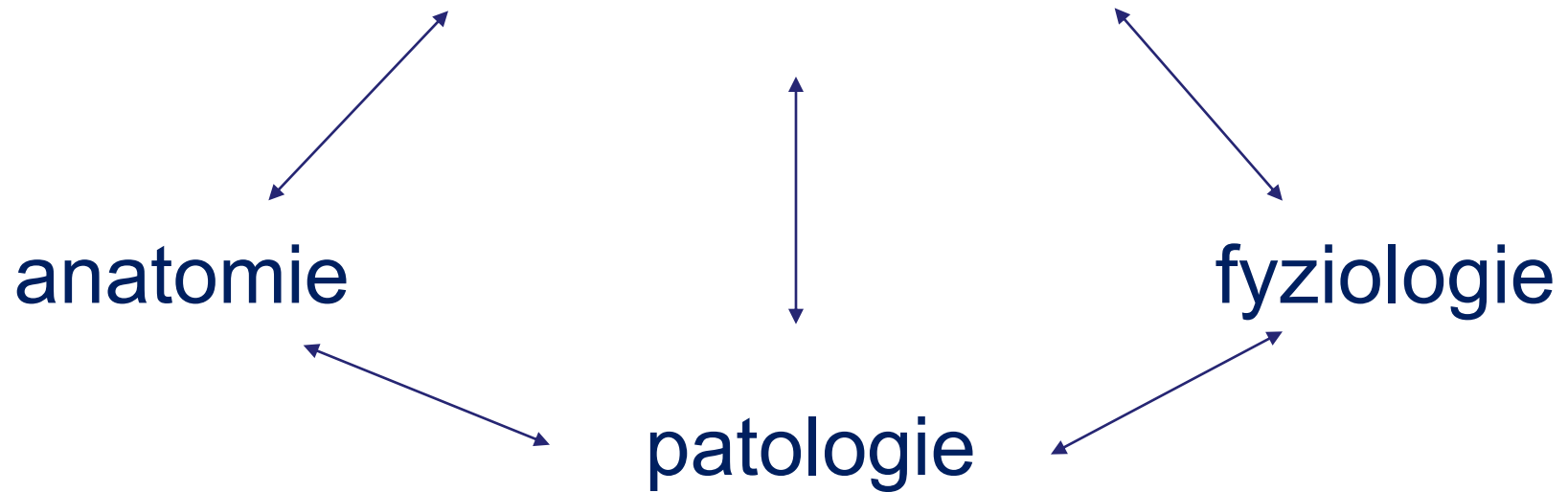


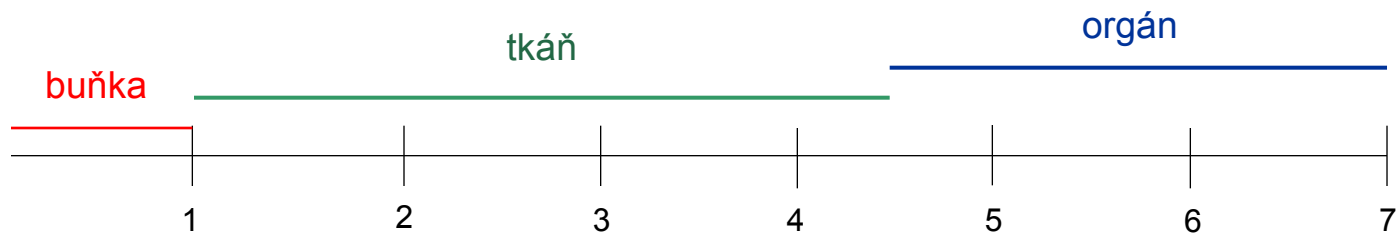
HISTOLOGIE



HISTOLOGIE

Nauka o stavbě normálních, tj. zdravých buněk, tkání a orgánů na mikroskopické a submikro-skopické úrovni





zpracování potravy

vs.

studium histologie



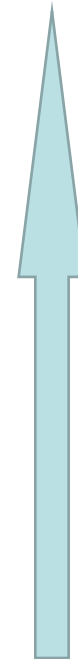
organismus

orgán

tkáň

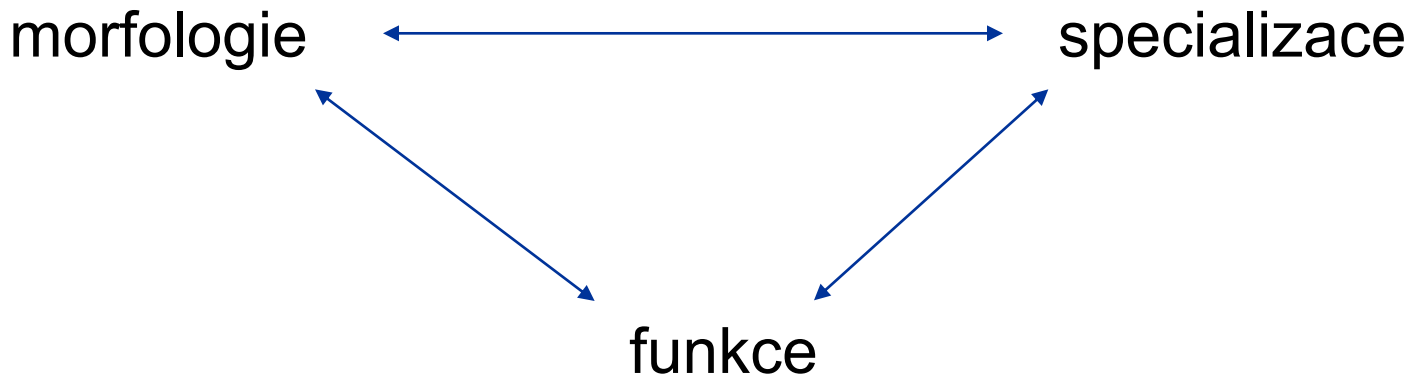
buňka

buněčný kompartment



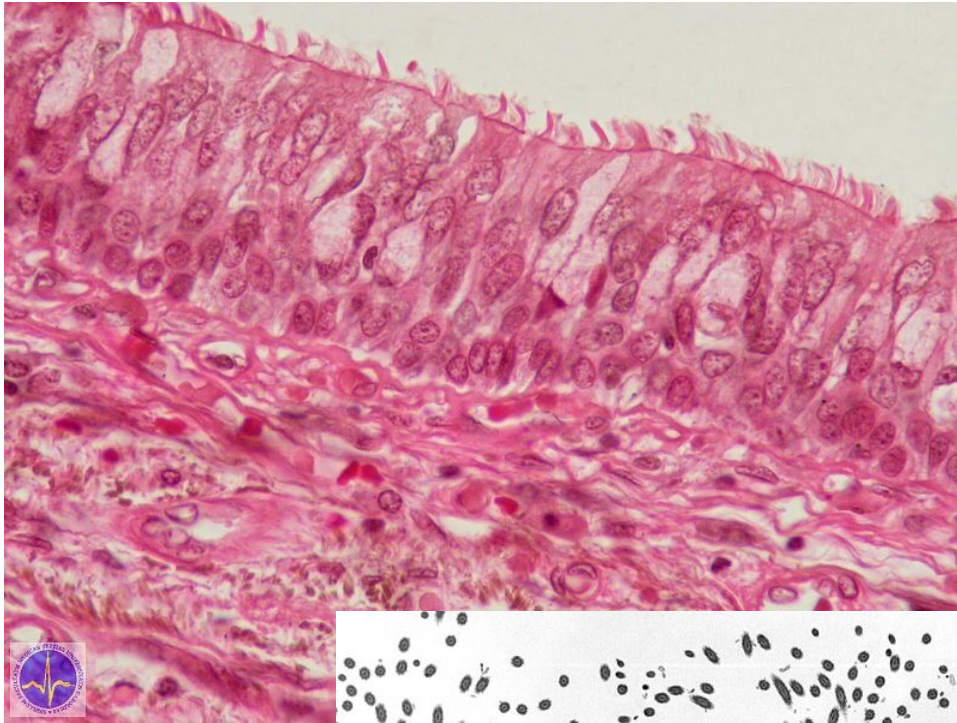
Metody studia buněk a tkání

Co studujeme? Jak to studujeme?

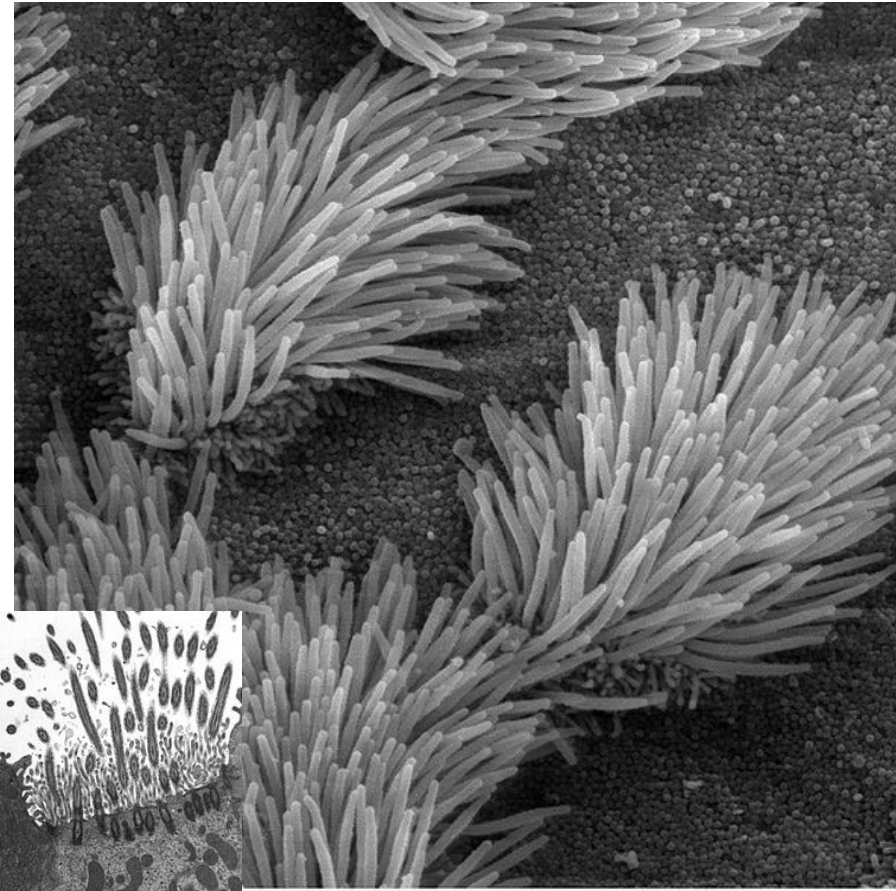


Specifická struktura buněk, tkání a orgánů má své funkční opodstatnění!

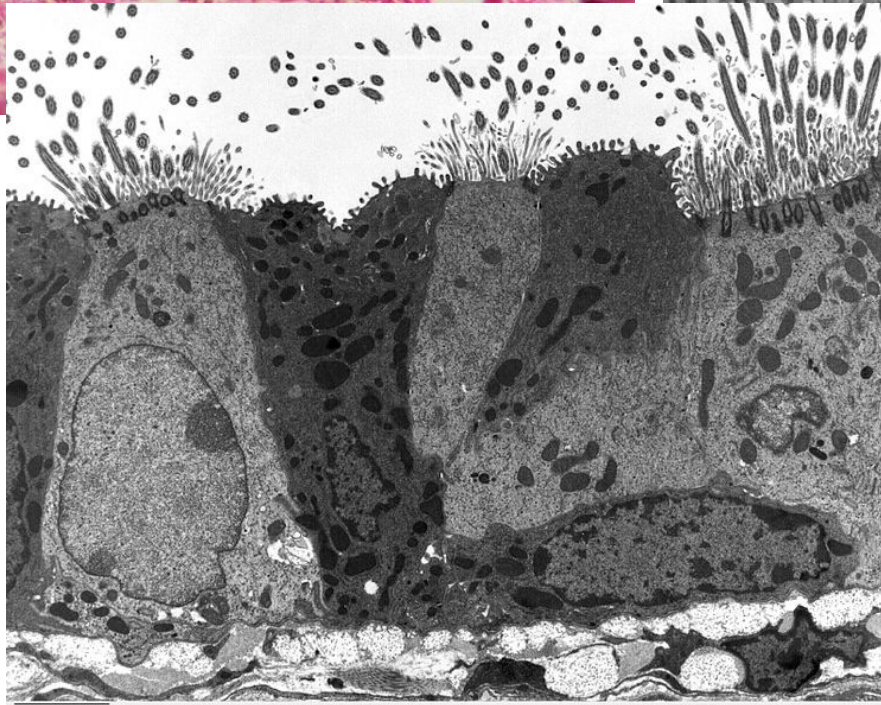
Mikroskopie



SM



SEM



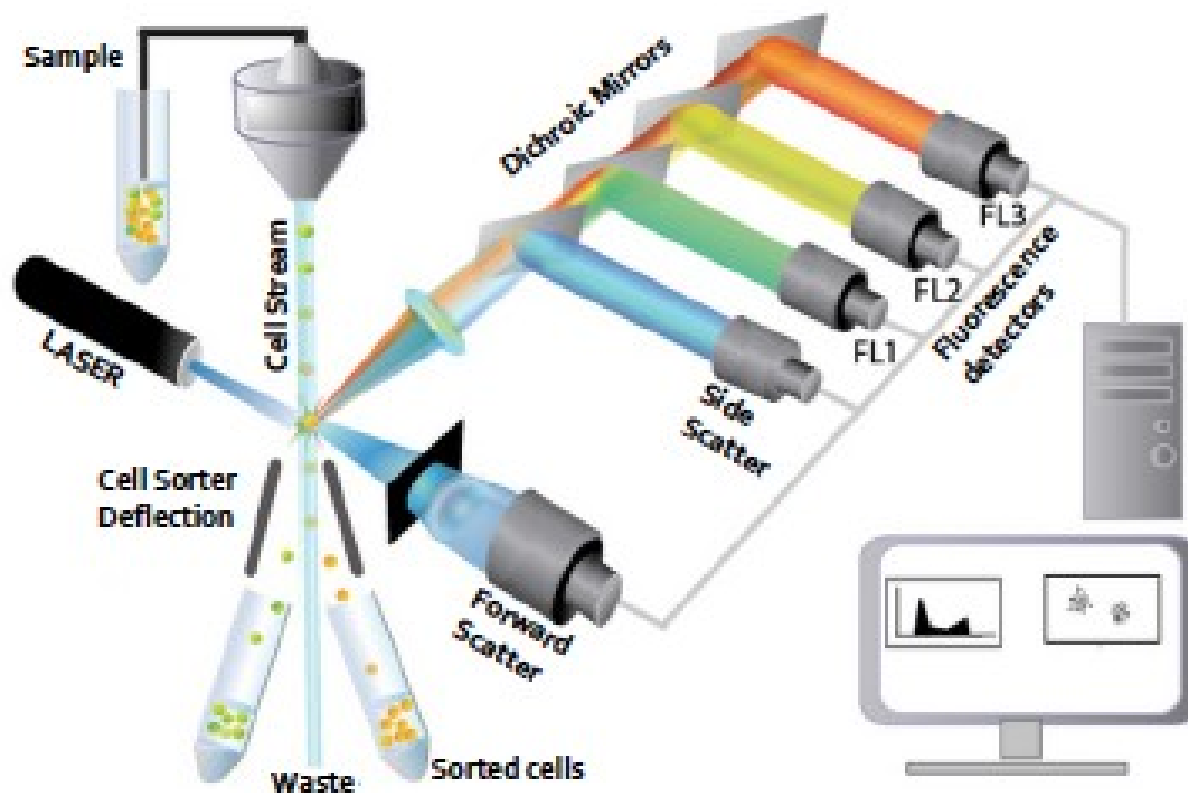
TEM

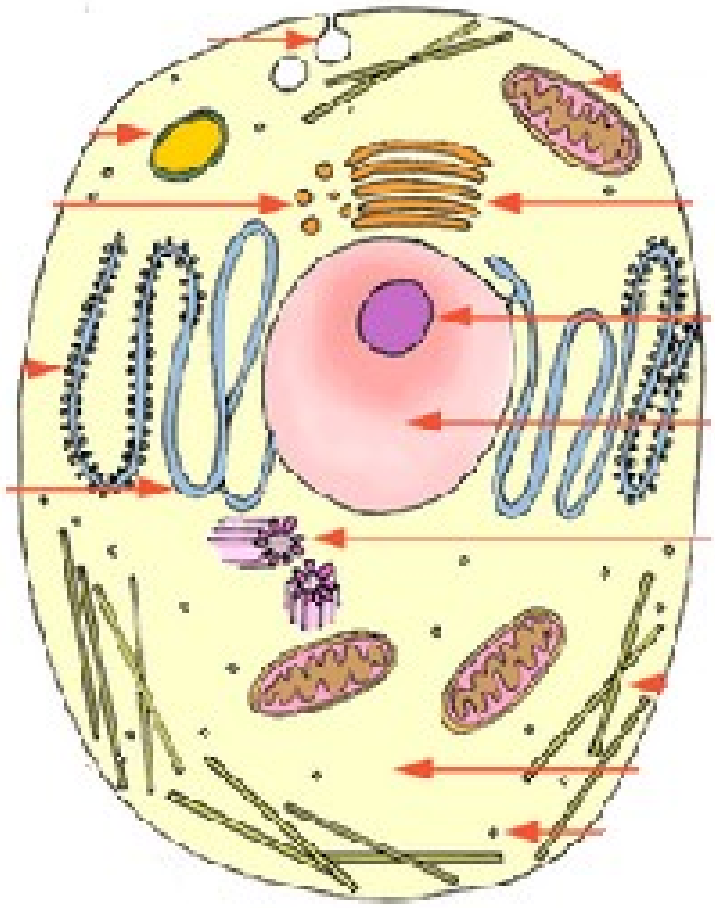
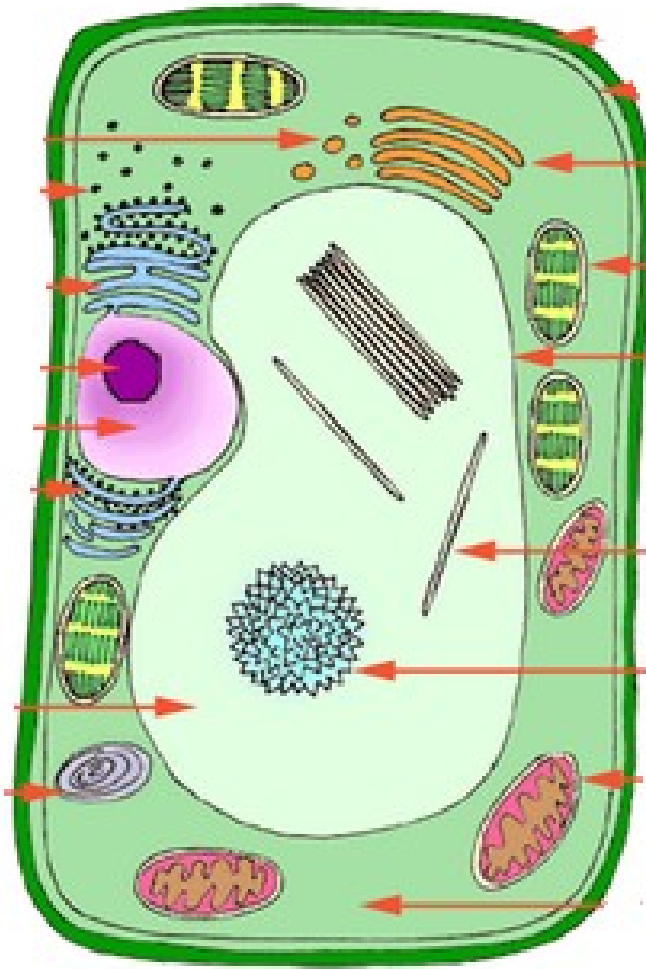
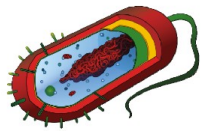
Trachea – víceřadý epitel s řasinkami

Průtoková cytometrie

Analýza fenotypu jednotlivých buněk – možné využití i pro jejich třídění

Hematologická laboratoř – DBOK





Buňka

Základní morfologická a funkční jednotka organismu schopná životních projevů: ???

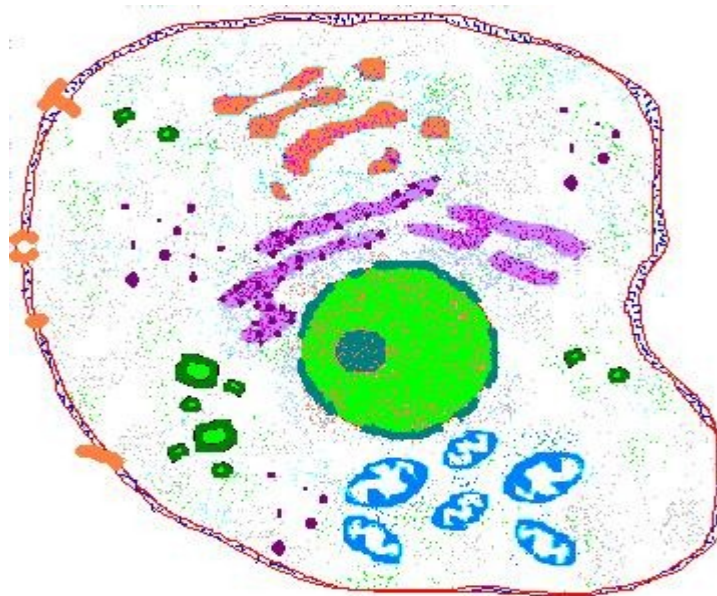
metabolismus

růst

dráždivost

rozmnožování

pohyb



- velikost

- životnost

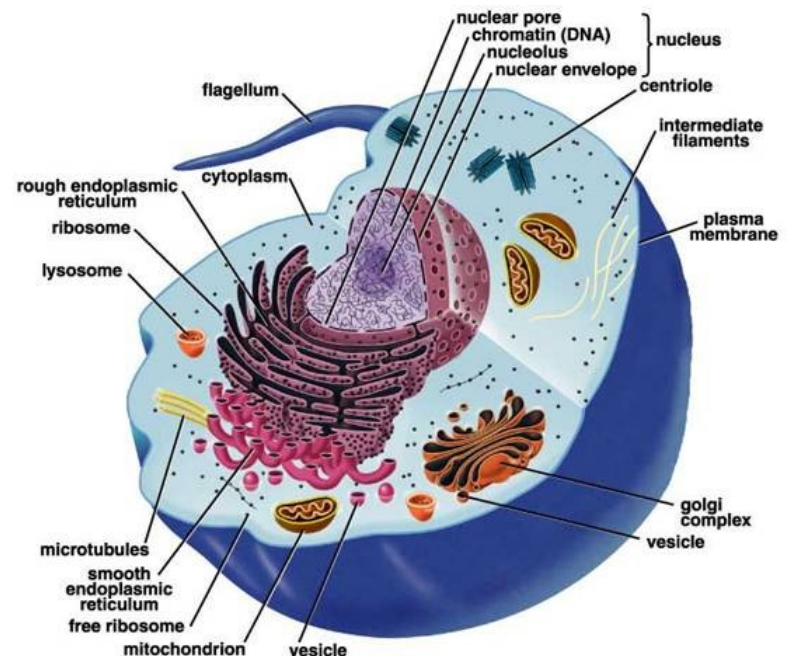
Organizace v buňce - kompartmentalizace

Izolace specifických prostředí
Selektivní přenos látek, energie a informací

jádro

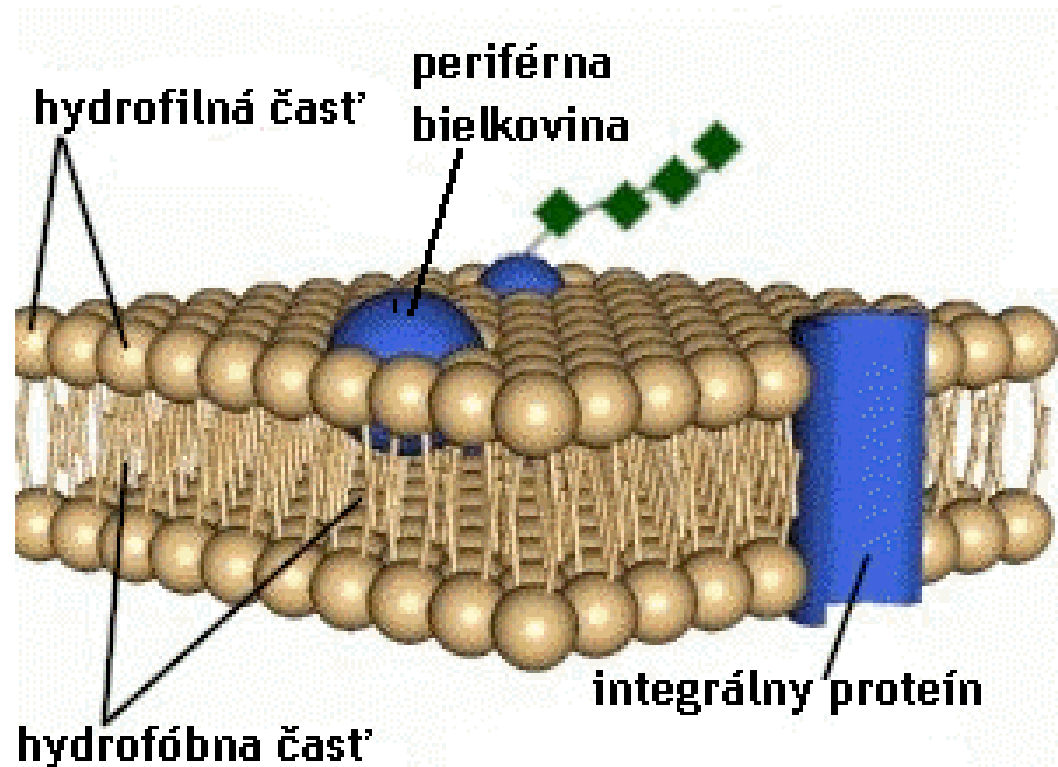
cytoplazma

cytosol
organely
inkluze



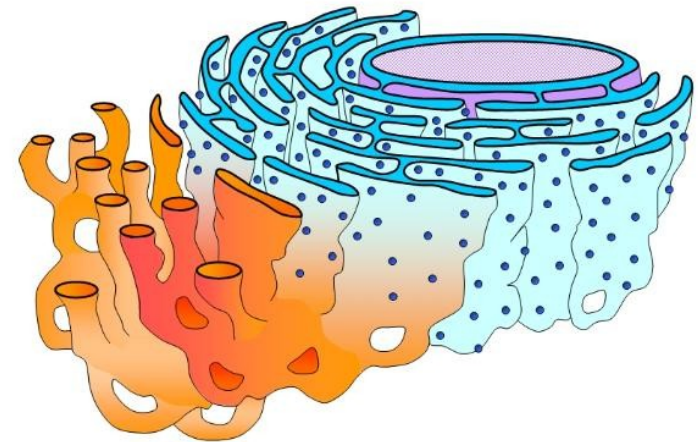
Stavba biomembrány

- tloušťka 7 – 10 nm
- dvě vrstvy fosfolipidů
- povrchové a prostupující proteiny



Membránové struktury v buňce

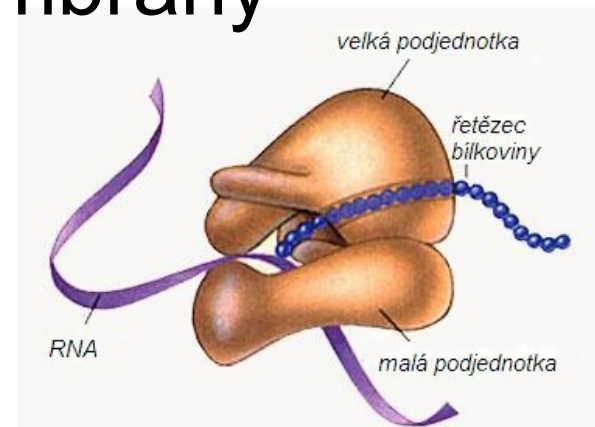
- Cytoplazmatická membrána
- Endoplazmatické retikulum
- Golgiho aparát
- Mitochondrie
- lysozomy, endozomy, peroxizomy



http://cronodon.com/BioTech/Cell_structure.html

Struktury bez membrány

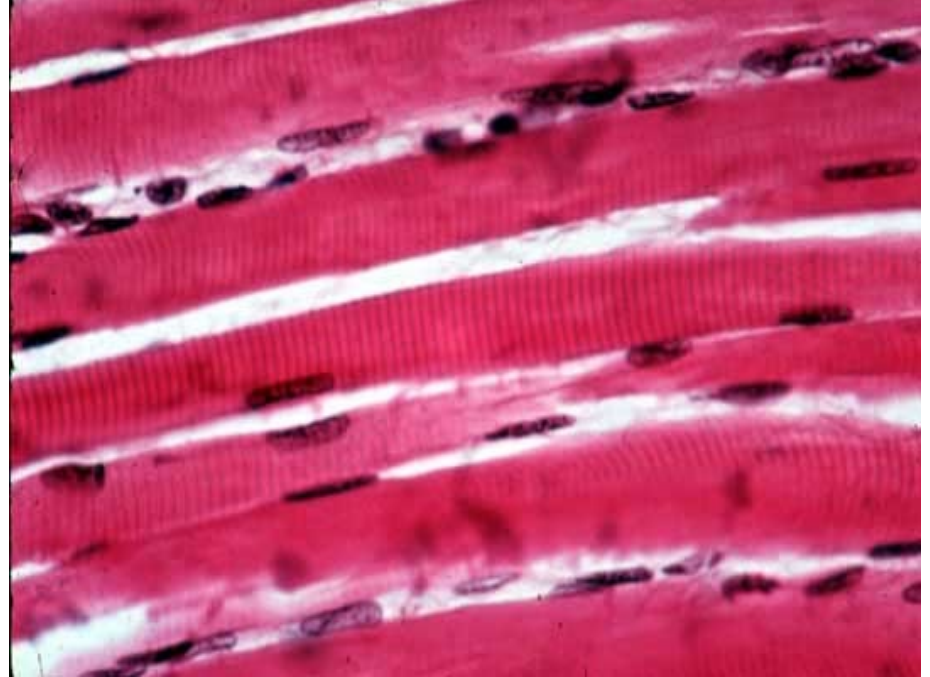
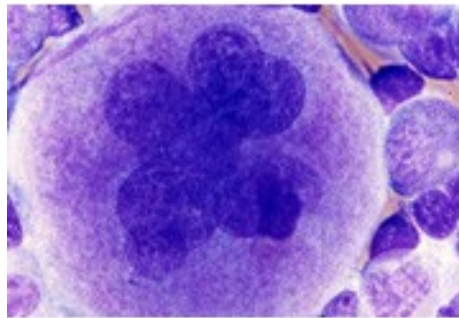
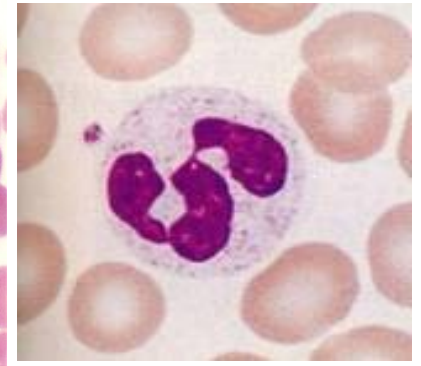
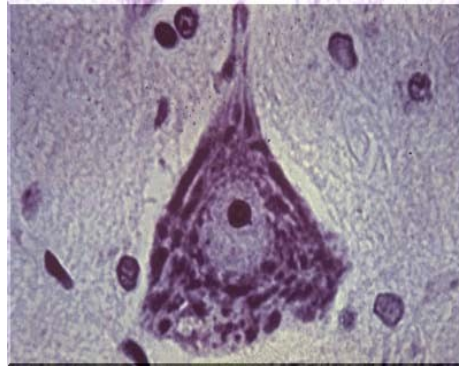
- Ribozomy
- Cytoskelet
 - Centriol
- Inkluze



<http://www.sszdra-karvina.cz/bunka/bi/02pro/obr/ribozom.jpg>

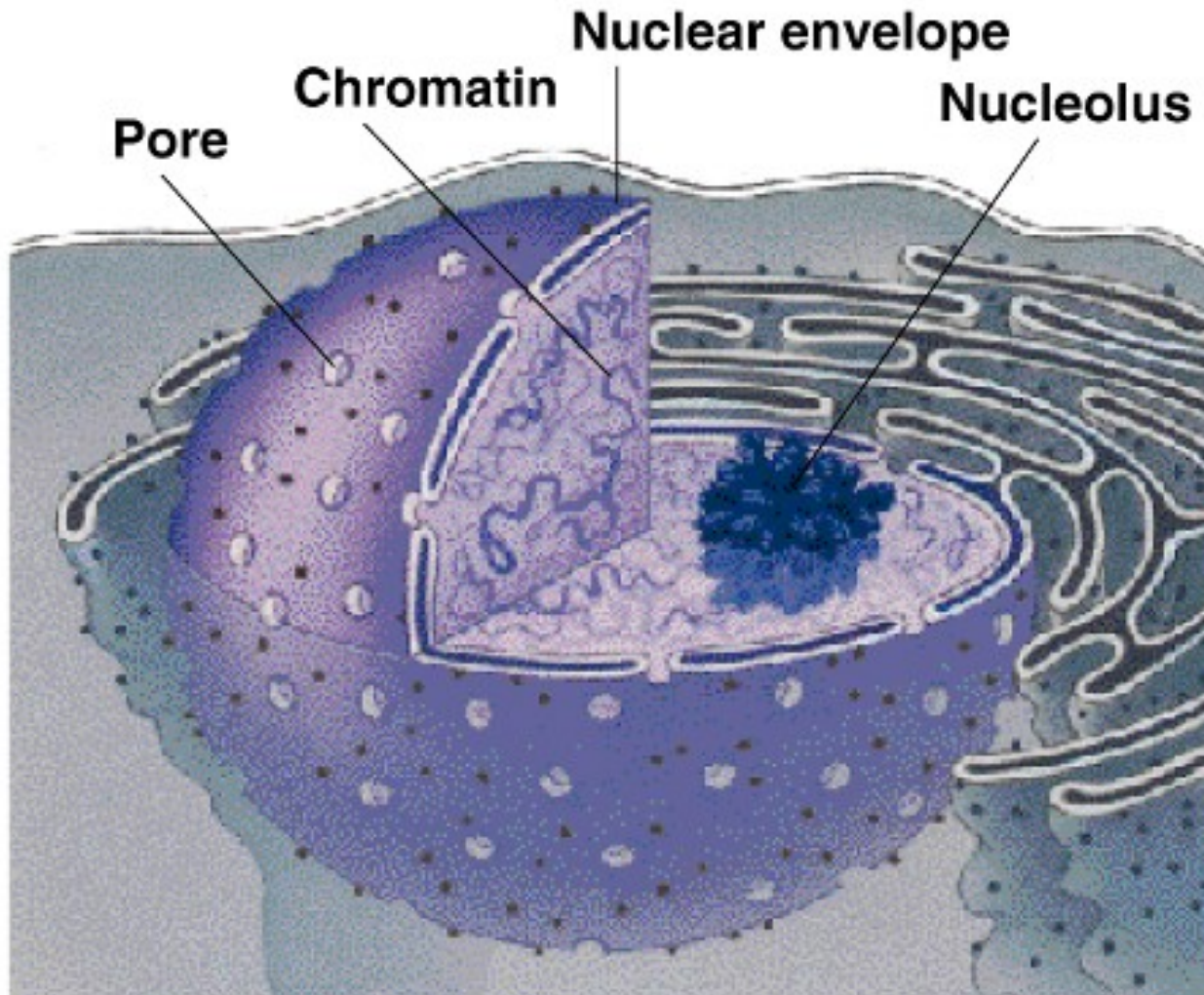
Jádro (nucleus)

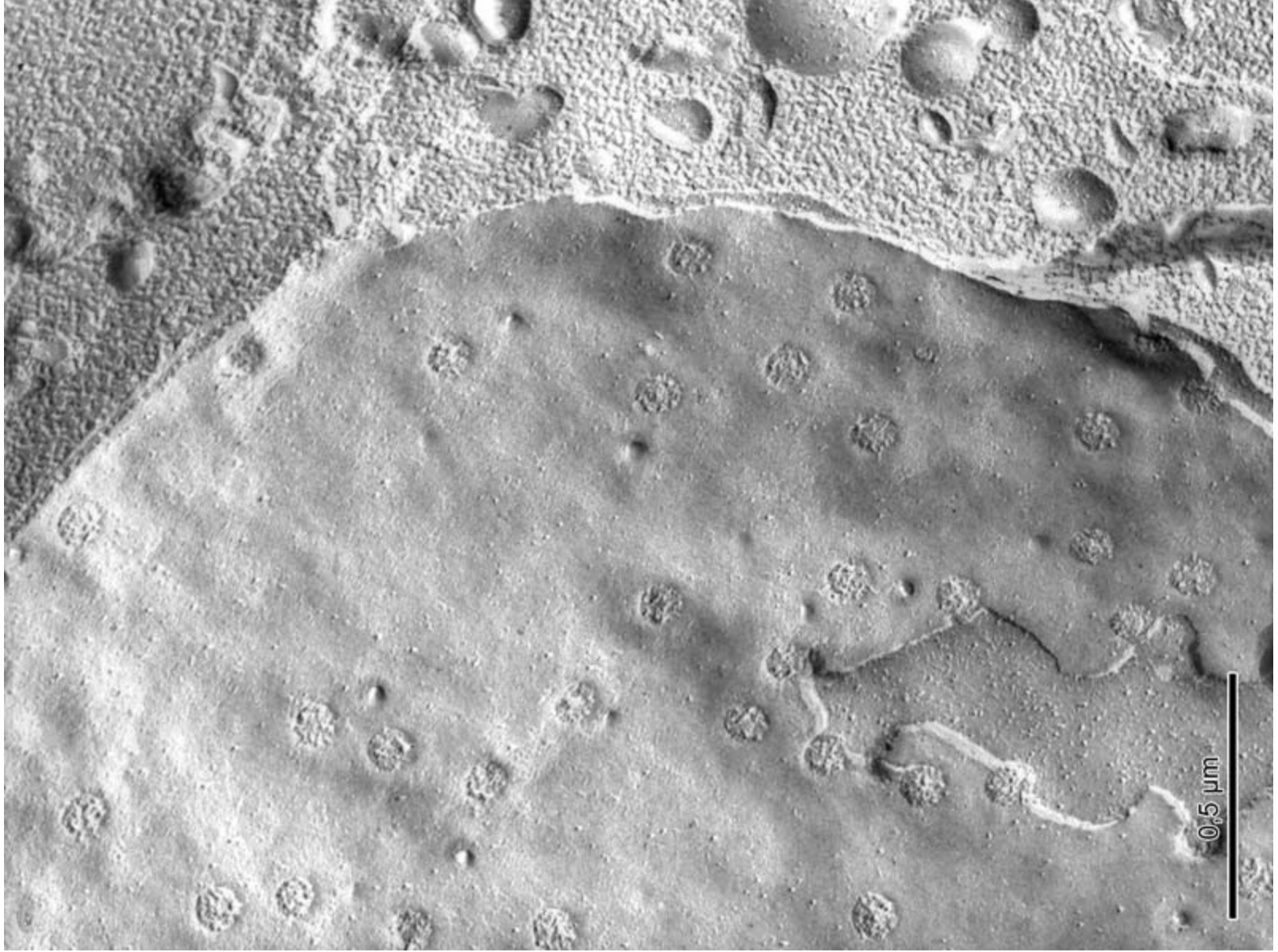
- Počet
- Velikost
- Tvar
- Stavba
- Funkce



Jaderný obal

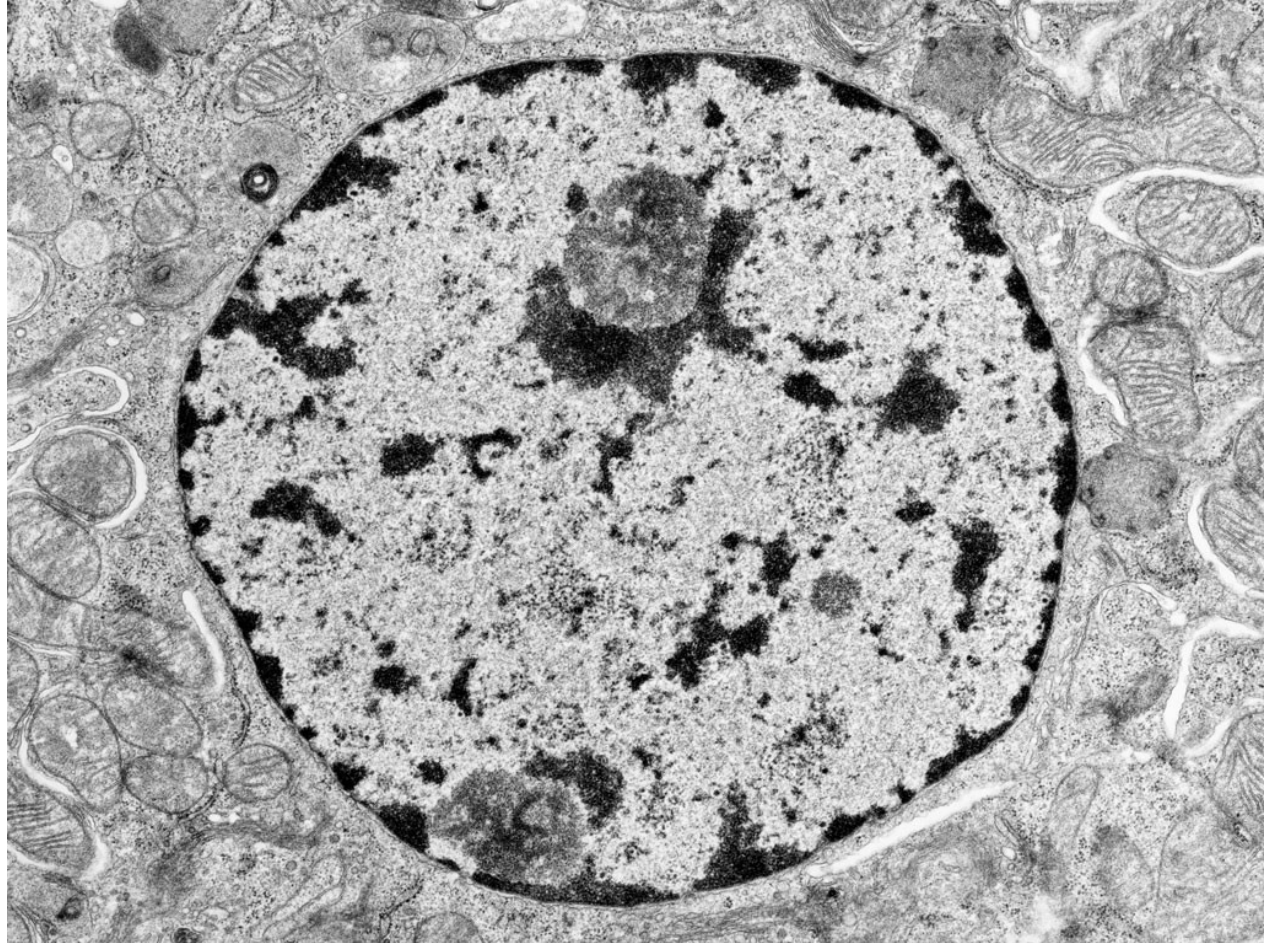
dvojitá biomembrána s
póry
perisinusoidální
prostor





Chromatin (interfáze)

- **Heterochromatin**
- **Euchromatin**



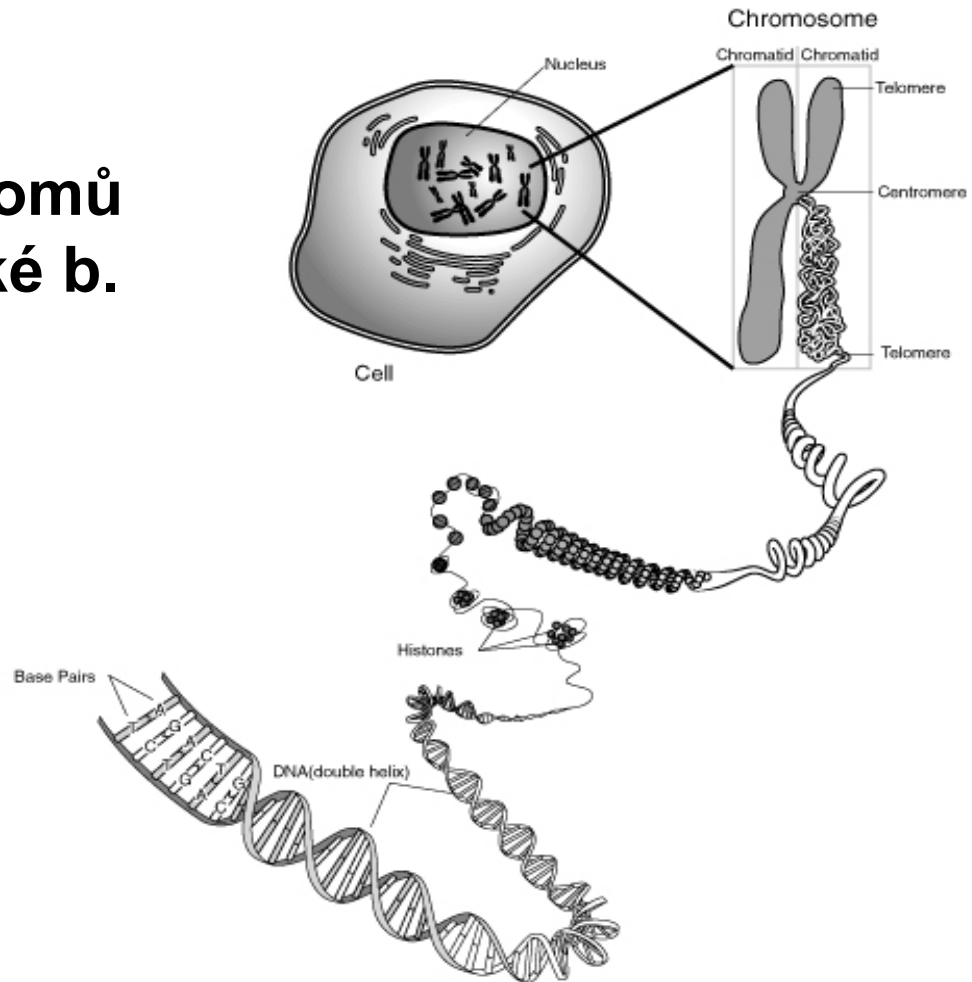
Chromosomy (M-fáze)

viditelná kondenzovaná vlákna DNA během mitózy

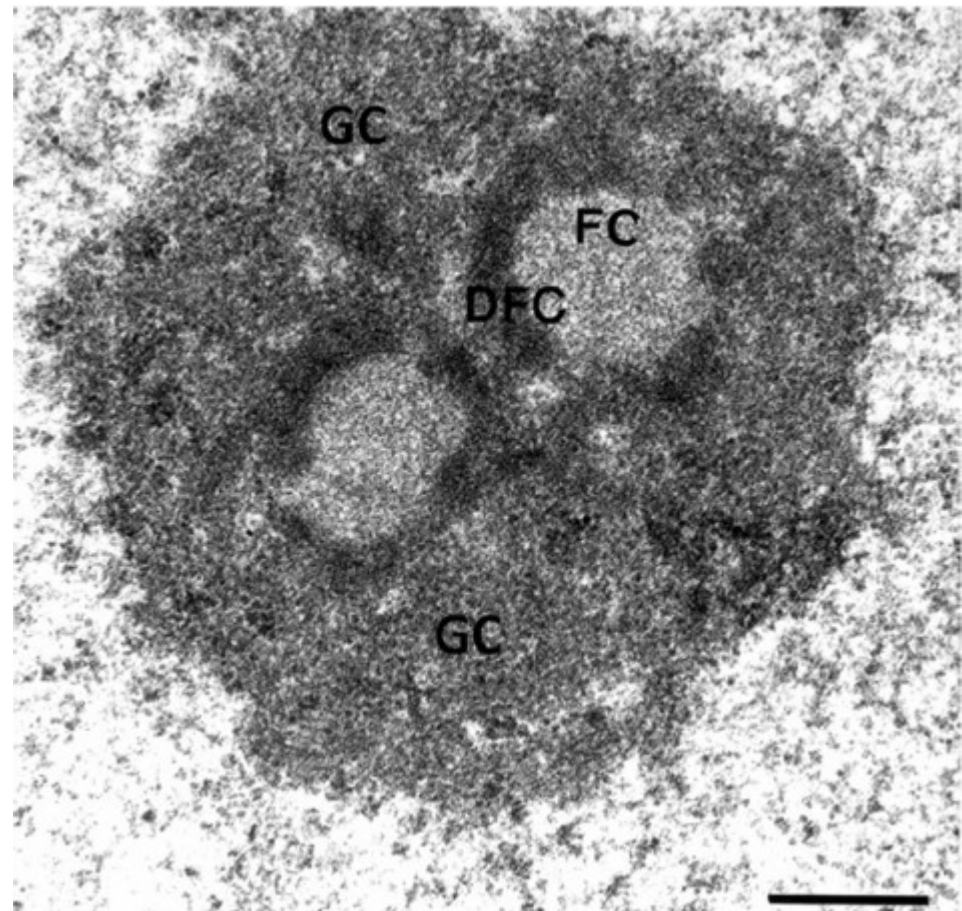
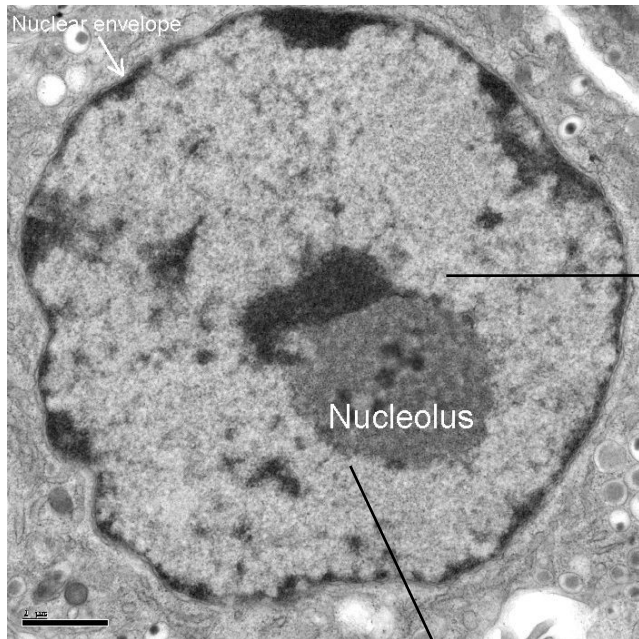
**Diploidní sada chromozomů
= 2x23 v každé somatické b.**

♀ 44 + XX

♂ 44 + XY

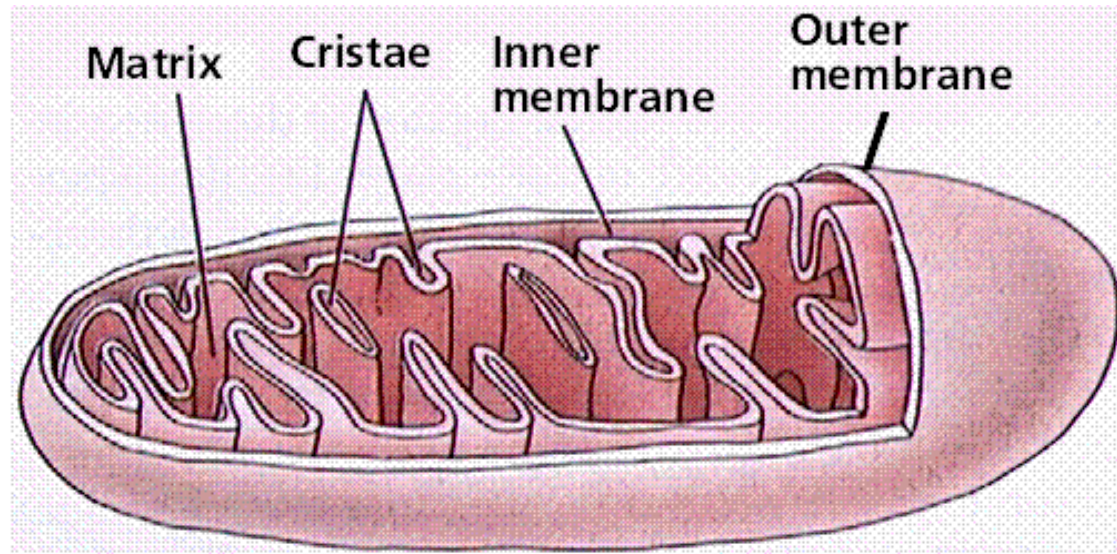


Jadérko (nucleolus)



Mitochondrie

- Semiautonomní organela
- Velikost
- Stavba
- Počet



<http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookCELL2.html>

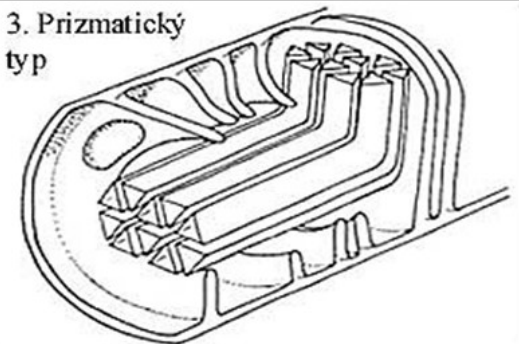
1. Kristový typ



2. Tubulární typ

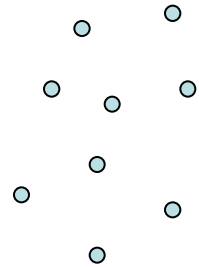


3. Prizmatický typ

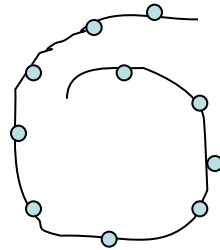


Ribosomy

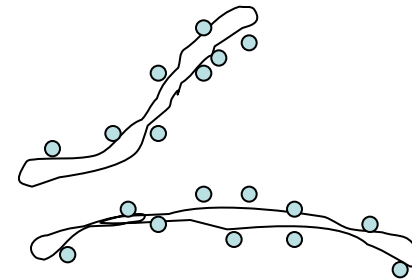
- Složení
- Velikost



volné
ribosomy

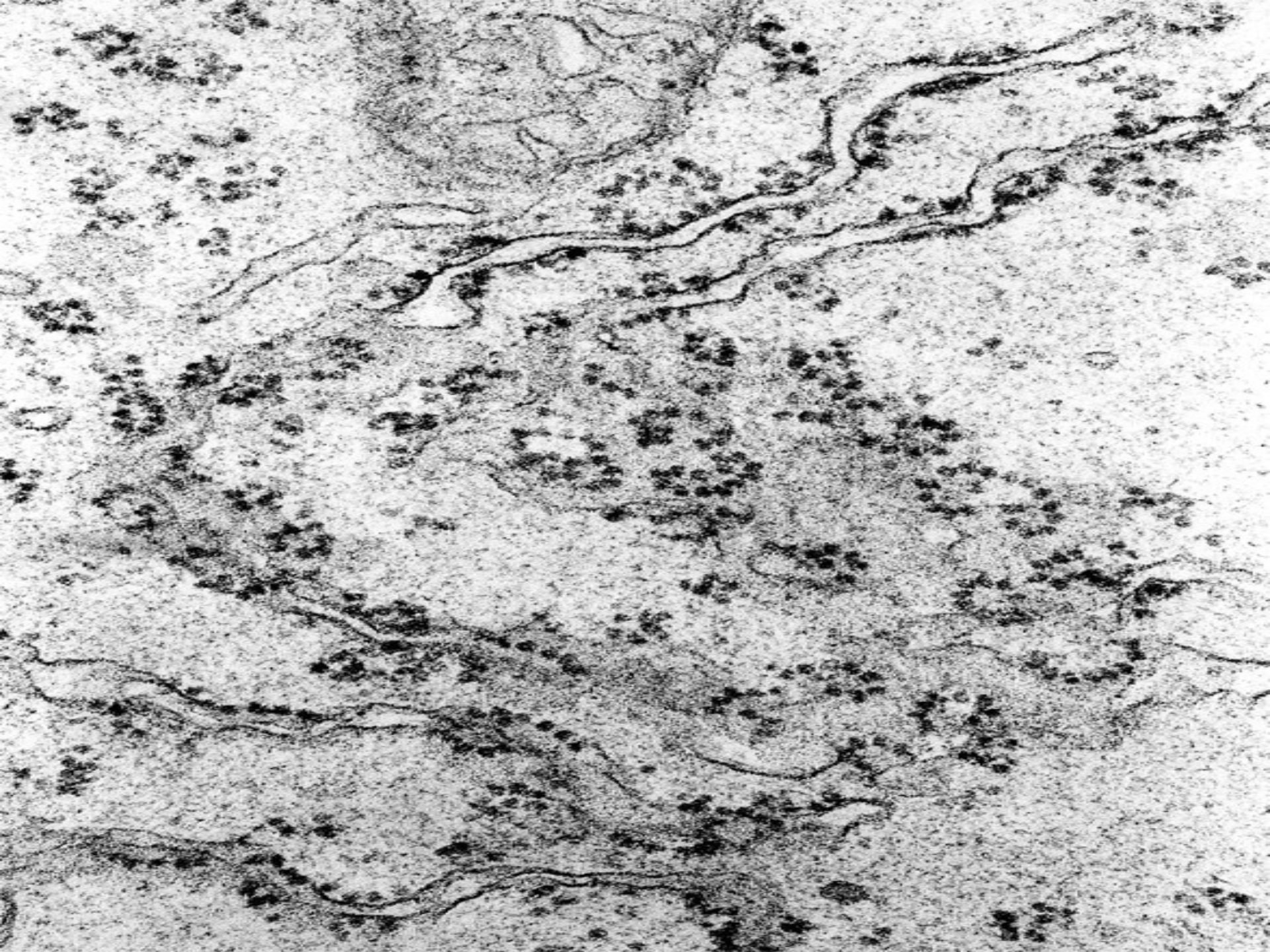


polyribosomy



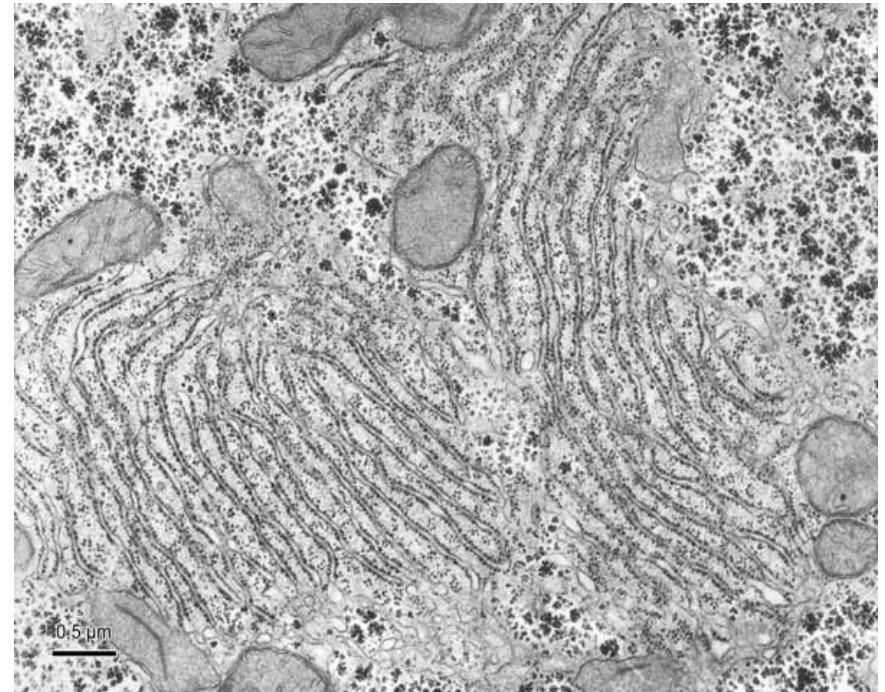
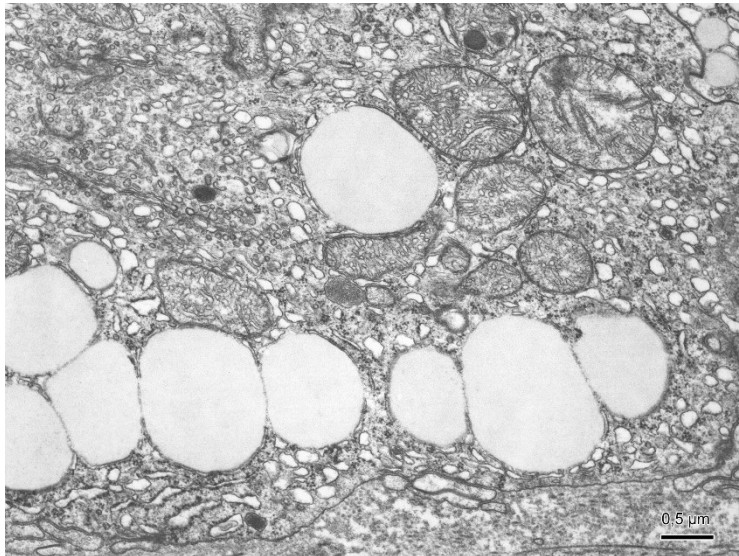
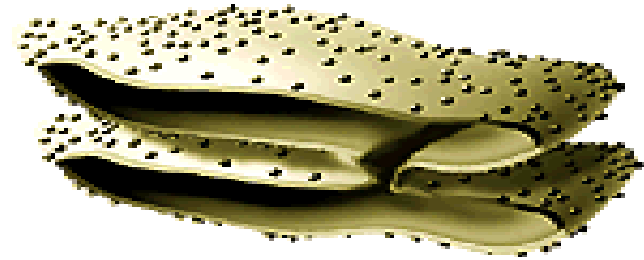
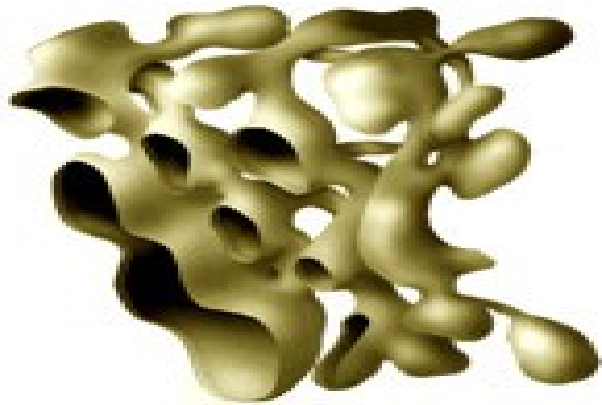
ribosomy na
endoplazmatickém
retikulu

Proteosyntéza „pro buňku“ a „na export“ (*např. žlázné bb.*)



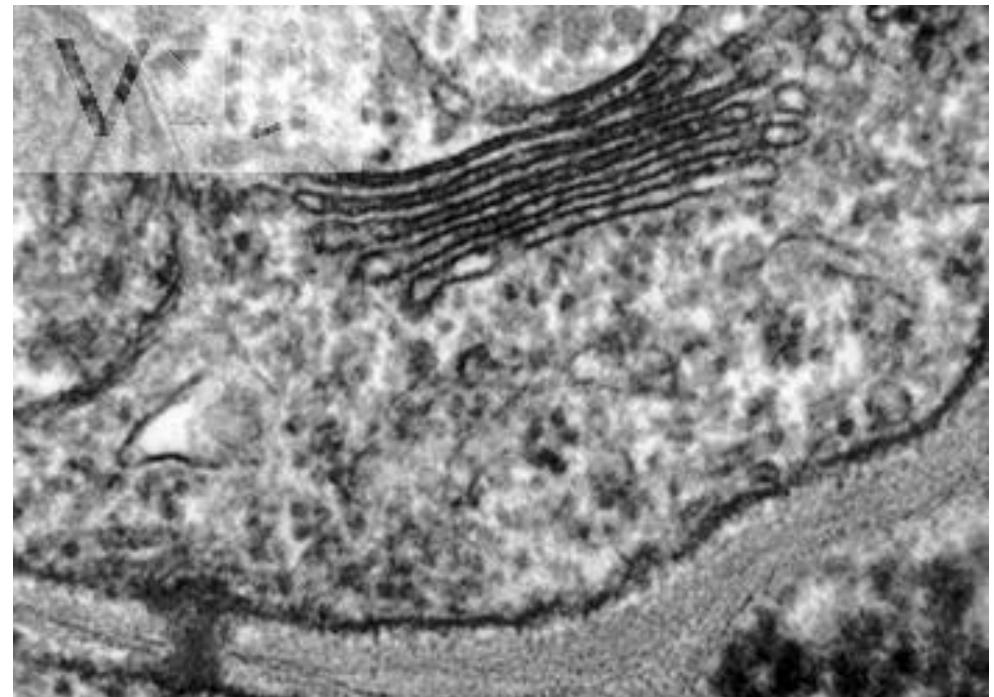
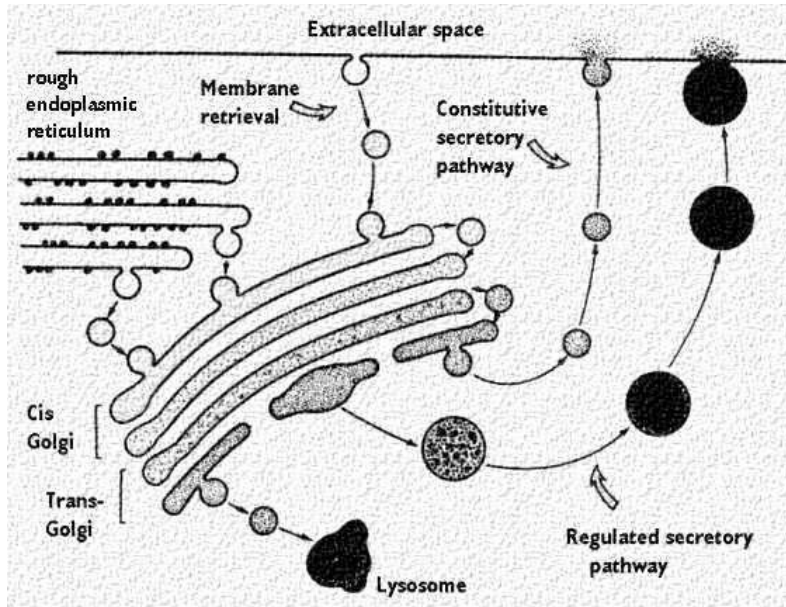
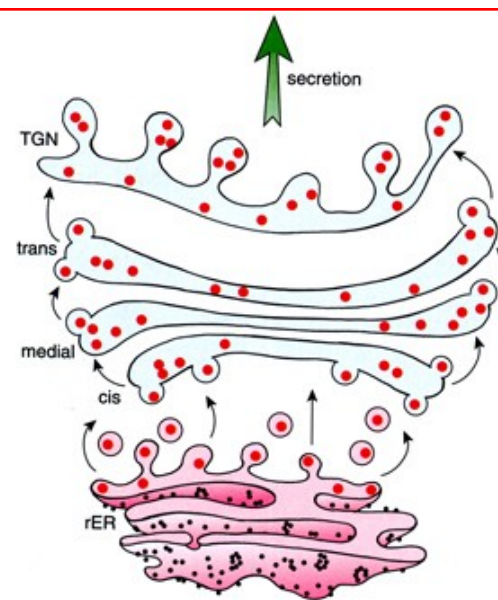
Endoplazmatické retikulum

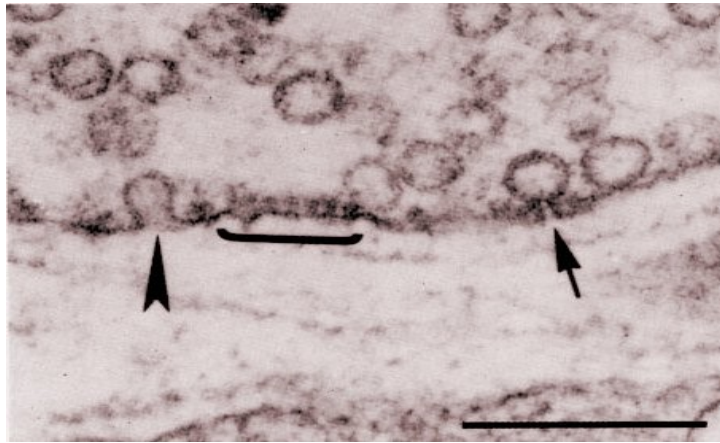
- Zrnité (granulární) ER – GER
- Hladké (agranulární) ER – AER



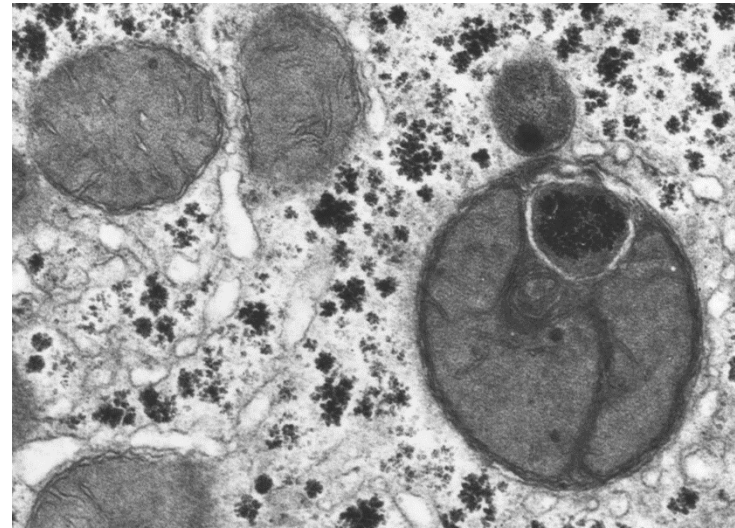
Golgiho aparát

- Struktura
- Funkce

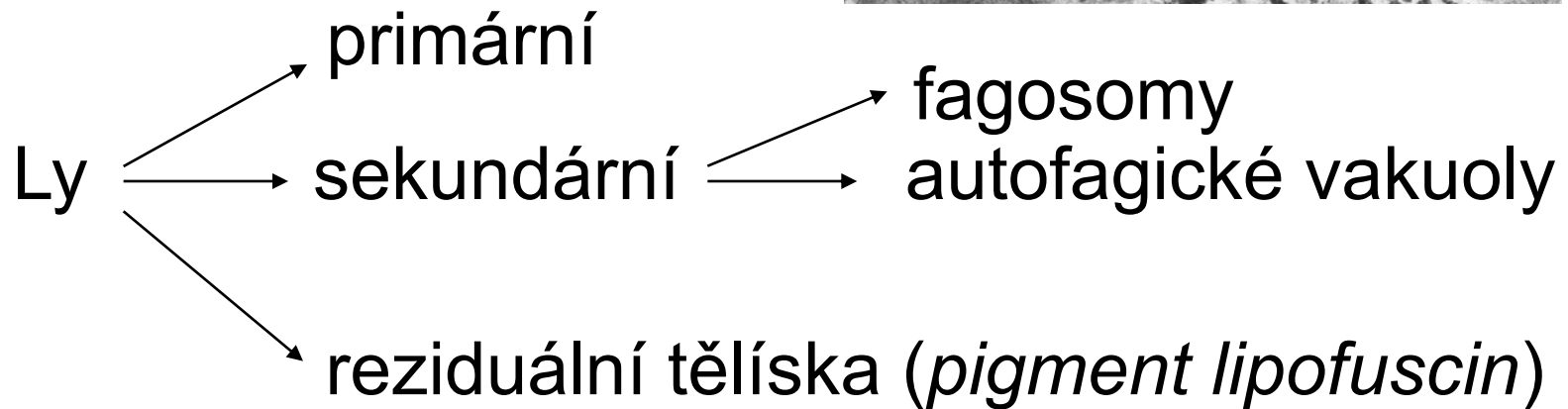




Endosomy

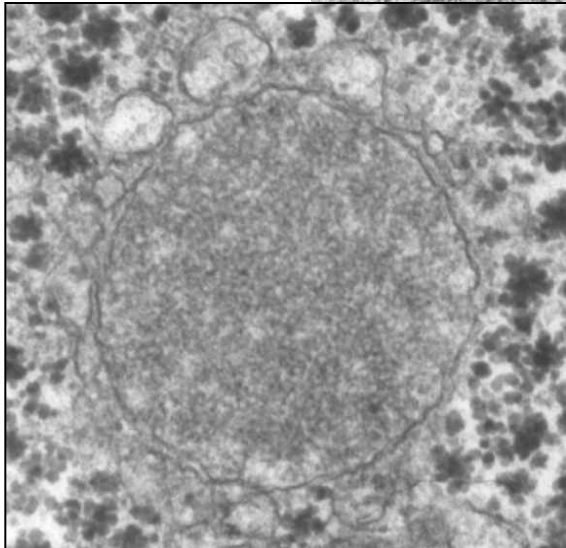
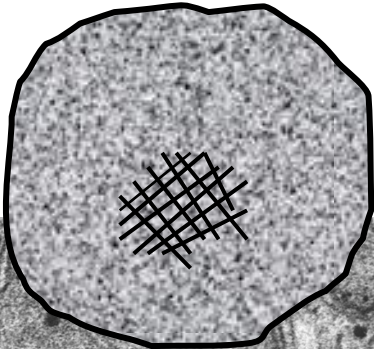
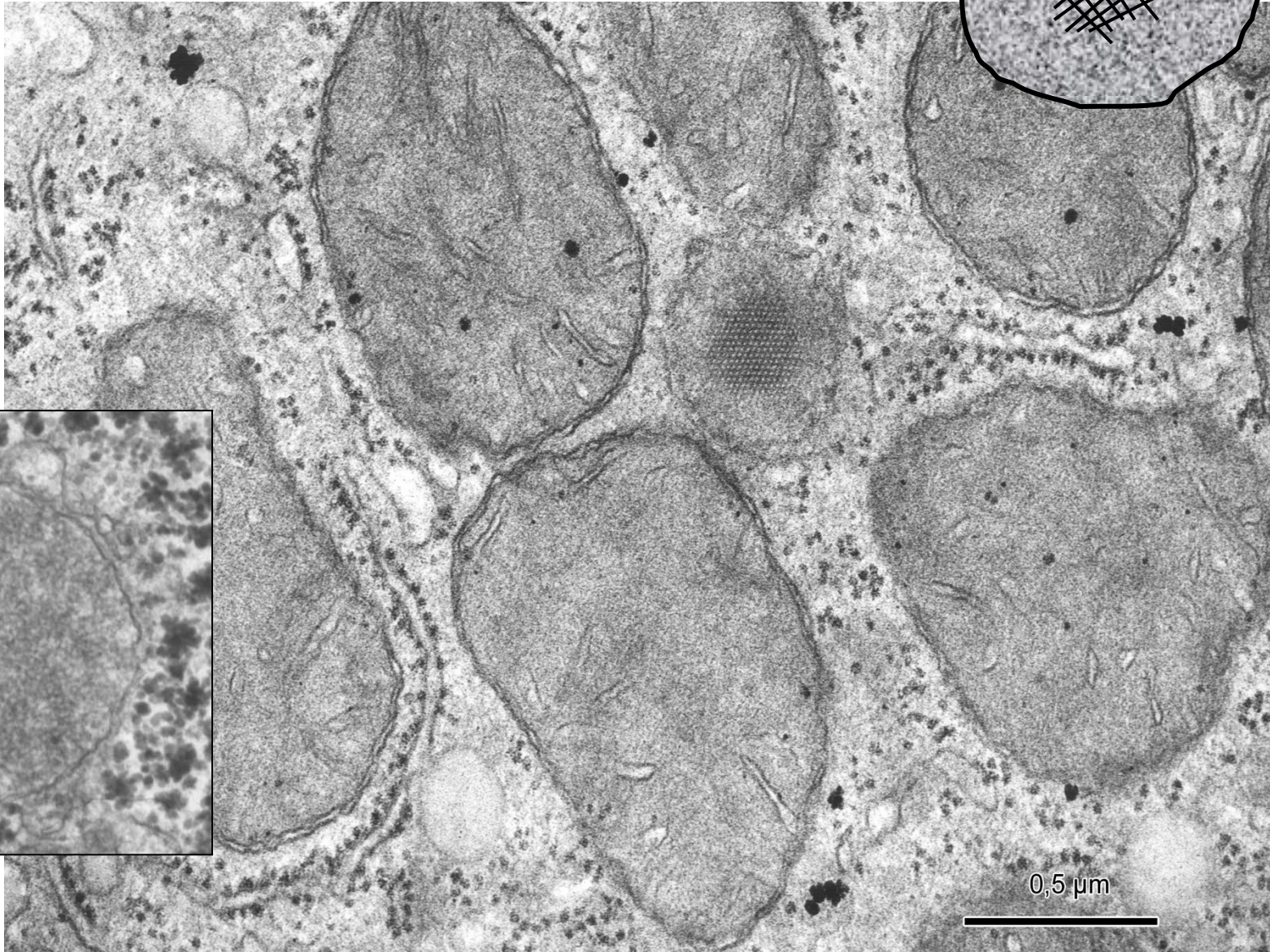


Lyzosomy



Peroxisomy (mikrotělíška)

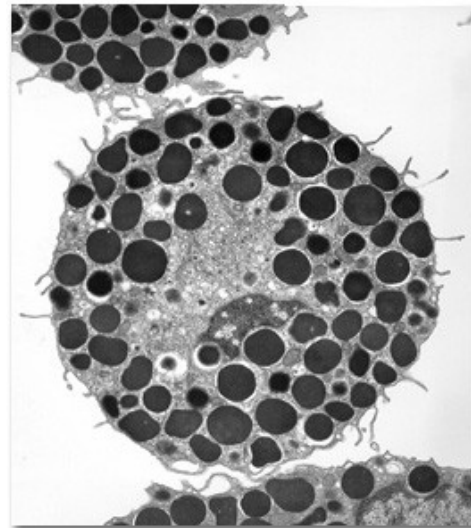
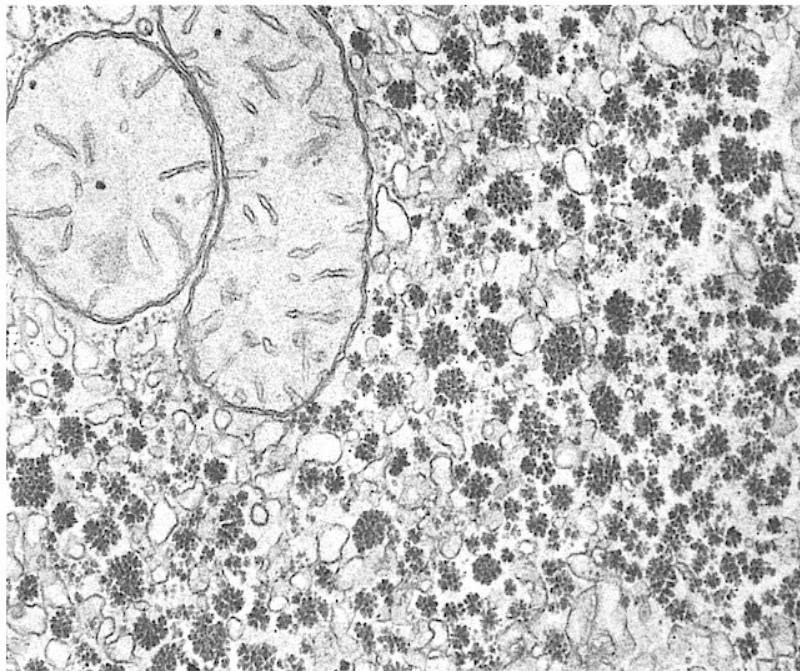
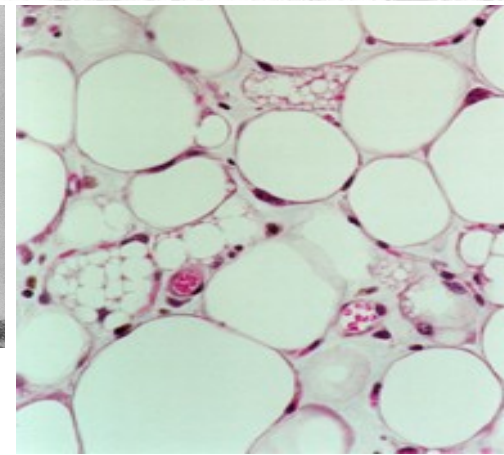
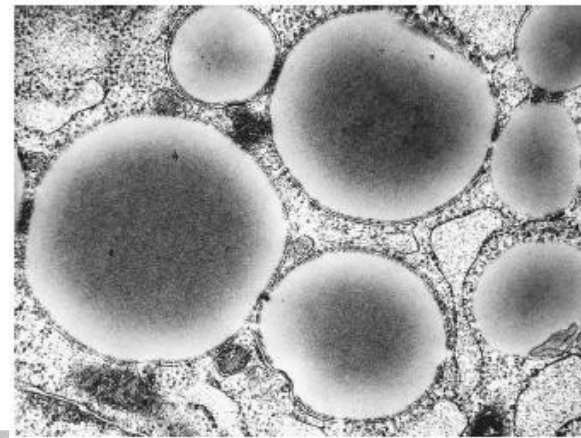
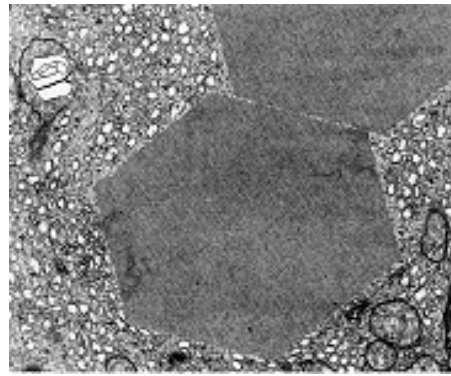
- Stavba
- Výskyt
- Funkce



0,5 μm

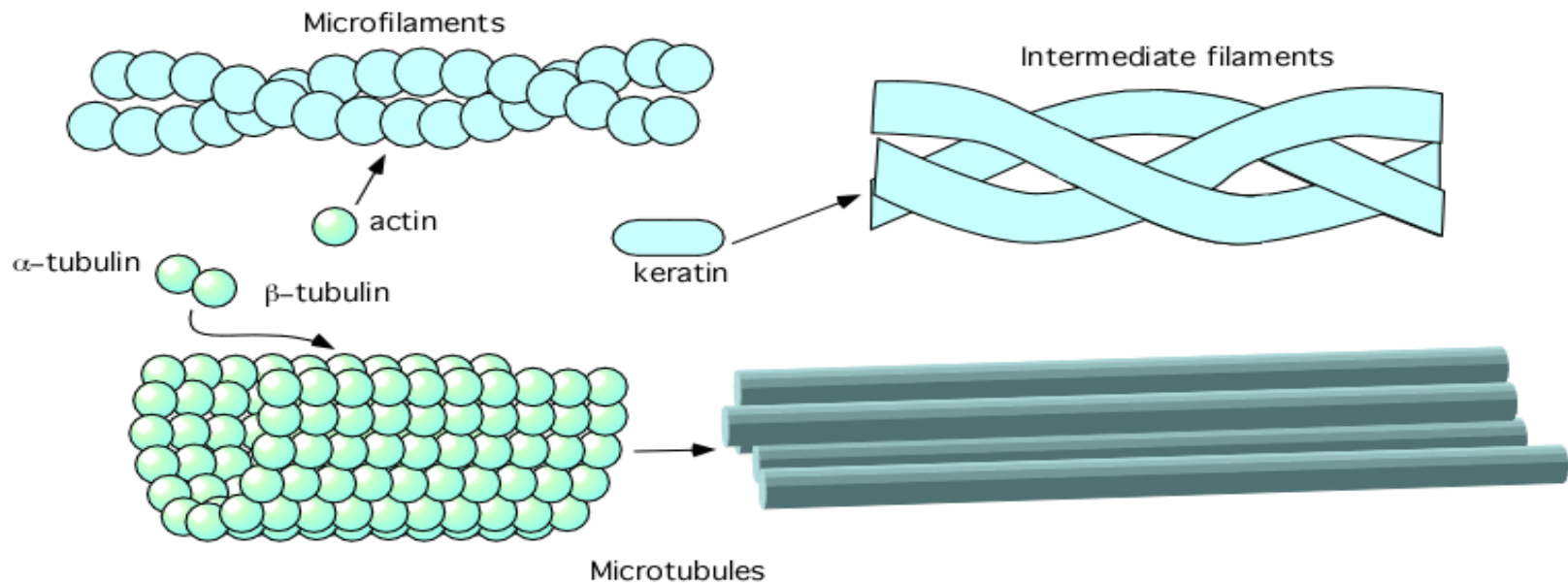
Inkluze

- Sekreční granula
- Zásobní látky
- Krystaly (proteiny)
- Pigmenty
endogenní
exogenní

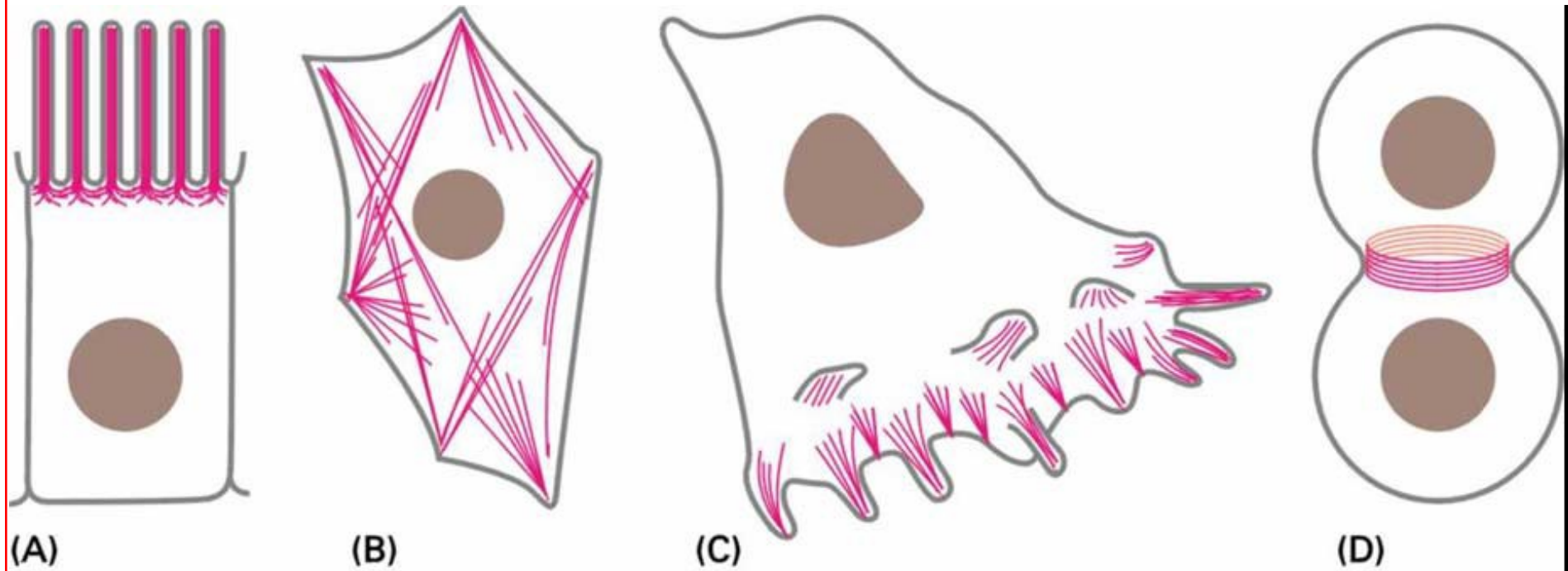


Cytosol (základní cytoplazma) obsahuje cytoskelet

- Mikrotubuly (válce o Ø 22 nm) - α + β tubulin
- Mikrofilamenta (vlákna o Ø 5-7 nm) - aktin
- Intermediární filamenta (vlákna o Ø 8-11 nm) – tkáňově specifická



Typy aktinových struktur v živočišných buňkách



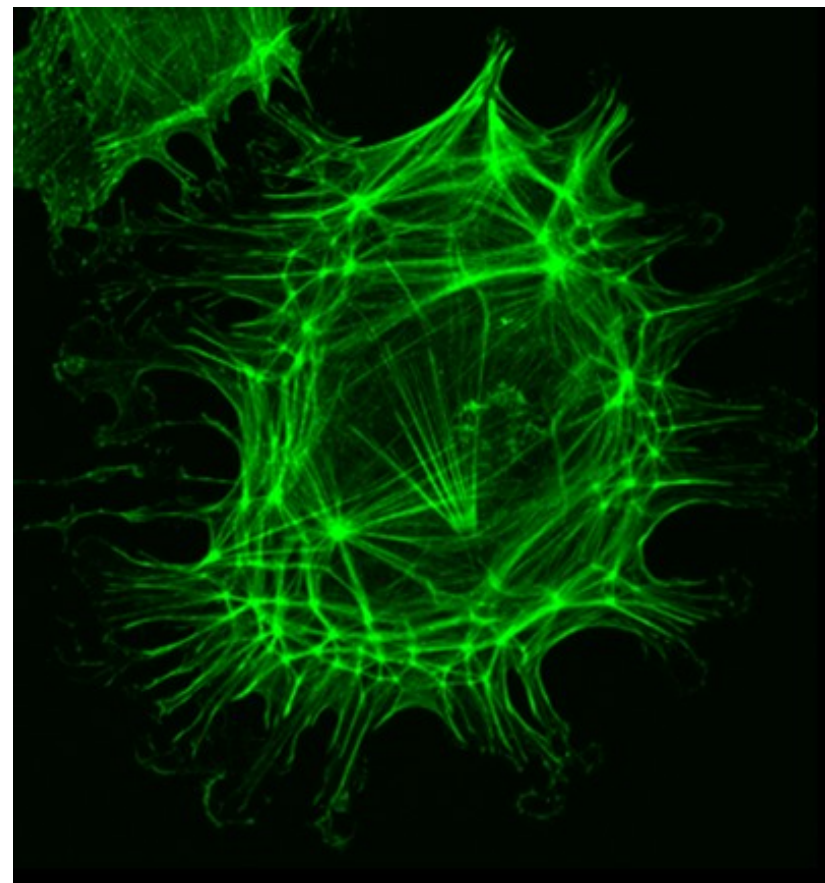
mikroklky

buněčný skelet

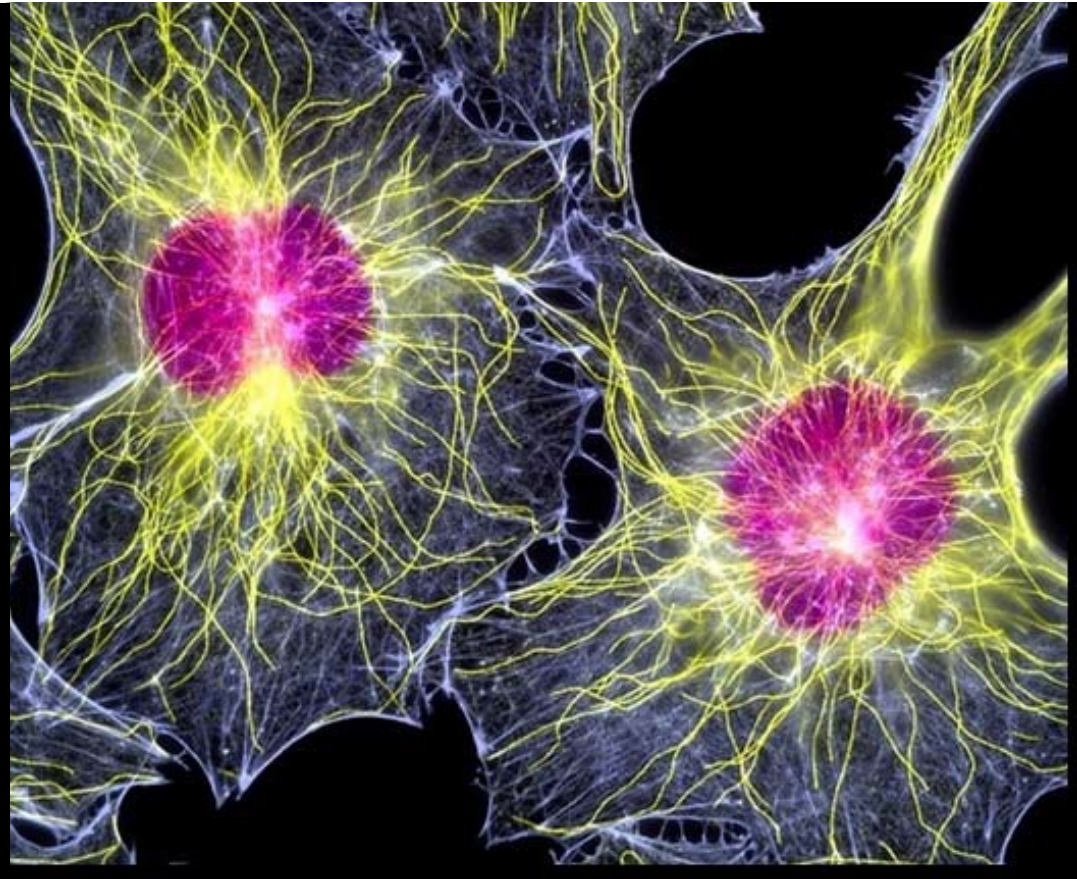
filopodia, lamelipodia

kontraktilní prstenec

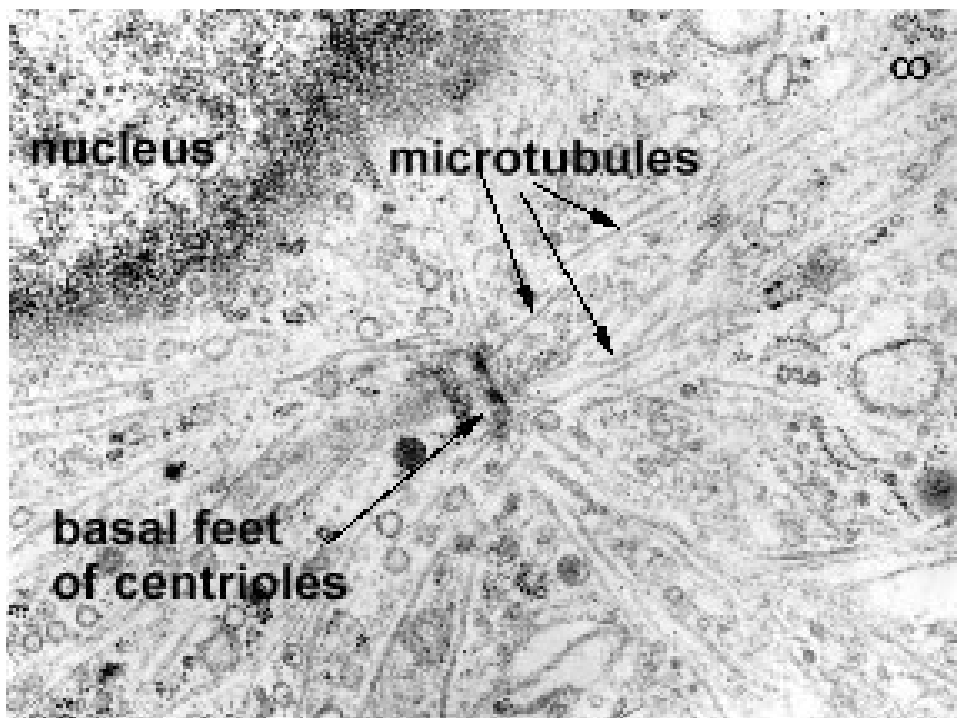
Cytoskelet – imunocytochemický preparát



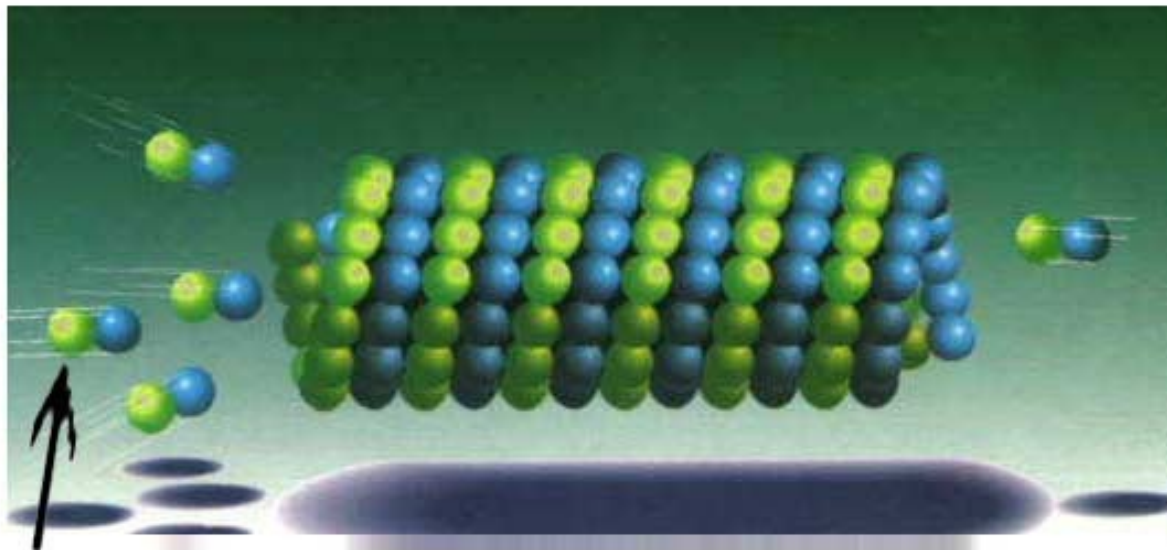
F-aktin



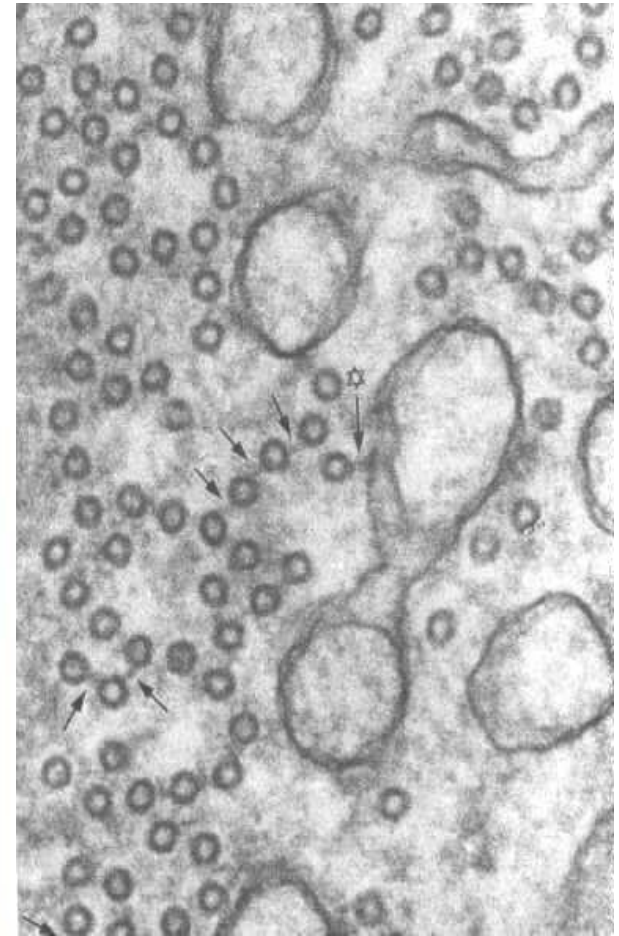
α -tubulin / **F-aktin** / **DNA**



Model ultrastruktury mikrotubulů

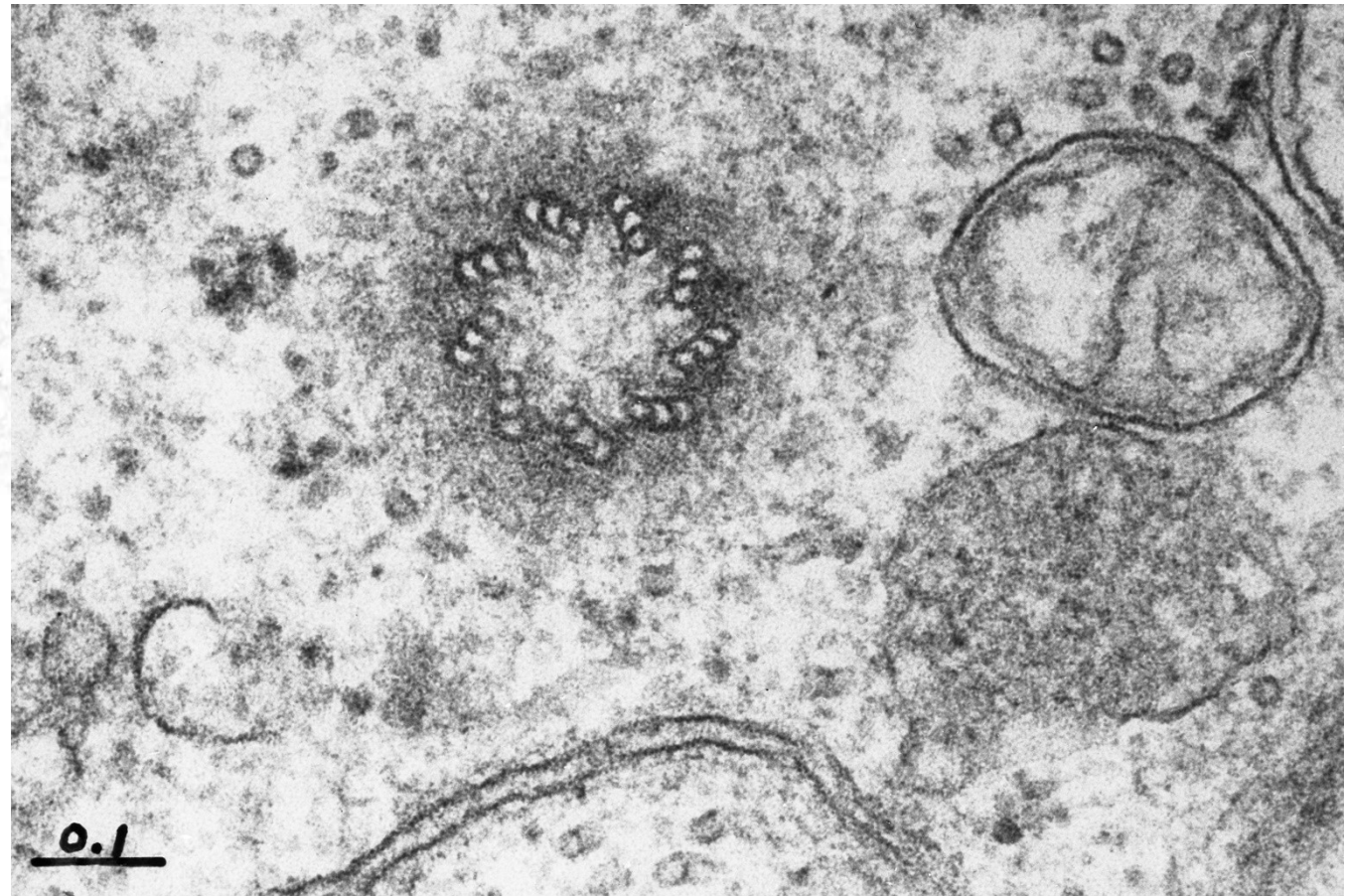
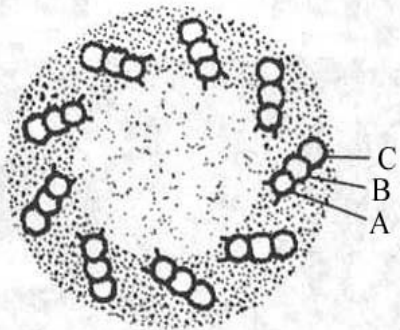
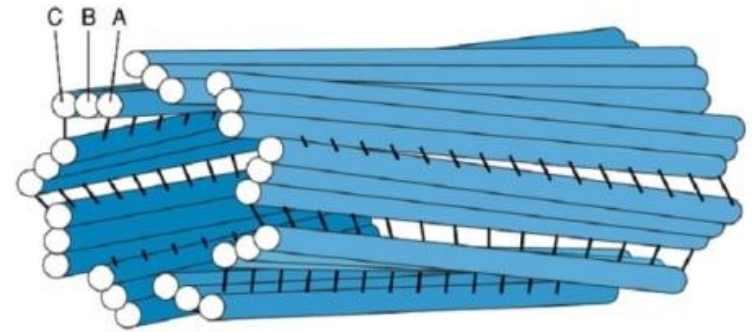


Mikrotubuly

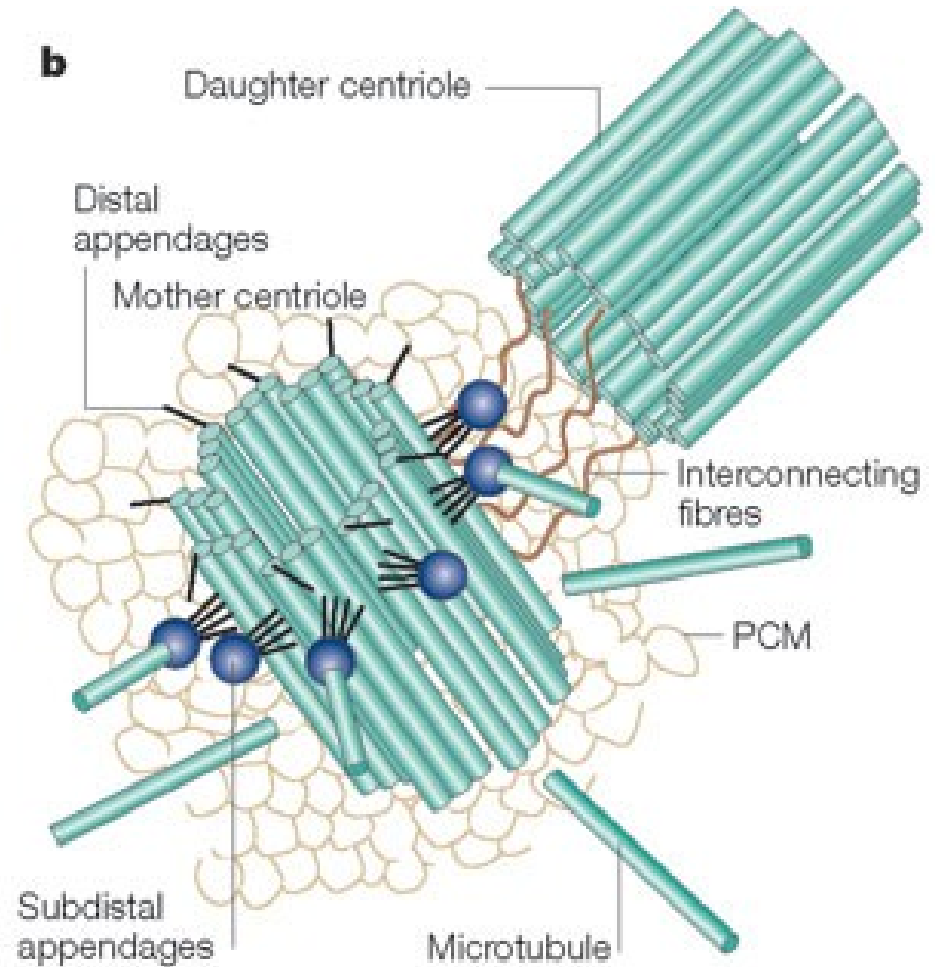


Centrioly

- Organizátory pro stavbu dělicího vřeténka
- Replikací vznikají bazální tělíska řasinek

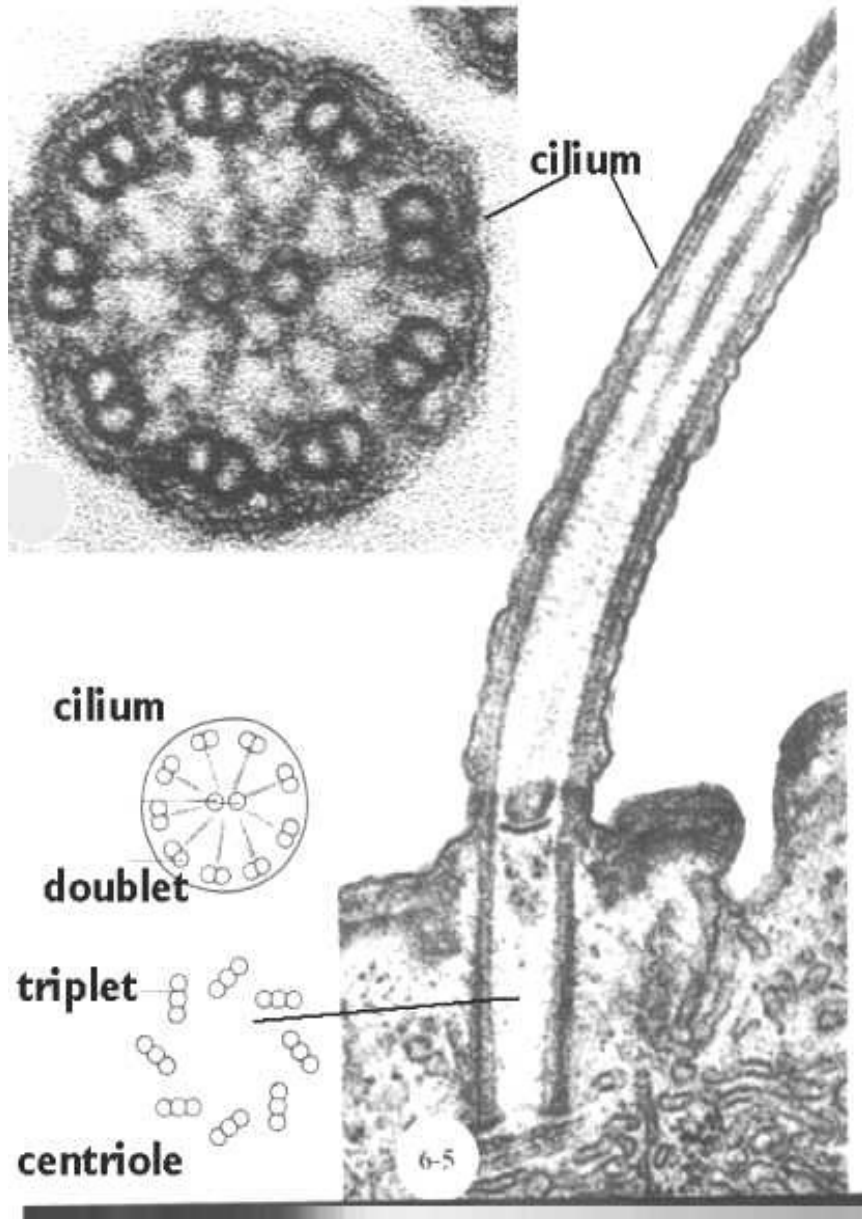


Stavba centrozomu



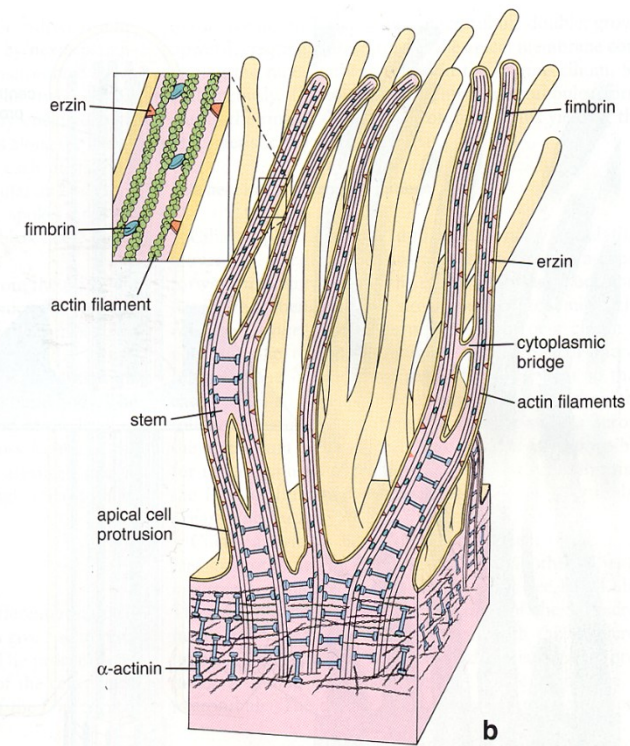
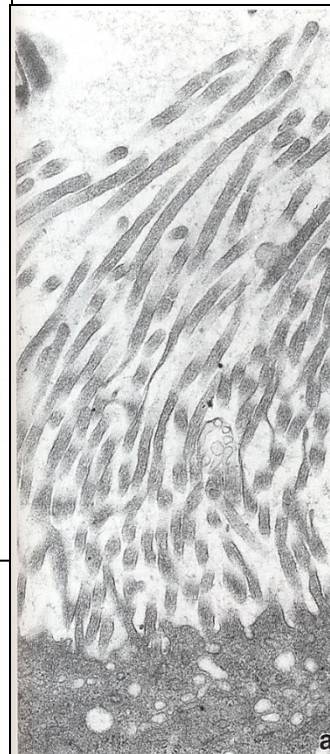
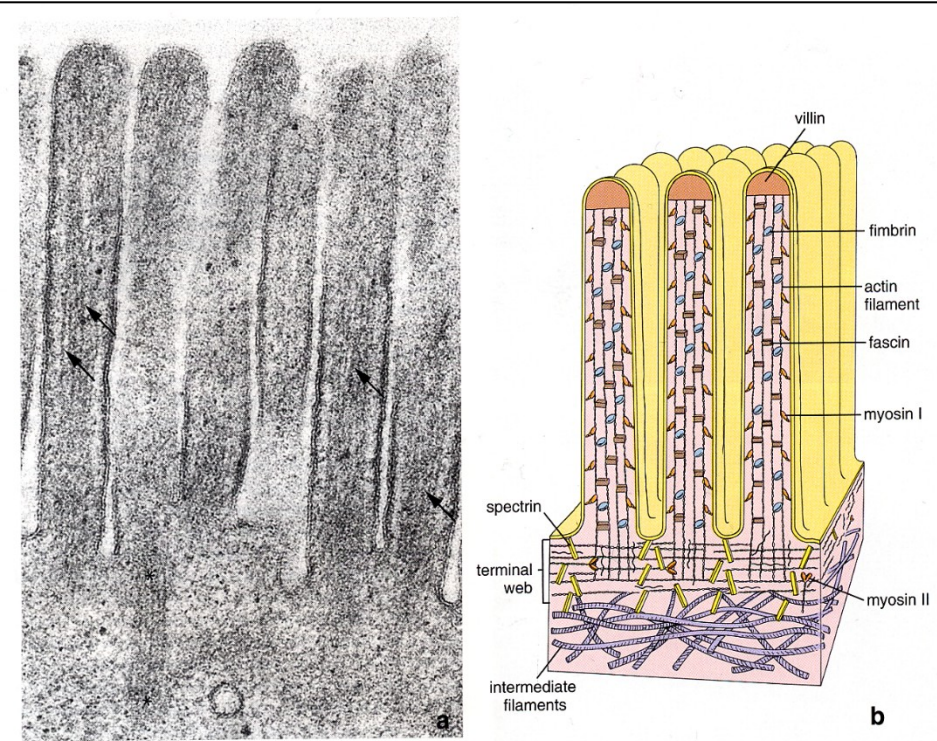
Úprava buněčných povrchů

řasinky, bičíky



Mikroklky, stereocilie

(výběžky vyztužené aktinovými filamenty)

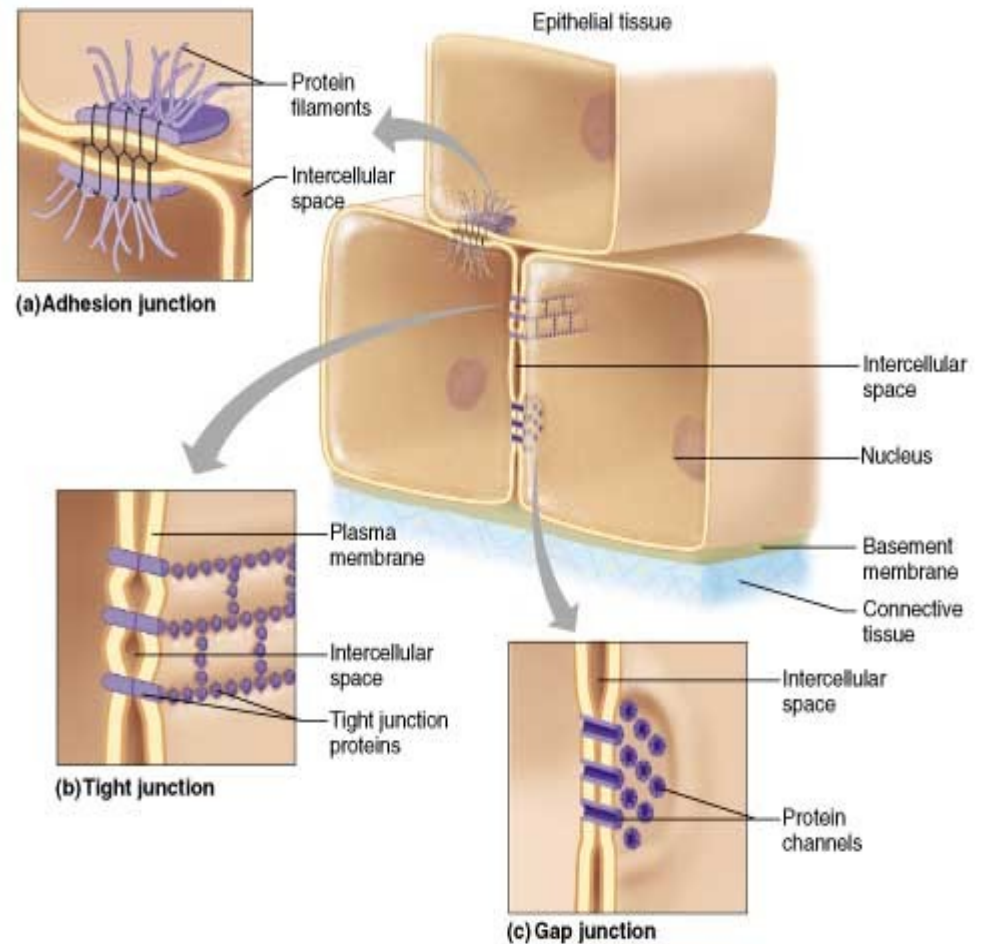


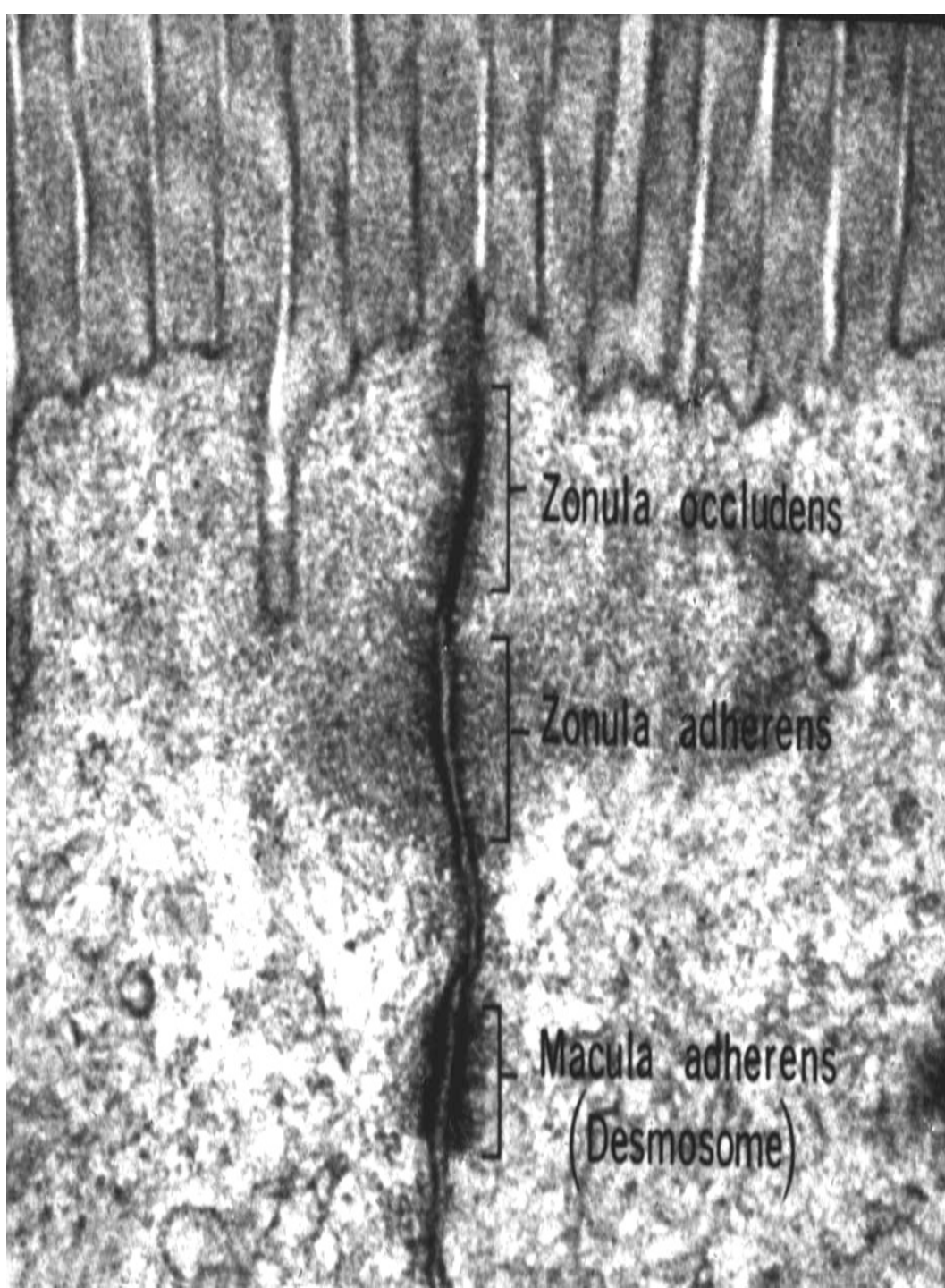
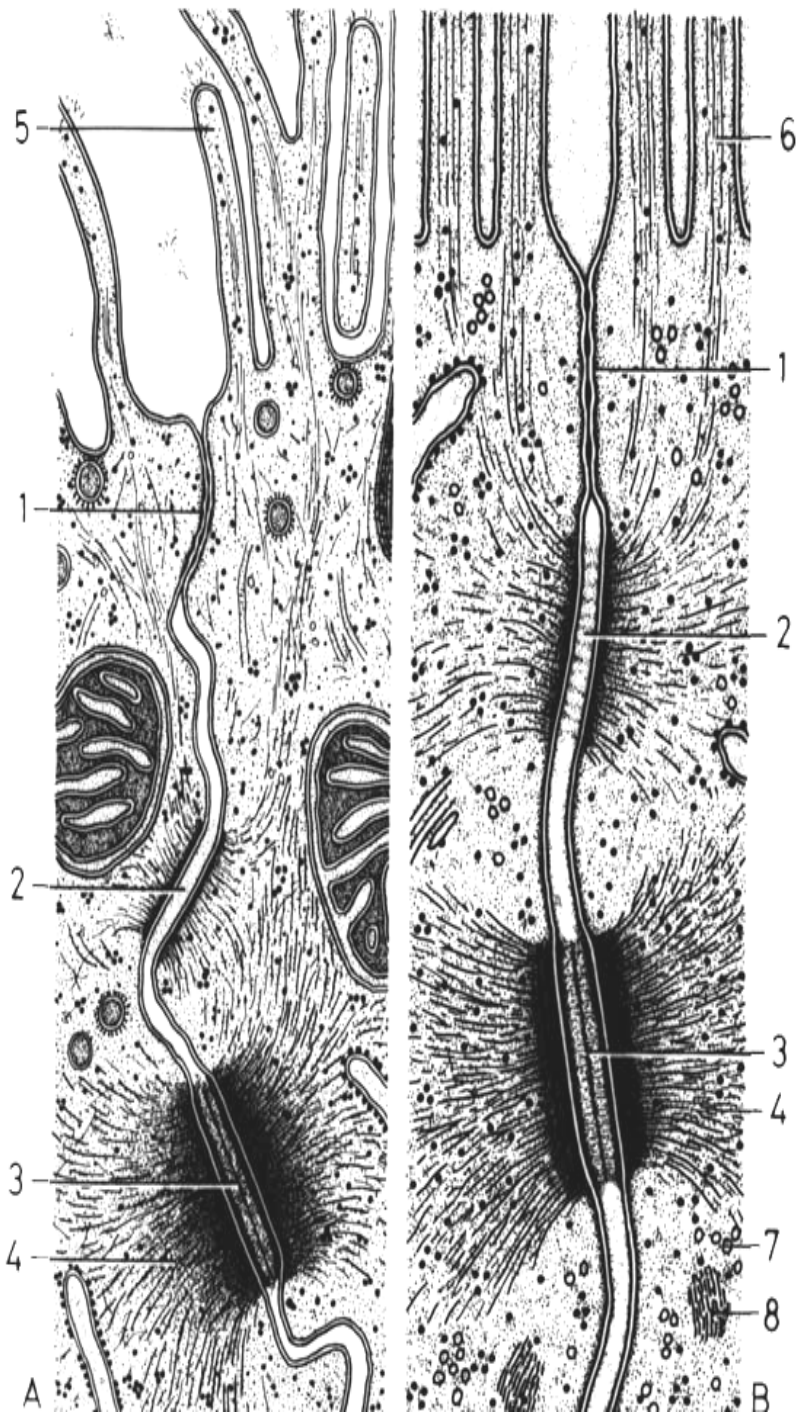
Intercelulární spoje

-Těsná (okluzní)
zonula occludens

- Adhezní:
zonula adherens (15-20 nm),
dezmosom (25-45 nm)

- Komunikační:
nexus (2 nm)

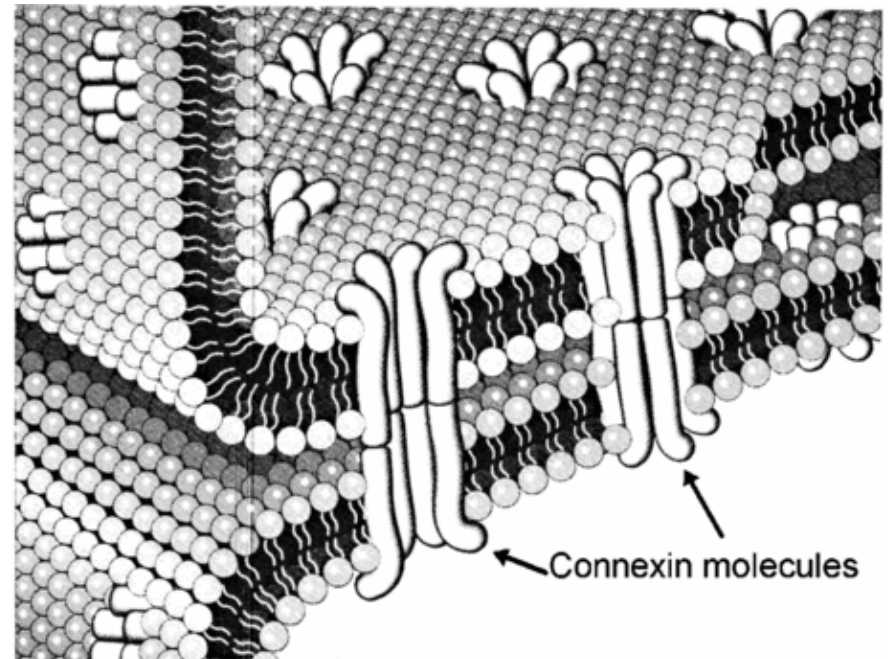
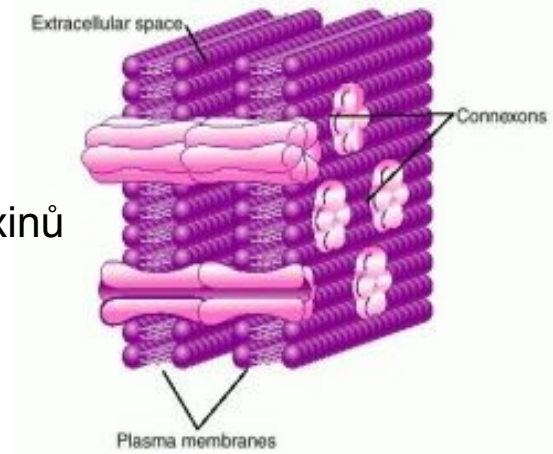




Nexus

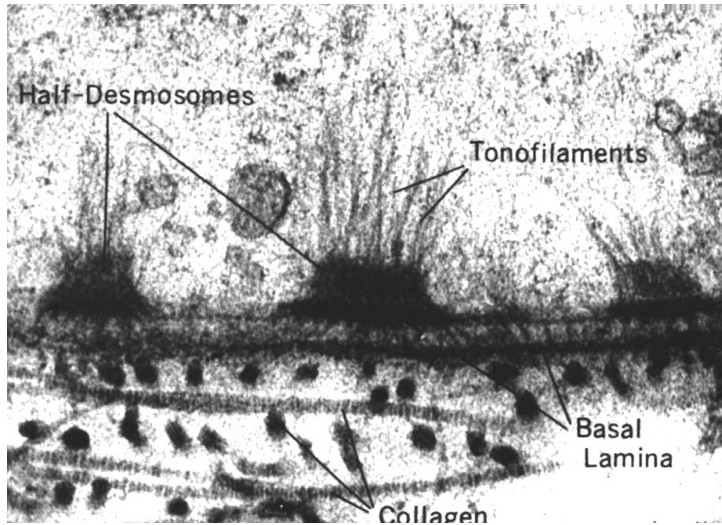


konexon = 6 konexinů

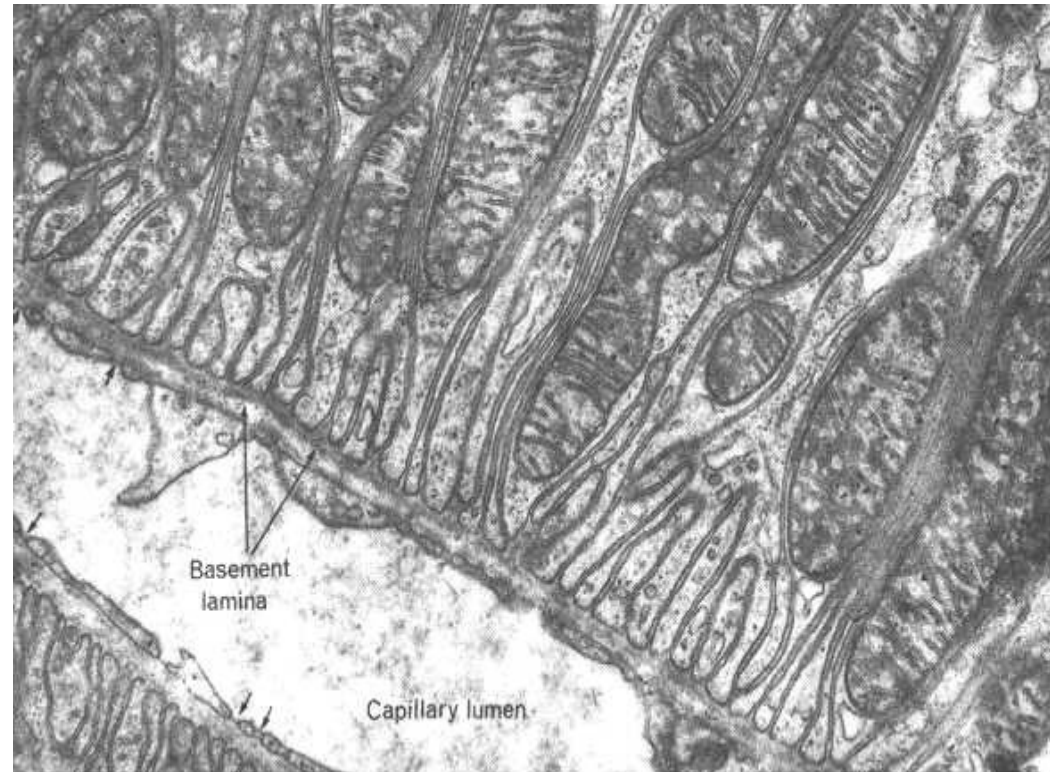


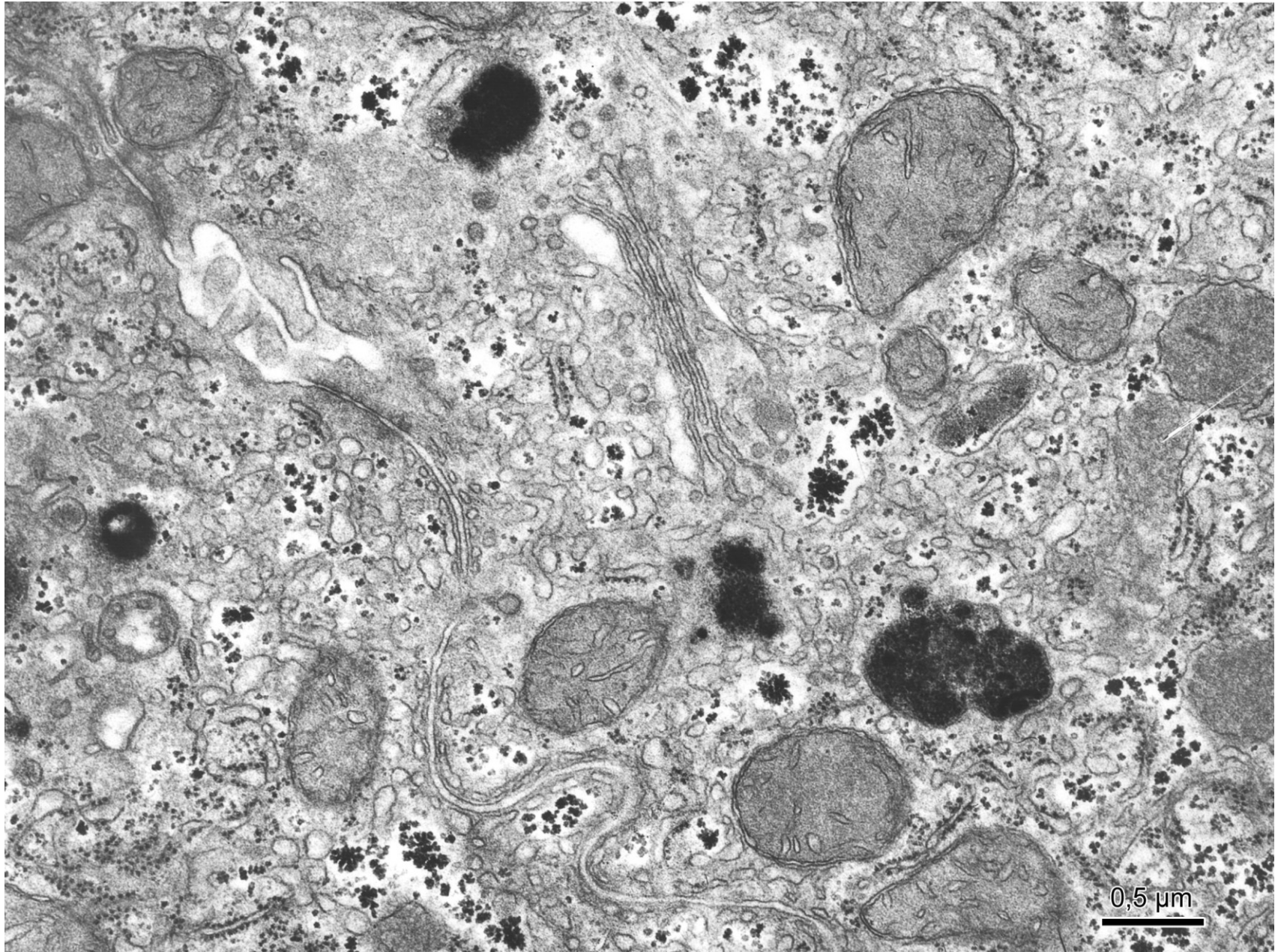
Bazální povrch buněk

hemidesmosomy

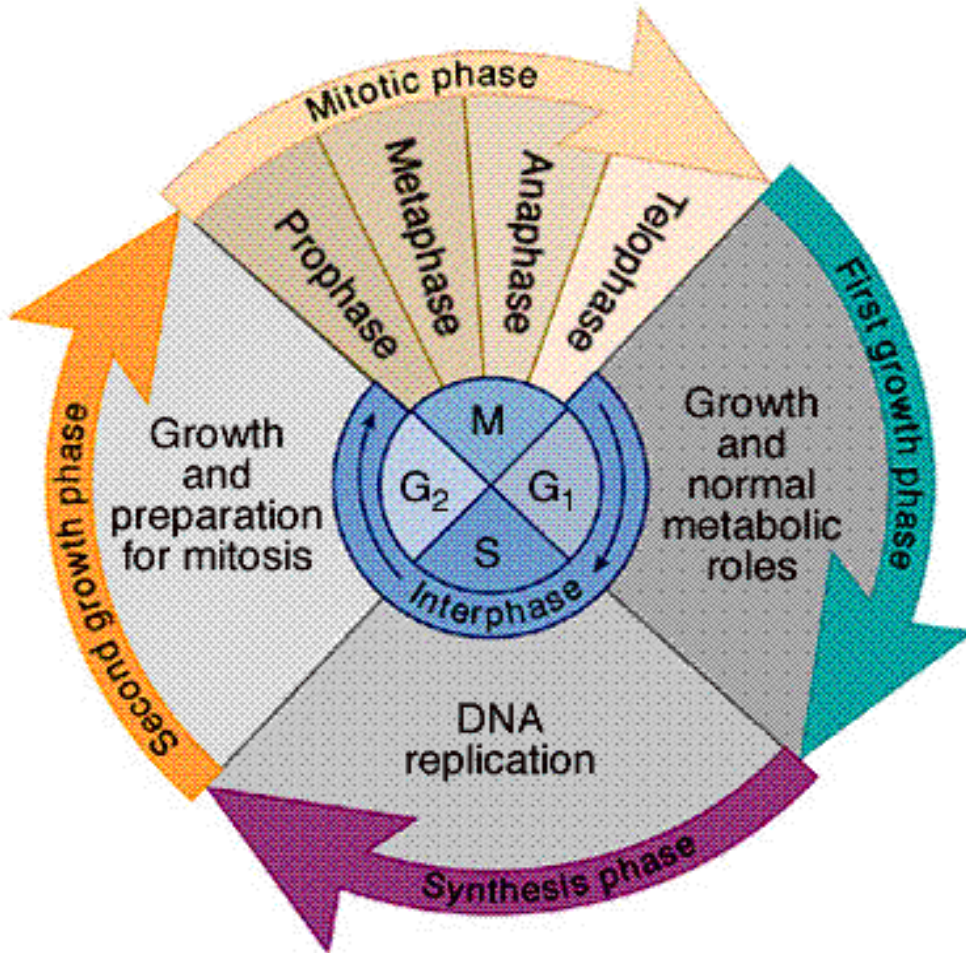


bazální labyrint



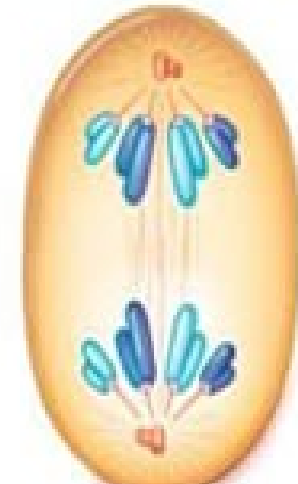
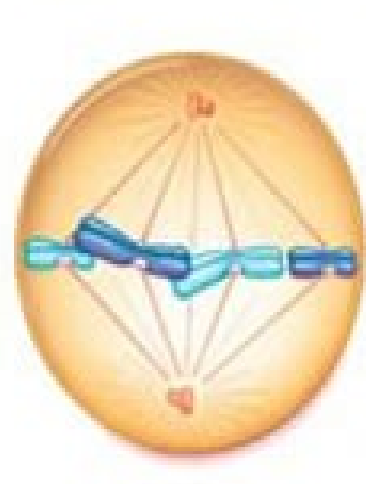
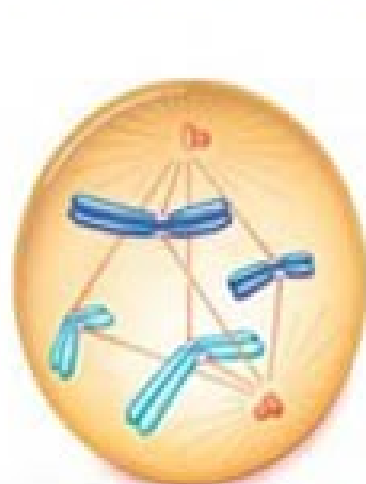
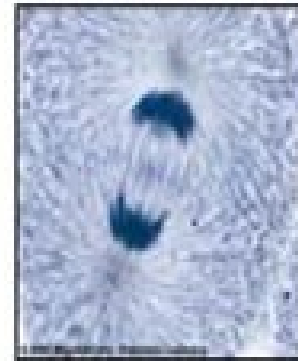
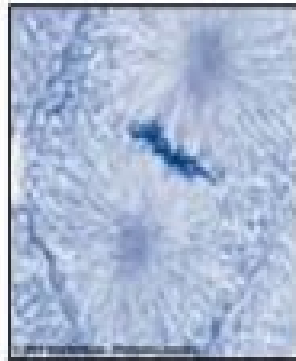
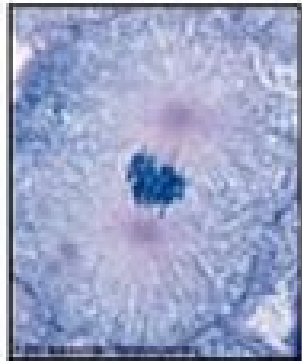
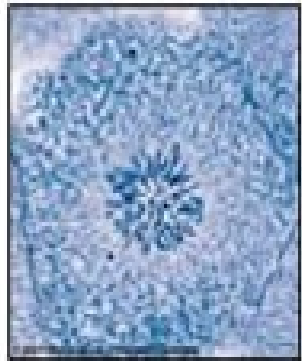


Buněčný cyklus



- **G₁** – fáze (délka závisí na typu buňky)
- **S** – fáze (asi 8 hod.)
- **G₂** – fáze
- **M** – fáze (mitóza) ($G_2 + M$ – fáze = 2,5 – 3 hod.)
- **G₀** – fáze = zastavený cyklus (buňky terminálně diferencované, nedělící se)

Mitóza



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Prophase:
Chromosomes Condense

Prometaphase:
Chromosomes Attach

Metaphase:
Chromosomes align

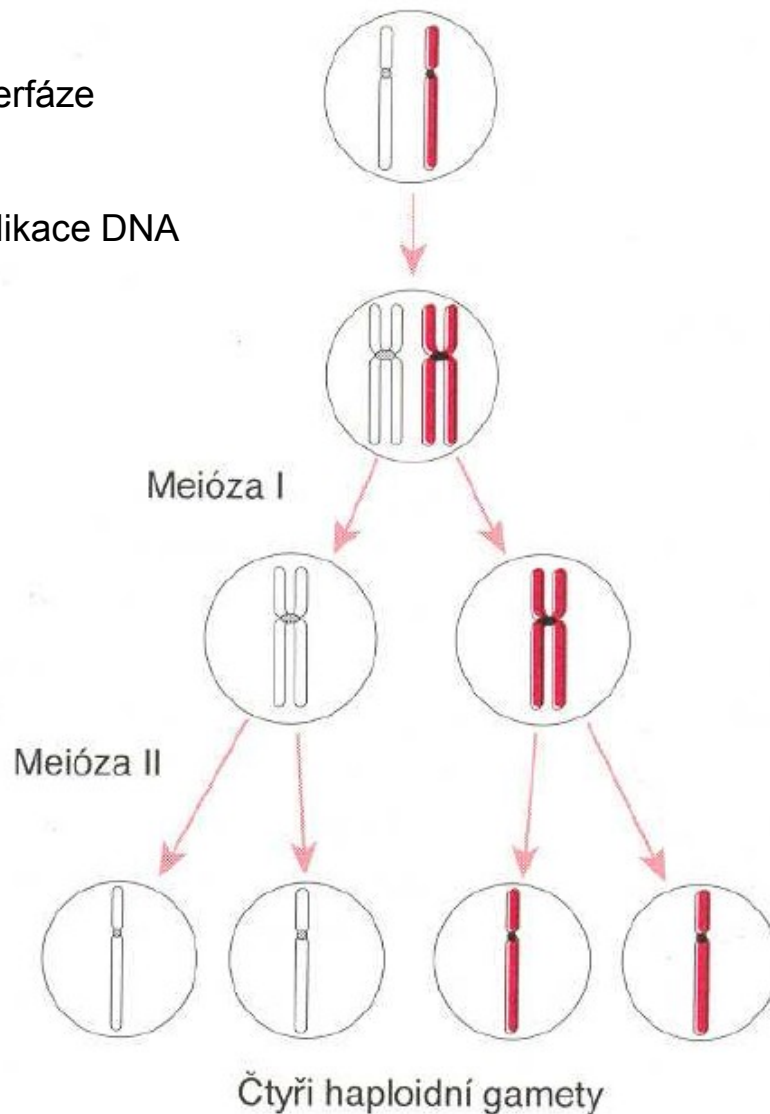
Anaphase:
Chromosomes separate

Telophase:
Chromosomes relax

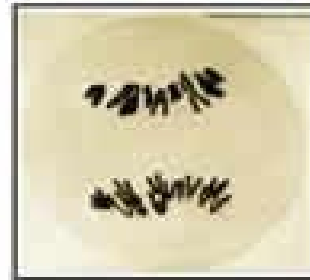
Meióza

Interfáze

- replikace DNA



Zjednodušené znázornění základních stadií meiózy sestávajících z jednoho cyklu replikace DNA, následovaného dvěma cykly segregace chromozomů, prvním a druhým meiotickým dělením.



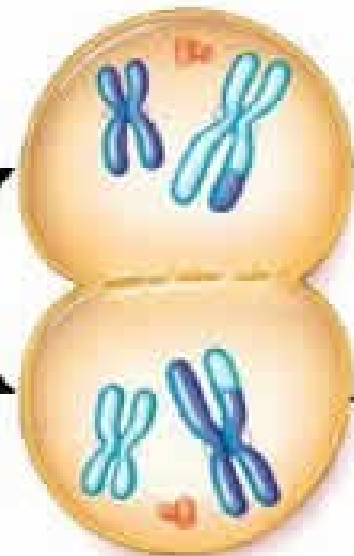
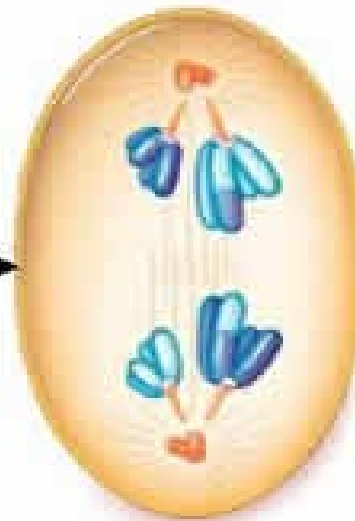
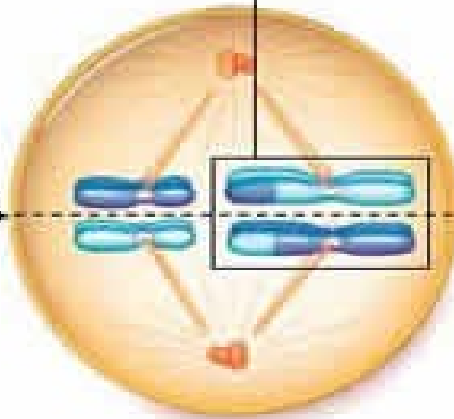
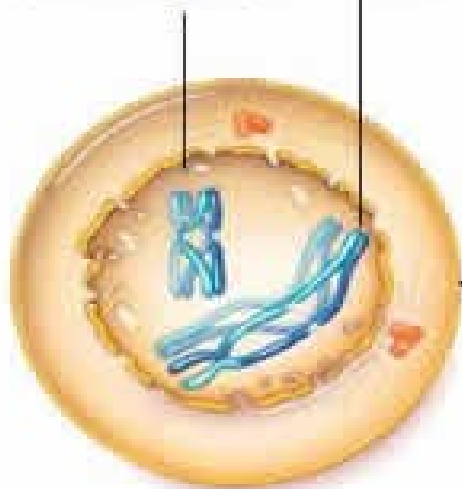
One pair of homologous chromosomes (homologues)

Homologues Condense and cross over

Homologues Align

Homologues Separate

Meiosis I result: homologues separated into 2 cells



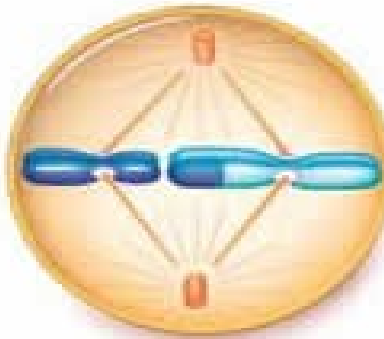
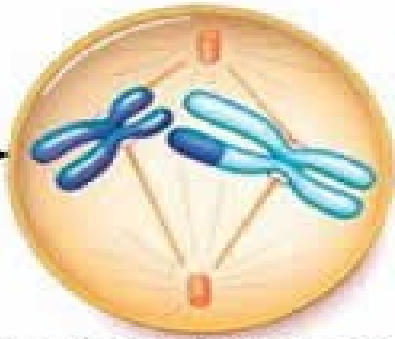
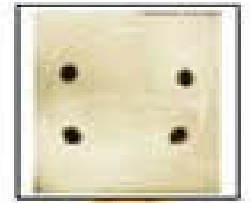
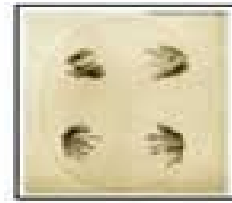
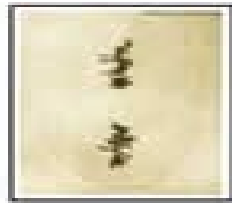
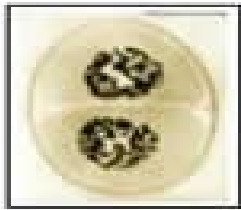
PROPHASE I

METAPHASE I

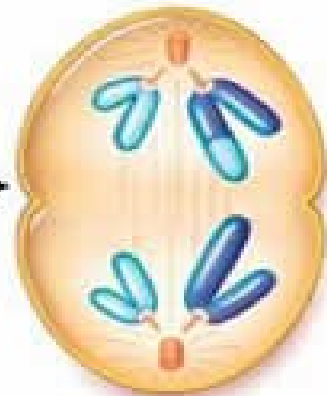
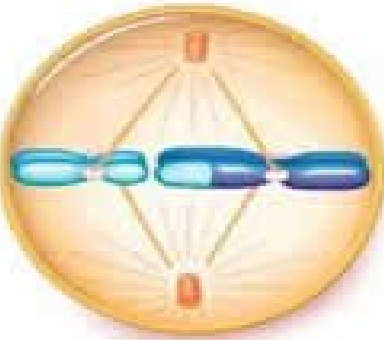
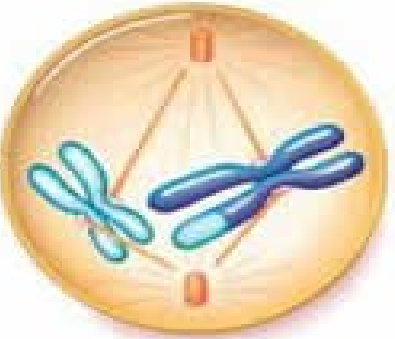
ANAPHASE I

TELOPHASE I

MEIOSIS I: Separate the Homologues



there is no DNA replication between the two divisions



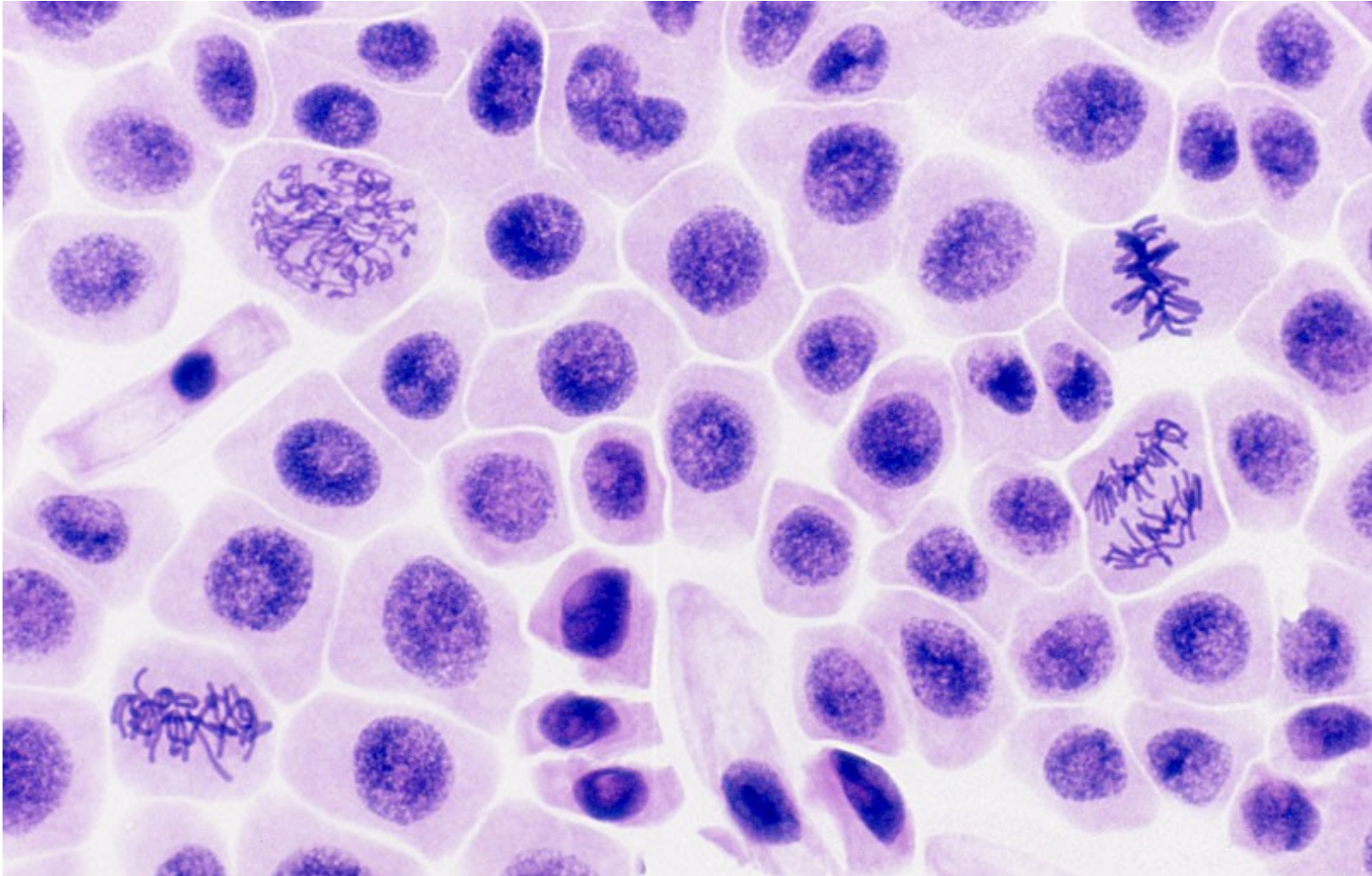
PROPHASE II

METAPHASE II

ANAPHASE II

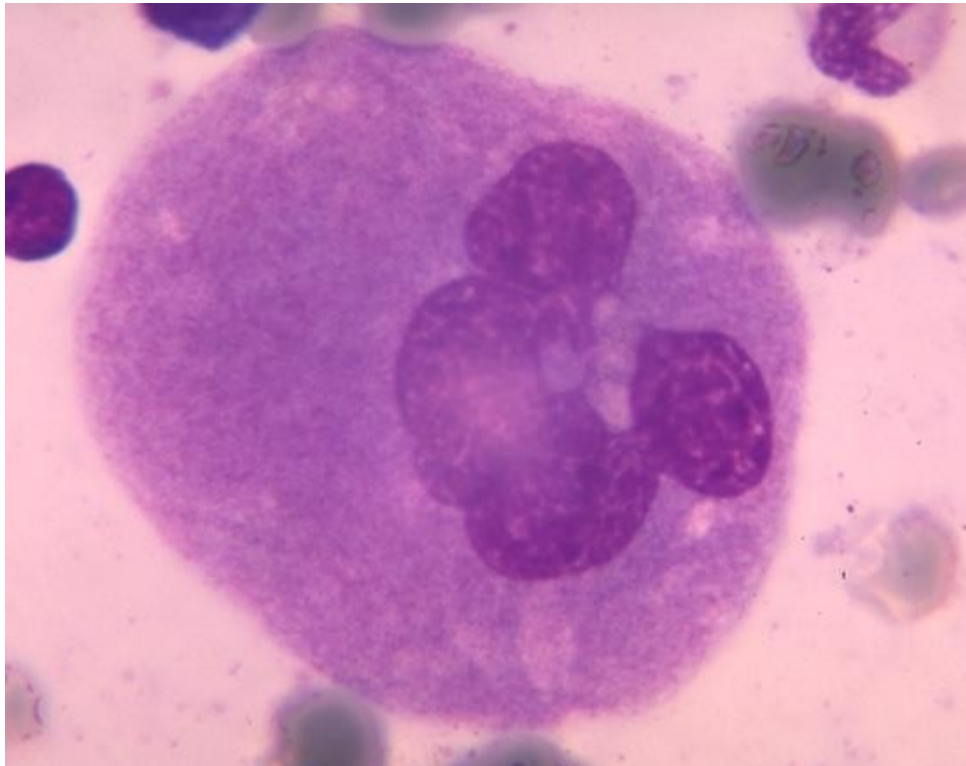
TELOPHASE II

MEIOSIS II: Separate the Sister Chromatids (by mitosis)



Endomitóza

- nedochází k rozestupu chromozomů, jádro se nedělí (polyploidní)
- např. megakaryocyt



<http://xenia.sote.hu/kortan/hematology/e/images/p1-66.jpg>

Po dnešní přednášce byste měli umět odpovědět na otázky:

Čím se zabývá histologie?

Co je to buňka?

Jaká je velikost většiny lidských buněk, různých vnitrobuněčných struktur?

K čemu je dobrá kompartmentalizace buňky?

Jaká je struktura biomembrány?

Jaká je stavba a funkce jádra?

Jaká je stavba a funkce jednotlivých organel?

Co jsou to inkluze a jaký mají význam?

Jaké součásti cytoskeletu znáte a jaká je jejich stavba a funkce?

Jaké typy mezibuněčných spojů znáte a jaká je jejich funkce?

Jakým způsobem může být modifikovaná buněčná membrána?

Co je to buněčný cyklus a jaké jsou jeho fáze?

Jaké buňky se nachází v tzv. G₀ fázi buněčného cyklu?

Jaké jsou typy dělení lidských buněk?

Jaký je rozdíl mezi mitózou a meiózou?