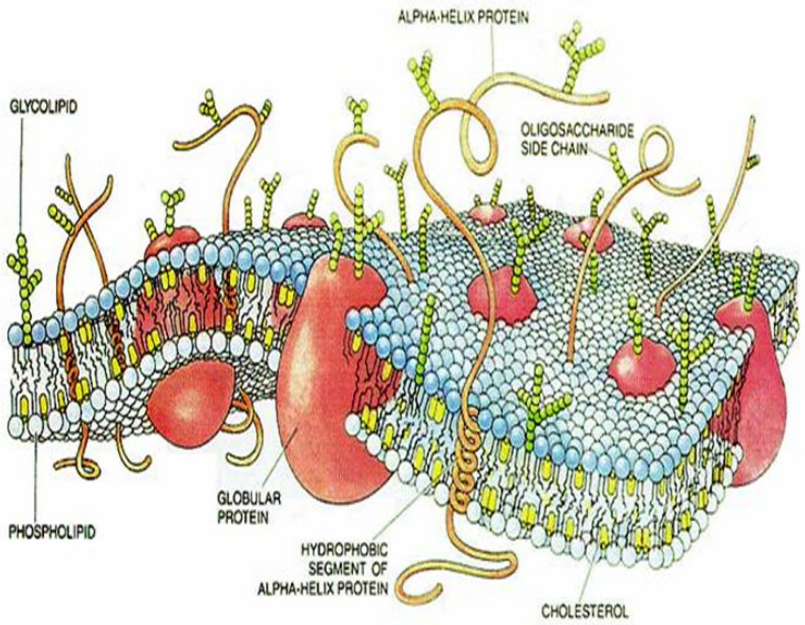
for the cell's activities. Lysosomes contain enzymes that can break down particles entering the cell. Centrioles participate in cell division.



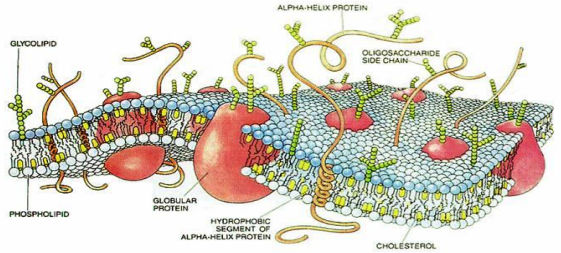

**Examples of Different Cells**



# Plasmamembraan



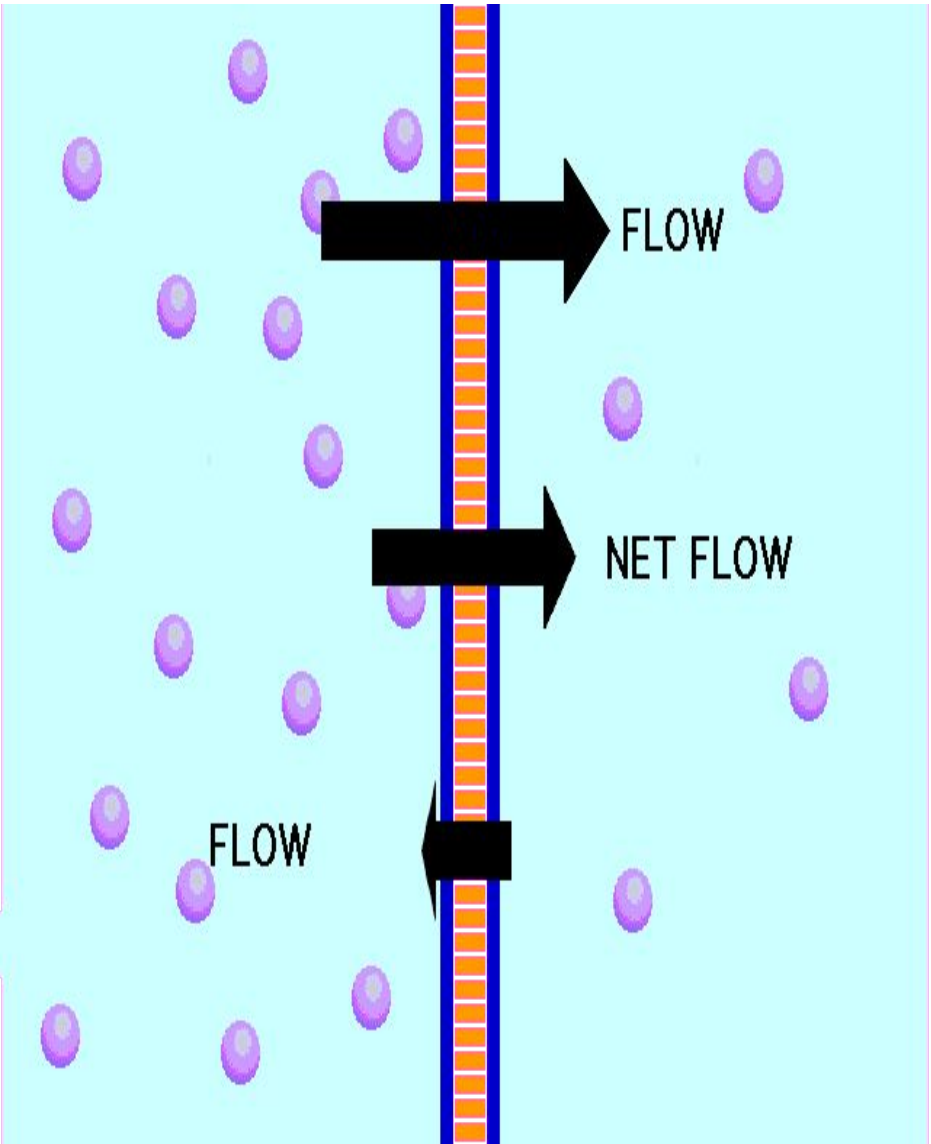

- 8 -10 nm paksune kest
- Koosneb:
- 1. kahest lipiidikihist
- 2. integraalsetest valkudest, mis talitlevad transportkanalitena või retseptoorsete valkudena
- 3. Perifeerse proteiini molekulidest, mis paiknevad membraani sise - või välispinnal
- 4. Glükokaalüksitest – polüsahhariidide molekulid rakumembraani välispinnal




- Plasmamembraani vahendusel toimub aine-, energia- ja infovahetus raku ja väliskeskkonna vahel.
- Plasmamembraani lipiidkiht on barjäär enamikule molekulidele.
- Funktsioneerib retseptoritena võttes  keemilisi signaale. Kontakteerudes ainult mingi kindla rakuvälises keskkonnas  leiduva ainega – näit hormoonid (insuliin)
- Plasmamembraan eraldab ja hoiab lahus kahte erinevat vedelikuruumi: tsütoplasmat ja rakuvälist vedelikku.
- Transpordib molekule rakku ja rakust välja

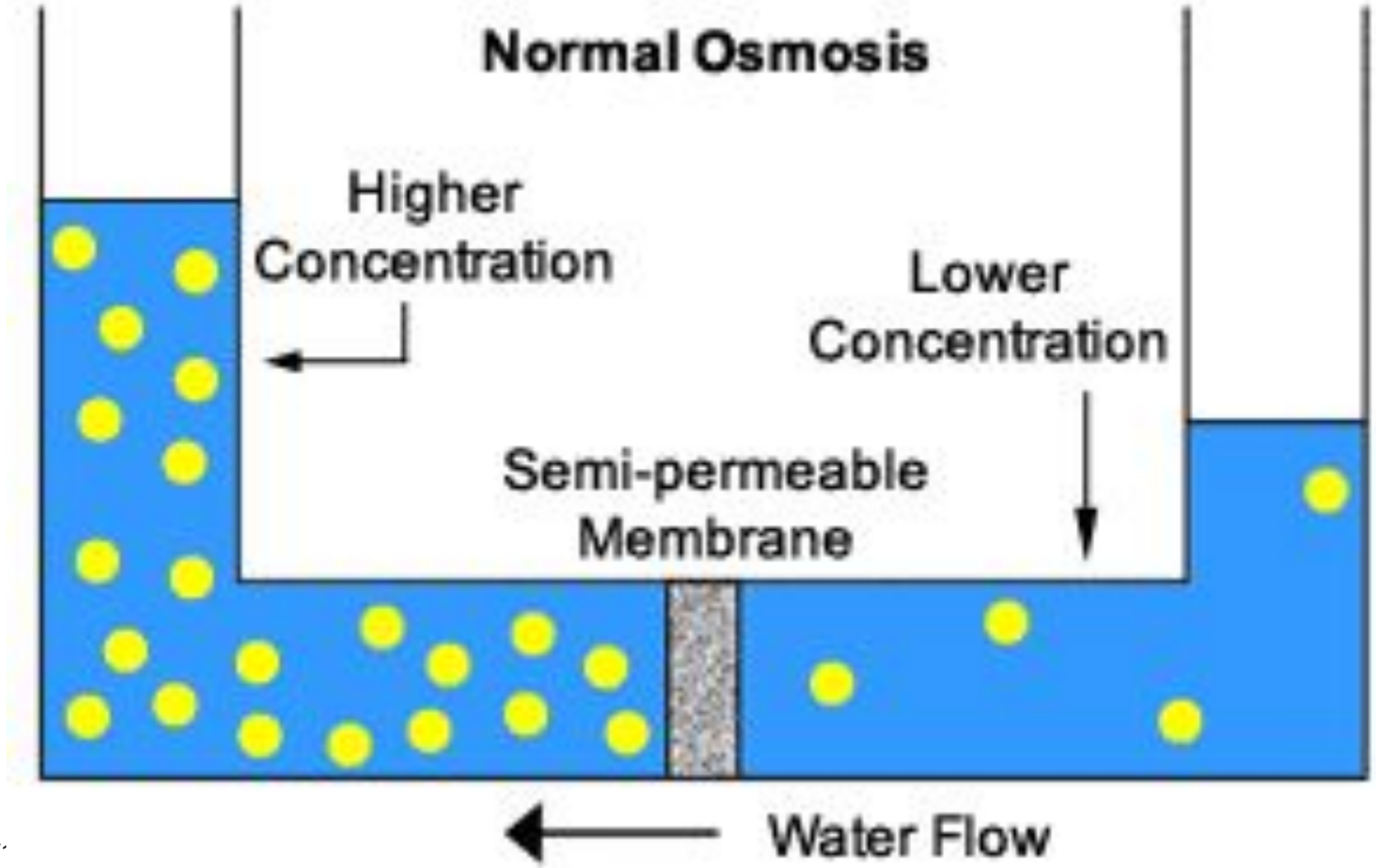
- Kuidas toimub transport läbi plasmamembraani?

# Difusioonil lahustes (ja gaasides) liiguvad aatomid ja molekulid kontsentratsioonide võrdsustumiseni

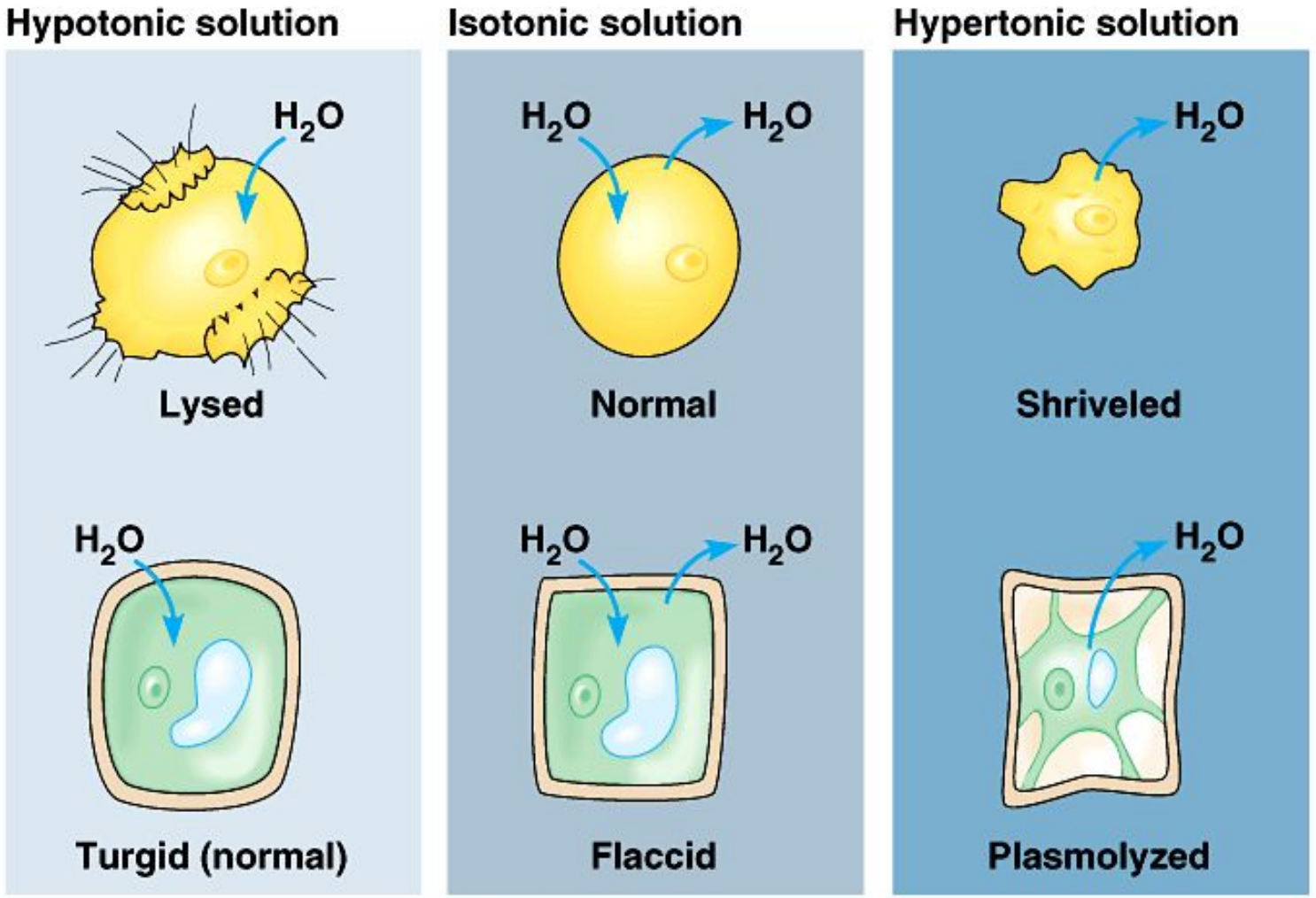



- Läbi lipiidmembraani võivad vabalt difundeeruda vesi ja lahustunud gaasid ($O_2$ ja $CO_2$), rasvlahustuvad ained, väikesed polaarsed molekulid (etanool, kusiaine)

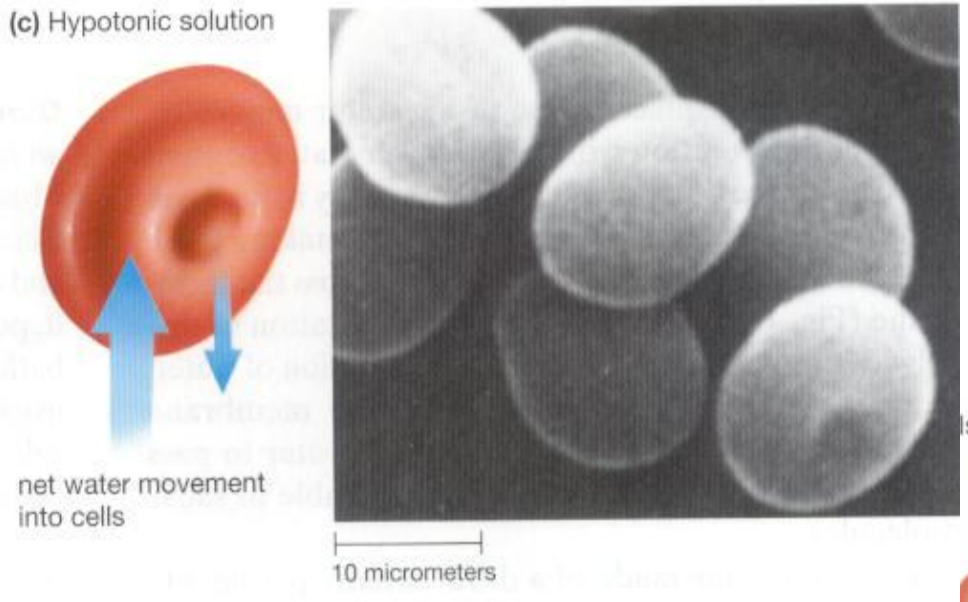
# Osmoos

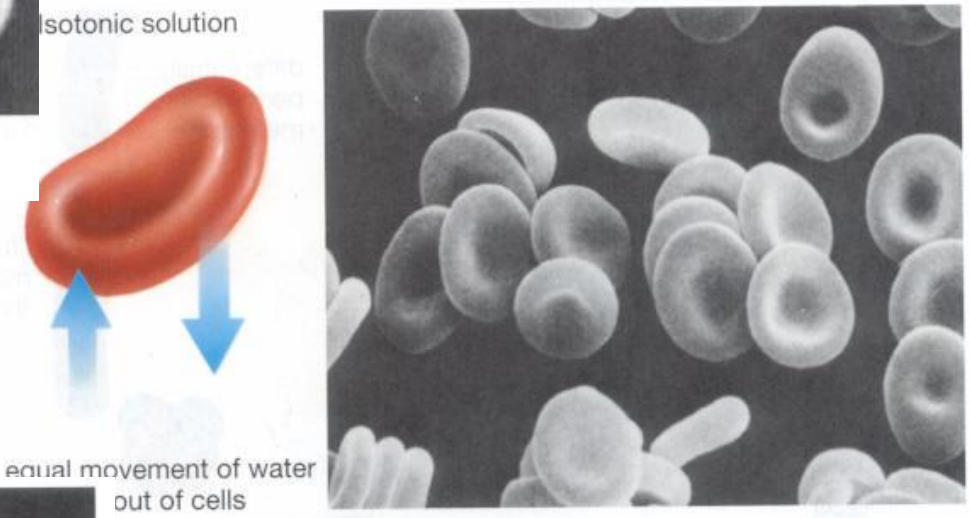

Normal Osmosis
Higher Concentration
Lower Concentration
Semi-permeable Membrane
Water Flow

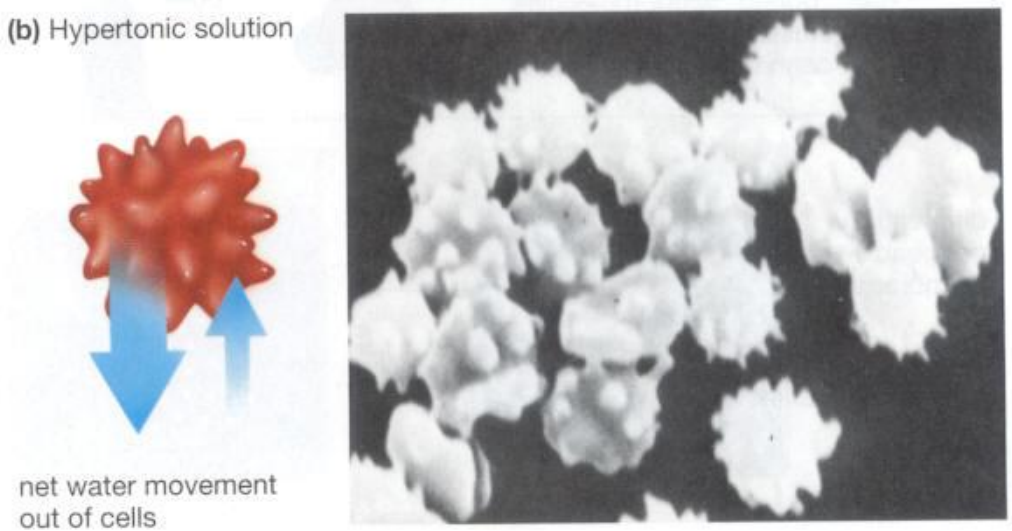
# Hüpo-, iso- ja hüpertooniline lahus



- Kolloidosmootne hemolüüs – vesi tungib rakku, see puruneb, hemoglobiin satub plasmasse

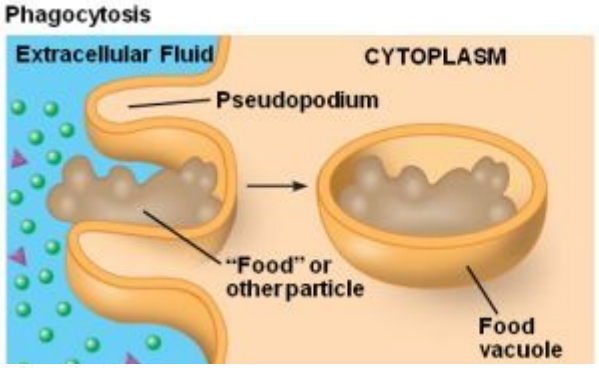


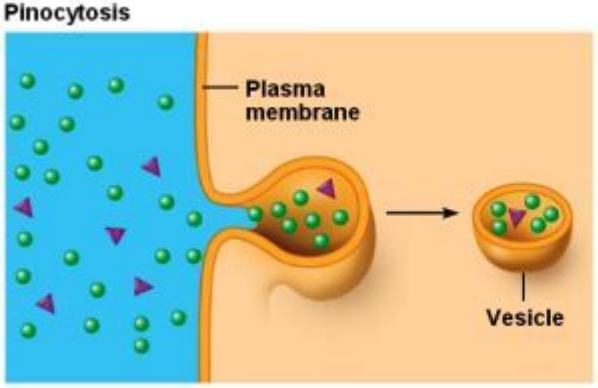

- Okasõuna kujuline erütrotsüüt, tema asetamisel hüpertoonilisse soolalahusesse

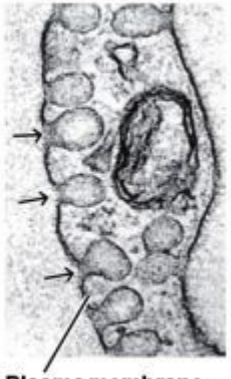
# Endotsütoos



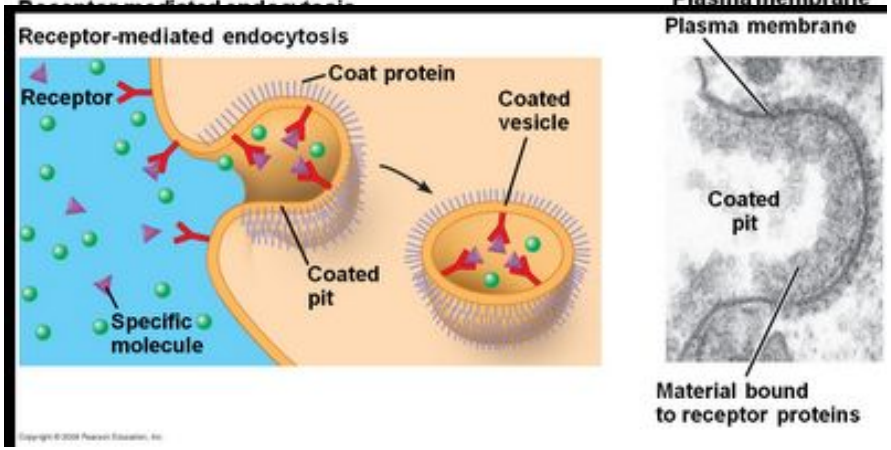


**fagotsütoos – aine molekuli, bakteri rakku haaramine;**



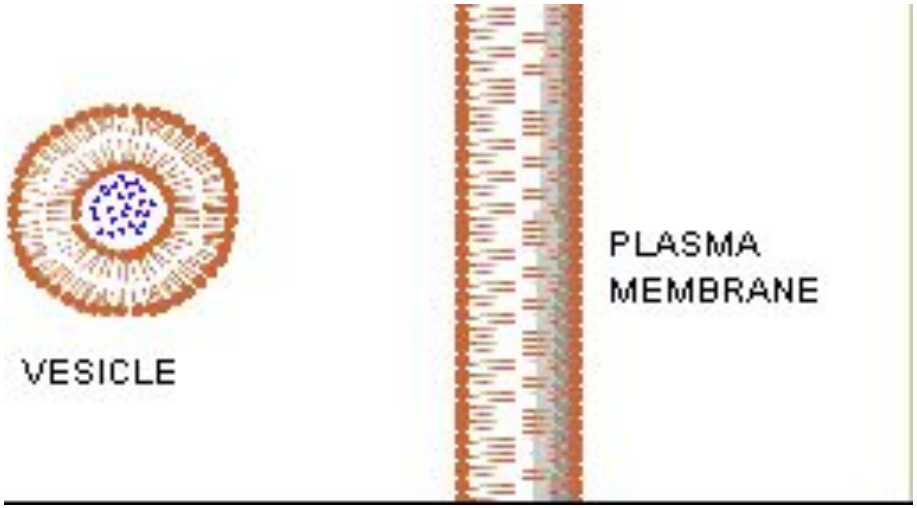




**pinotsütoos** – ainete siirdamine rakku membraanpõiekeste vahendusel ilma seostumiseta membraani retseptoriga




Retseptor-vahendatud endotsütoos (insuliin, kolesterool)

# Eksotsütoos

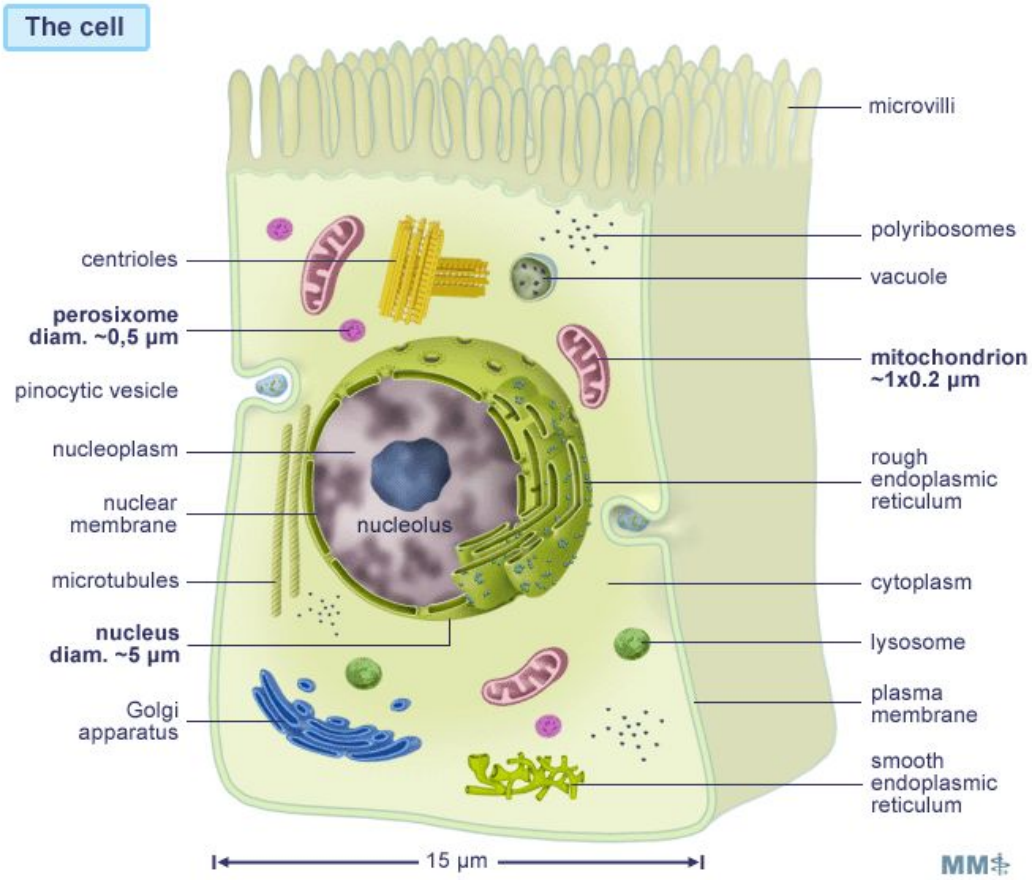


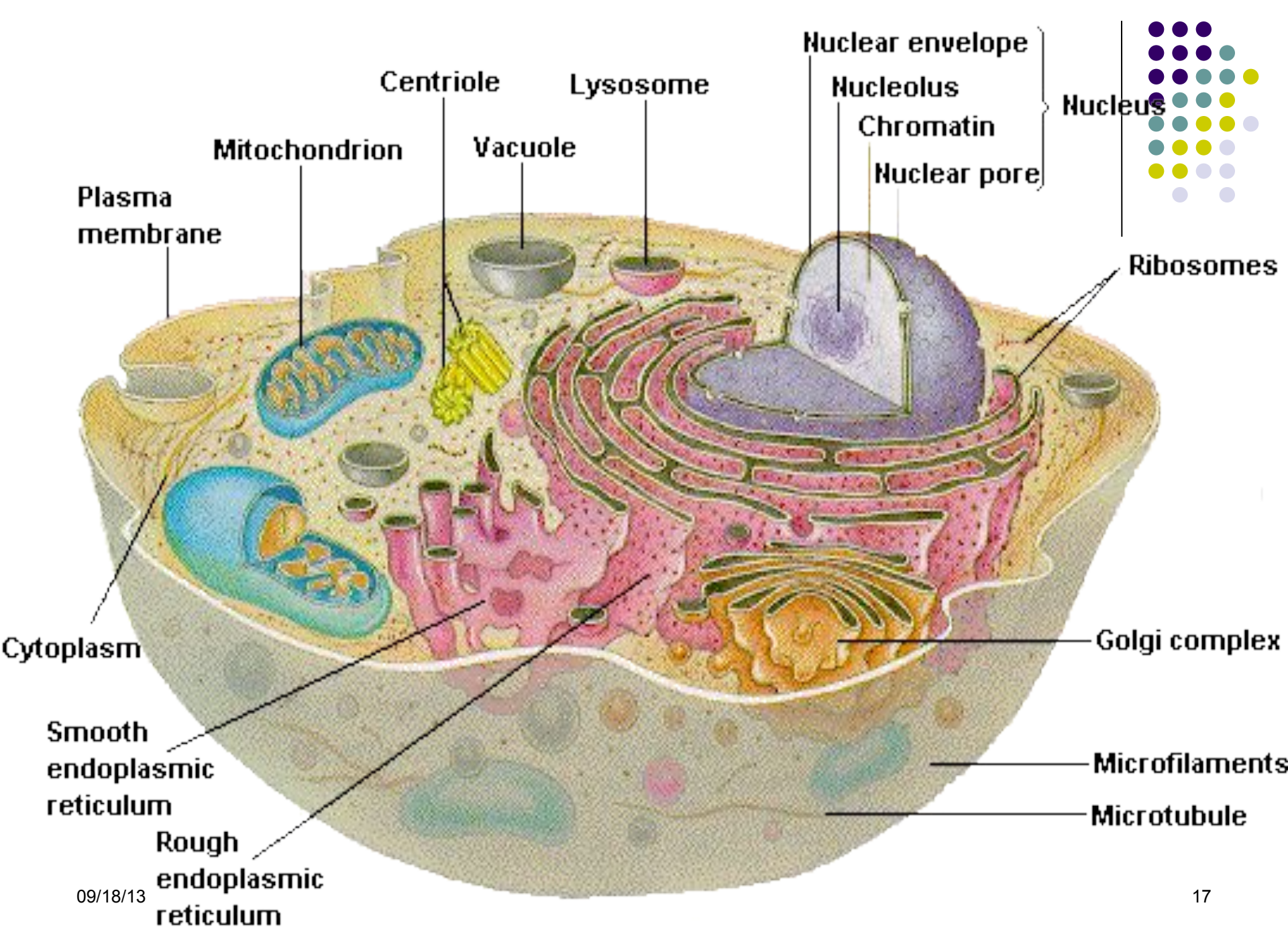

Seedetrakti limaskesta rakkude poolt toodetud **seedeensüümide** väljutamine rakust

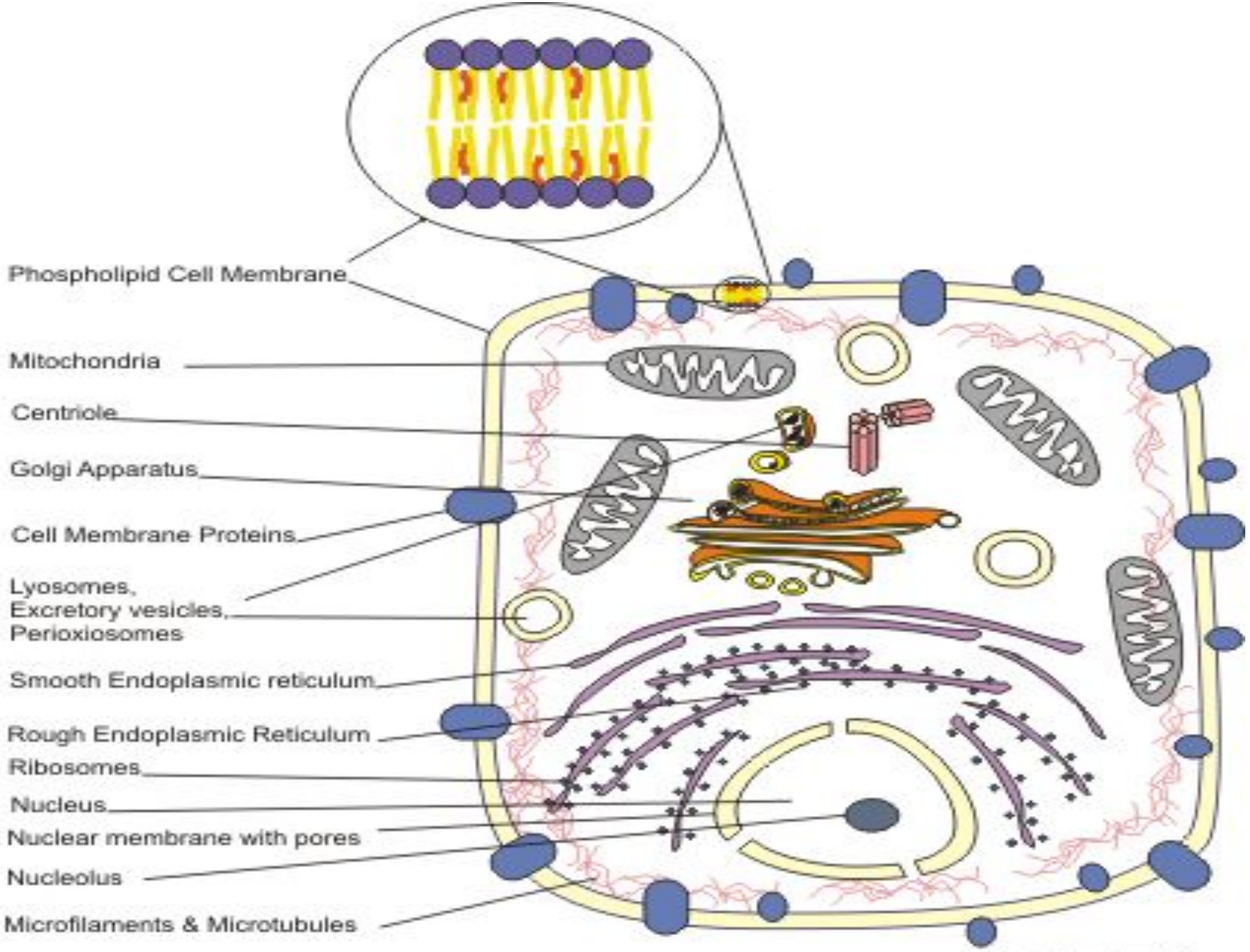
# Organellid – kindlale funktsioonile spetsialiseerunud struktuurid rakus

Tsütoplasma

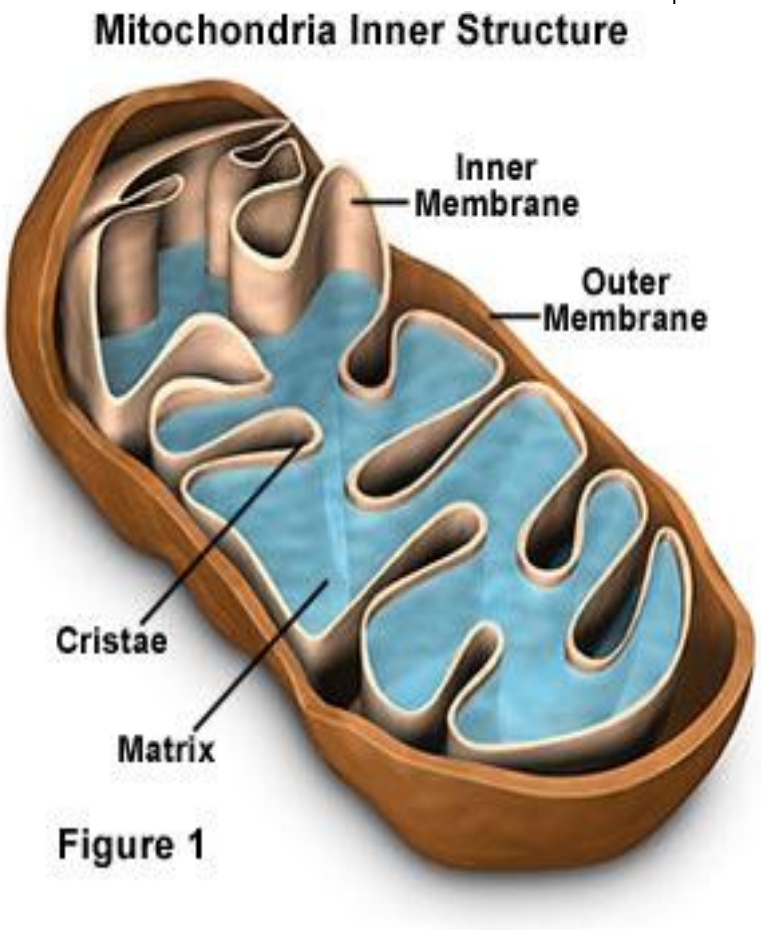
- Mitokondrid
- Ribosoomid
- Endoplasmaatiline retiikulum
- Golgi aparaat
- Lüsosoomid
- Peroksisoomid
- Tsütoskelett
- Tsentrioolid




Nuclear envelope
Nucleolus
Chromatin
Nuclear pore
Nucleus
Centriole
Lysosome
Mitochondrion
Vacuole
Plasma membrane
Ribosomes
Cytoplasm
Golgi complex
Smooth endoplasmic reticulum
Microfilaments
Microtubule
Rough endoplasmic reticulum


Phospholipid Cell Membrane
Mitochondria
Centriole
Golgi Apparatus
Cell Membrane Proteins
Lyosomes,
Excretory vesicles,
Perioxiosomes
Smooth Endoplasmic reticulum
Rough Endoplasmic Reticulum
Ribosomes
Nucleus
Nuclear membrane with pores
Nucleolus
Microfilaments & Microtubules
Frank Boumphrey M.D.

# Mitokondrid



# Ribosoomid

Ribosoom koosneb kahest allüksusest

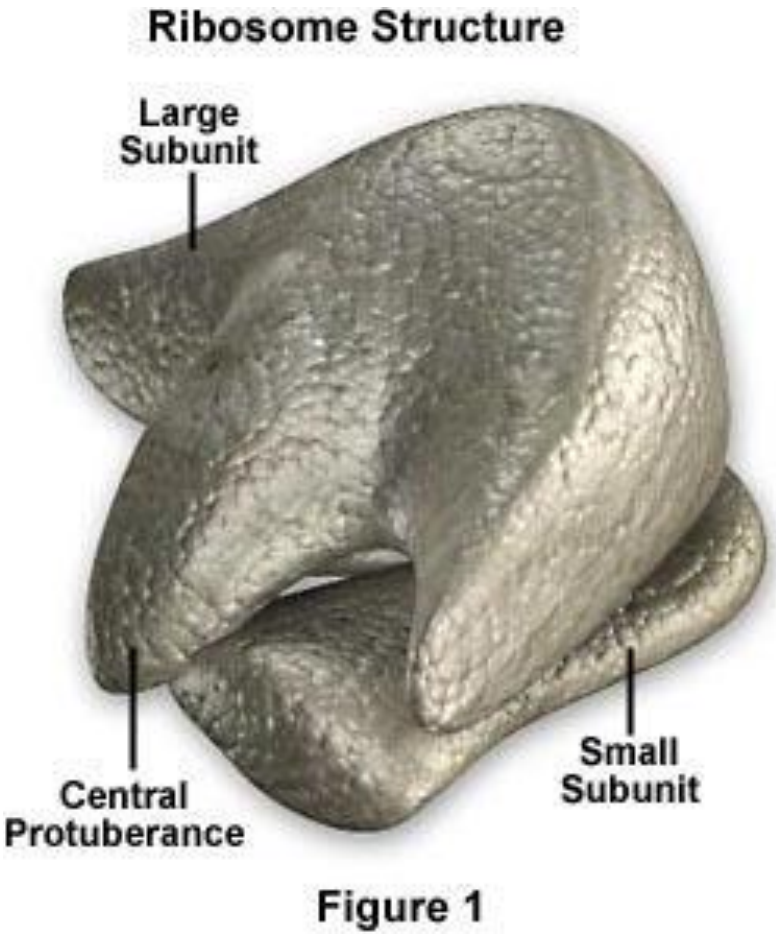
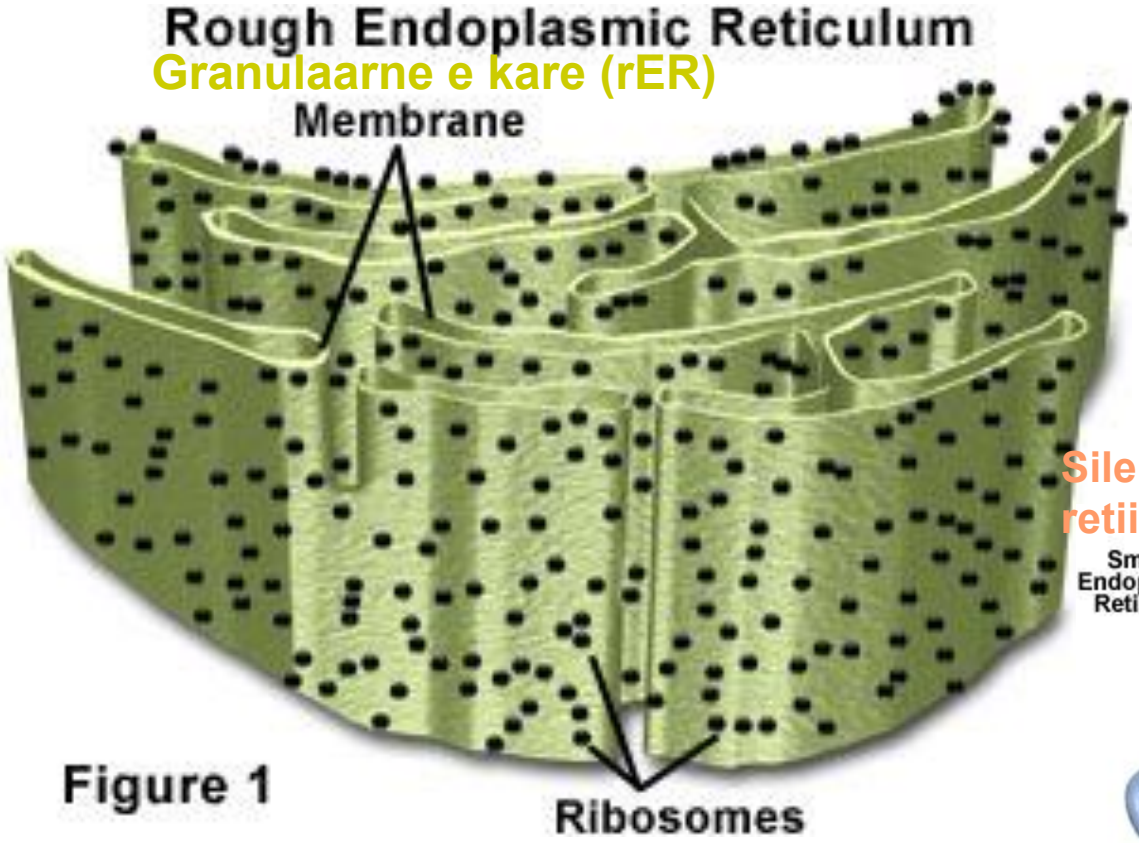
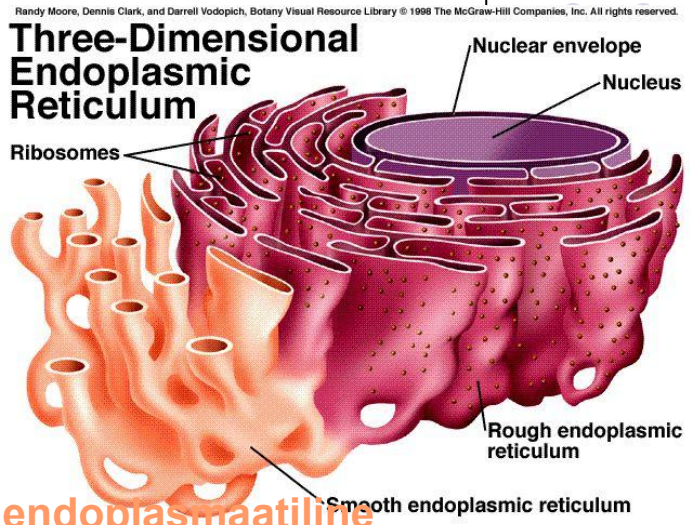


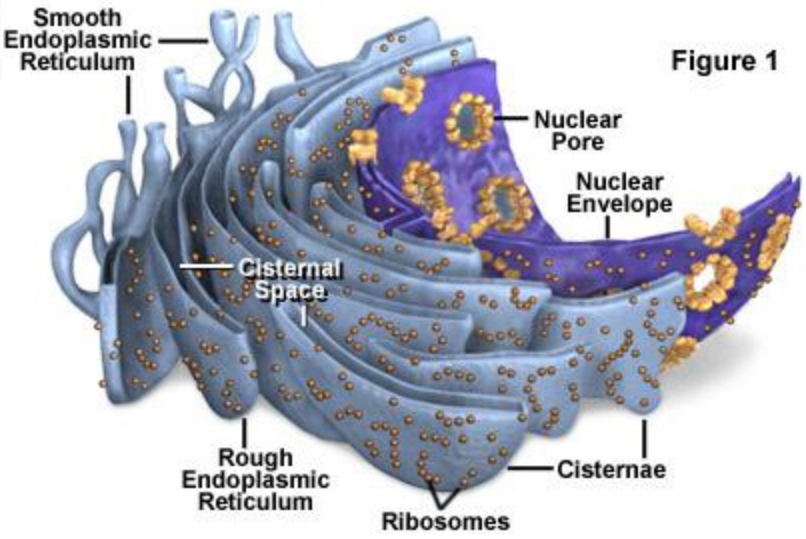

Figure 1

# Endoplasmaatiline retiikulum




Sile endoplasmaatiline retiikulum(sER)



# Golgi aparaat e Golgi kompleks

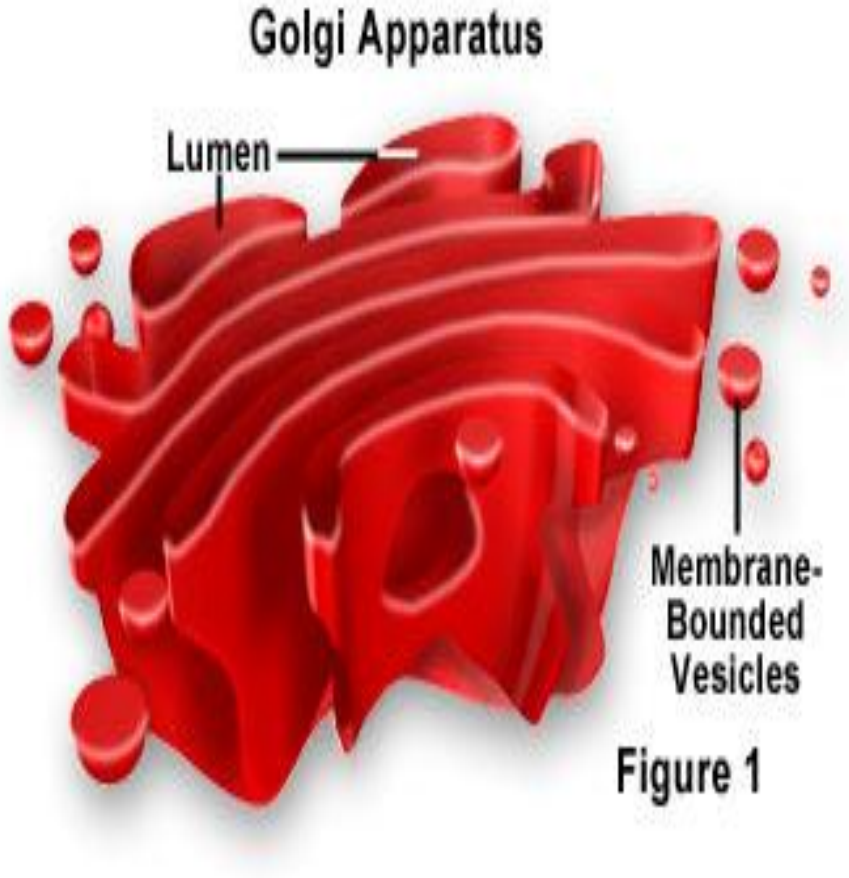


Figure 1

# Lüsosoomid (*lysis* + *soma* kr. keeles)

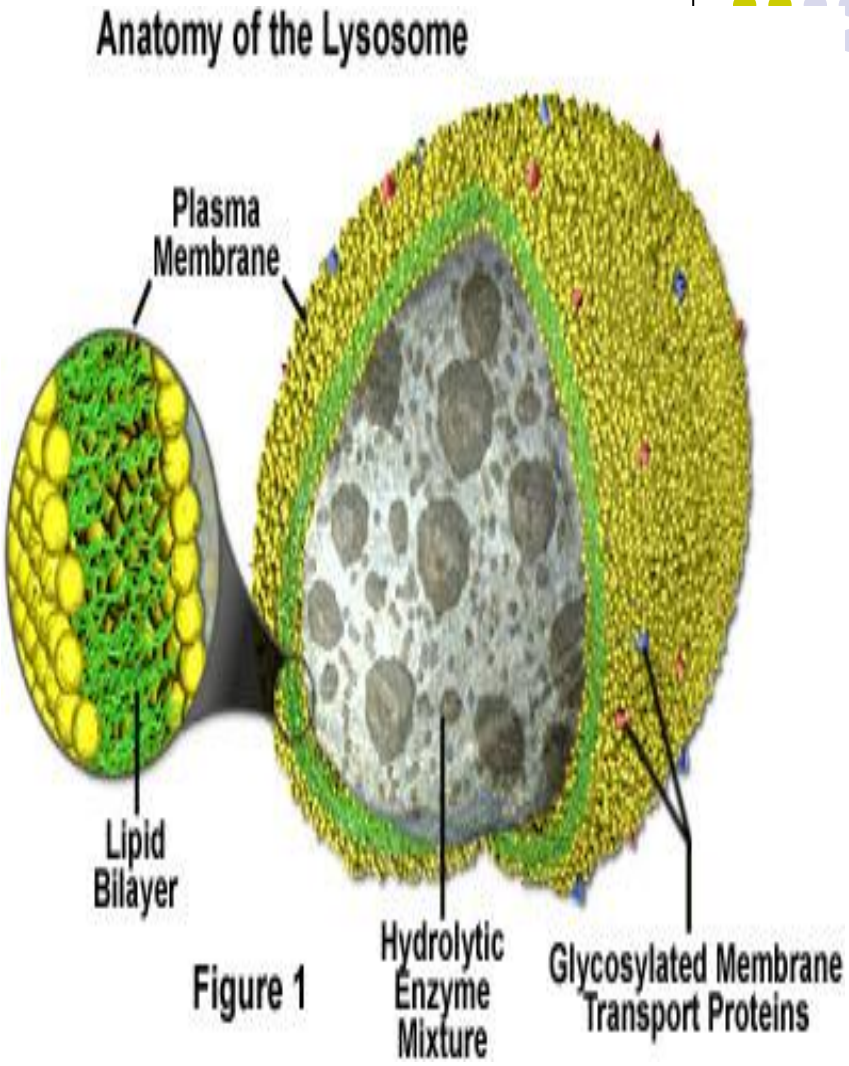


Figure 1

# Peroksisoomid

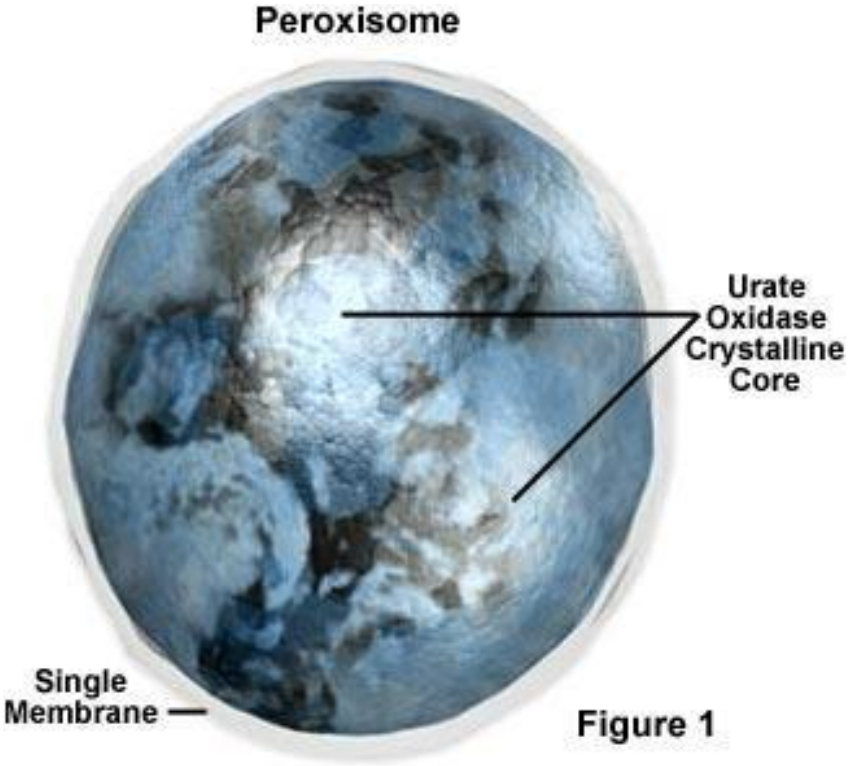



Figure 1

# Tsentriool

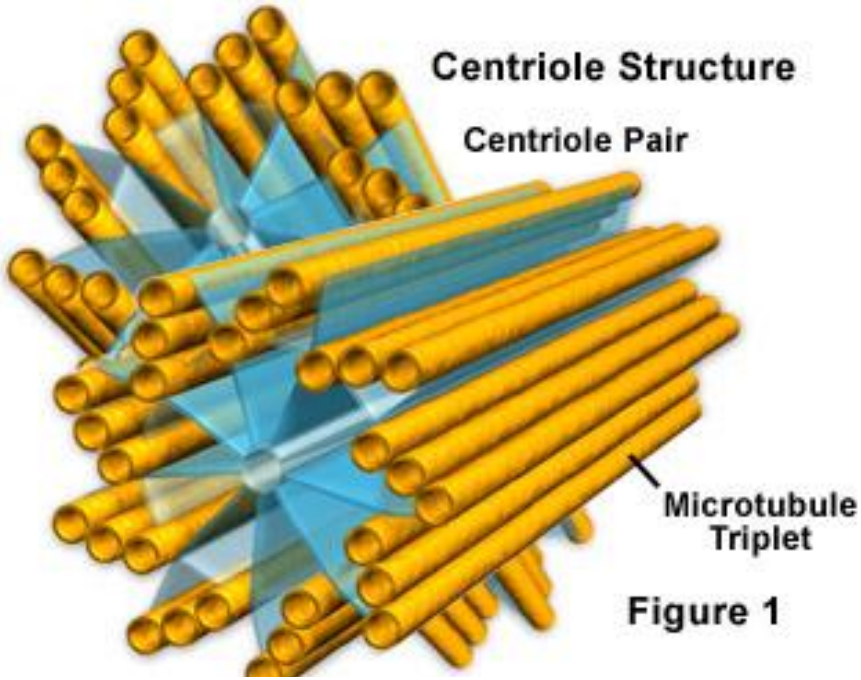
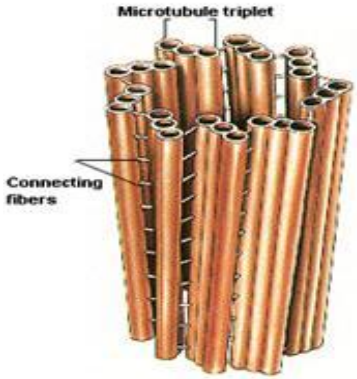
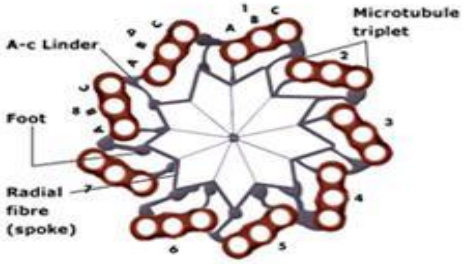
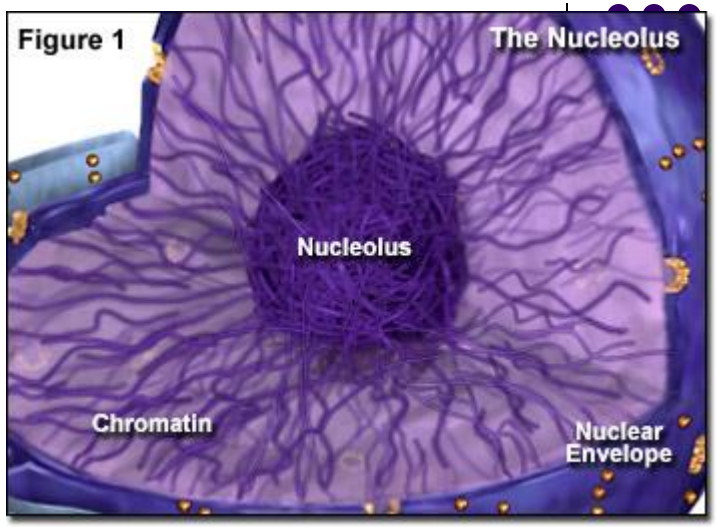



Figure 1



# Tuum, tuumake



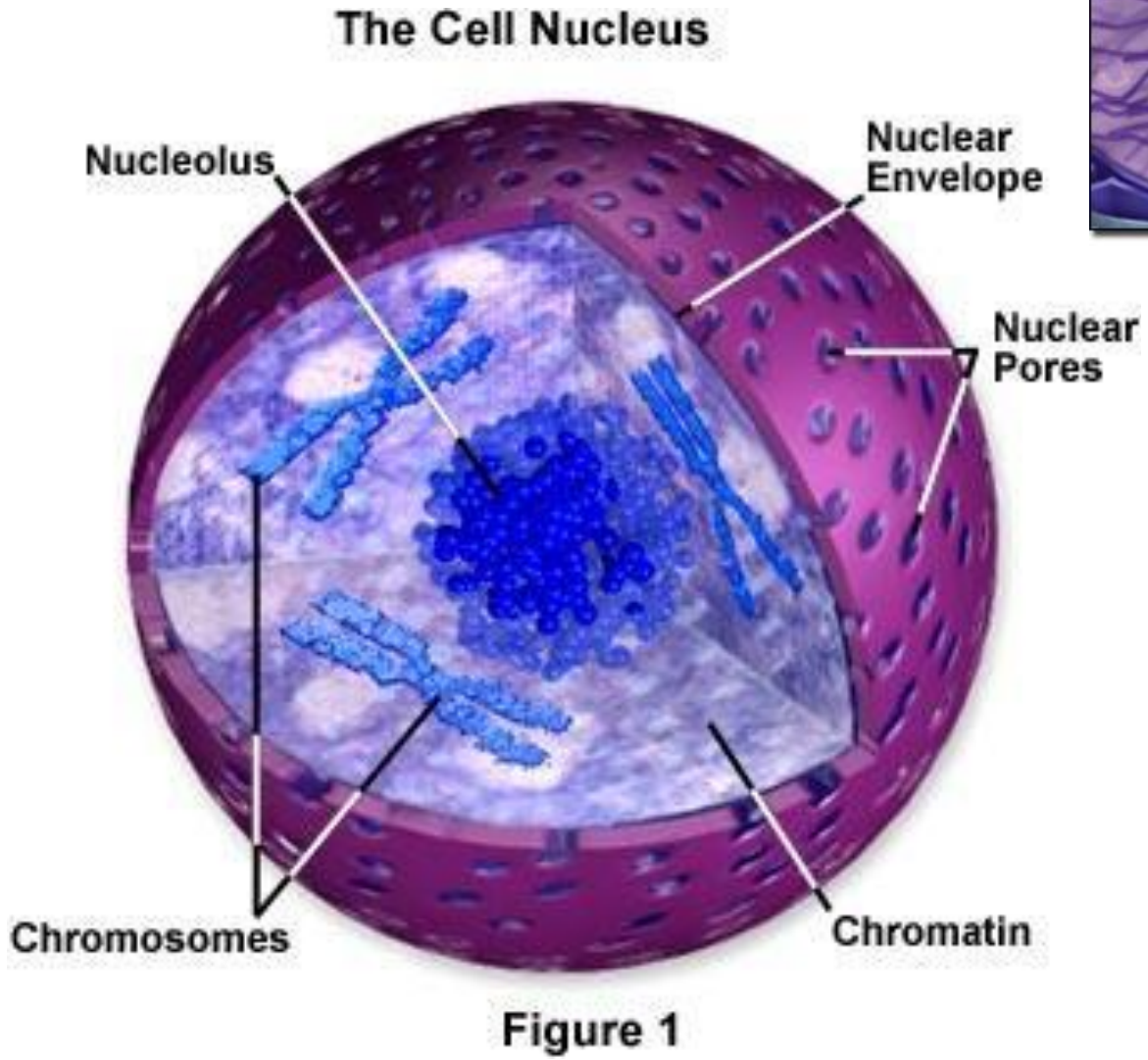
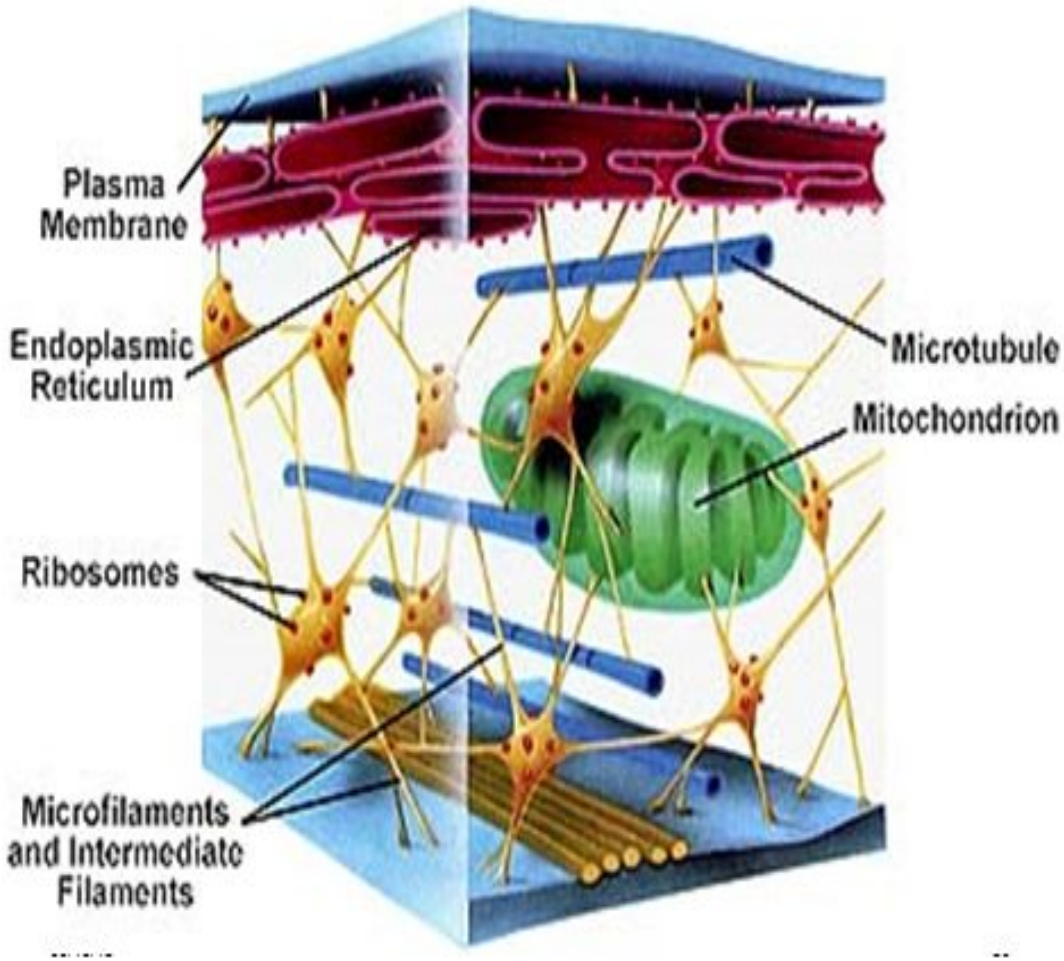
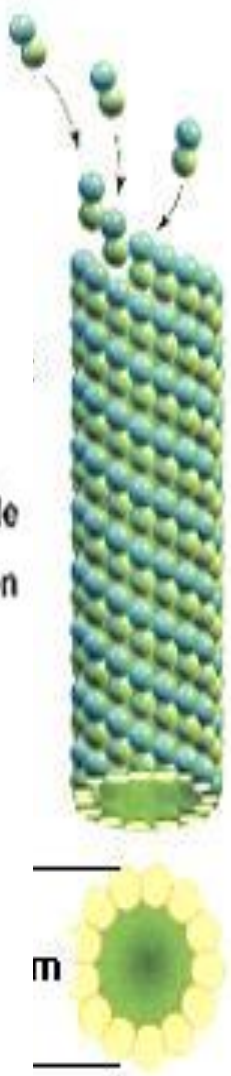
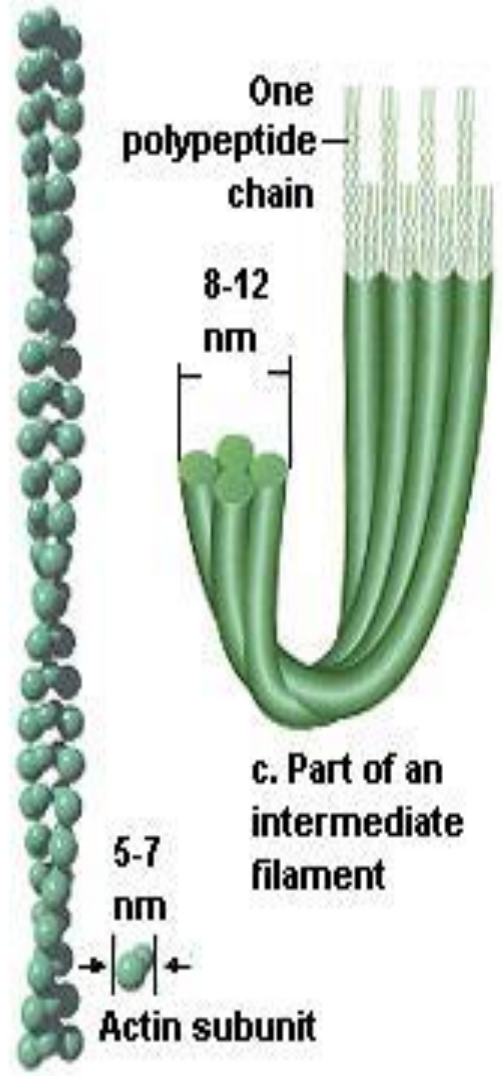




Figure 1

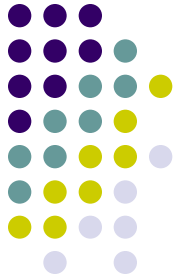
# Tsütoskelett (mikrotuubulid, filamendid)



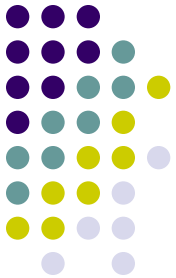



# Rakkude hulga regulatsioon



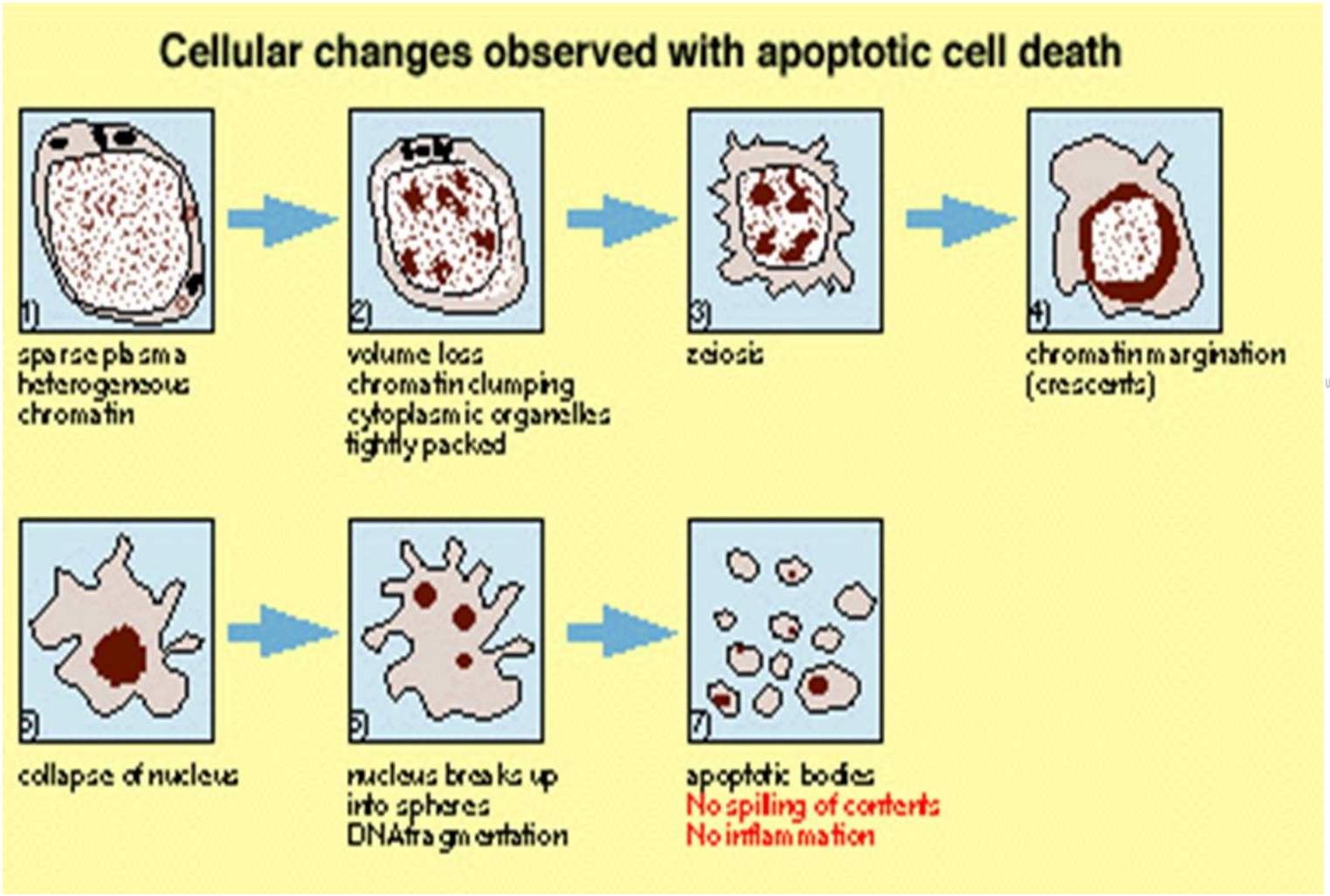
- Hulkrakse organismi areng seisneb rakkude kasvus, jagunemises ja diferentseerumises.
- Embrüonaalstaadiumi alguses jagunevad kõik rakud kiiresti, kuid erinevusi leidub diferentseerunud rakkude jagunemisvõimes.
- Mõningad rakud (enamik vererakke, mõned epiteelirakud, seemnerakud jt) on lühiealised, sest nemad või nende eelvormid peavad kiires tempos pidevalt jagunema. Näiteks inimese soole epiteelirakud uuenevad umbes kord viie päeva tagant.
- Mõningad rakud jagunevad võrdlemisi harva, näiteks kord kuus (maksarakud).
- Kolmandad kaotavad diferentseerudes jagunemisvõime. Näiteks on närvirakud.
- Rakutsükkel ehk raku jagunemistsükkel on raku elukäik pooldumisest pooldumiseni.

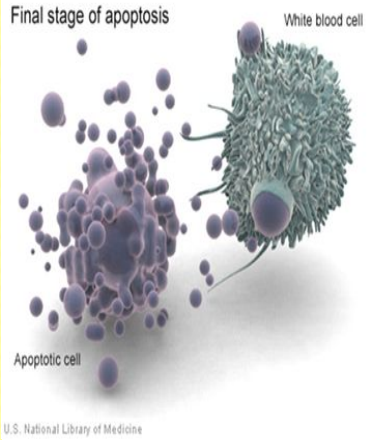
# Rakkude paljunemine



- Mitoos -mitoosi all mõeldakse raku tuuma jagunemist koos sellega kaasneva tsütoplasma jagunemisega.
- Meioos -ainult sugurakkud — munarakkude ja seemnerakkude — moodustumisel

# Apoptoos – raku programmeeritud surm füsioloogilistes tingimustes



# Kasutatud kirjandus


- **Nienstedt, W.** (2007). Inimese füsioloogia ja anatoomia. Tallinn: AS Medicina.
- **Ross, M., Kaye G., Pawlina, W.** (2003). Histology. Philadelphia: Lippincott Williams and Wilkins.
- **Ross, M., Pawlina, W.** (2006). Histology. Philadelphia: Lippincott Williams and Wilkins.
- www.cartage.org.lb/.../AnimalCellStructure.htm