

Kůže a kožní orgány

Integumentum commune

Kůže = cutis (ř. derma)

nejtěžší orgán v těle

- 16 % hmotnosti, 1,2-2,3 m²

- pokožka (*epidermis*)
- škára (*corium, dermis*)
- podkoží (*tela subcutanea; subcutis; hypodermis*)
 - nepatří ke kůži jako orgánu

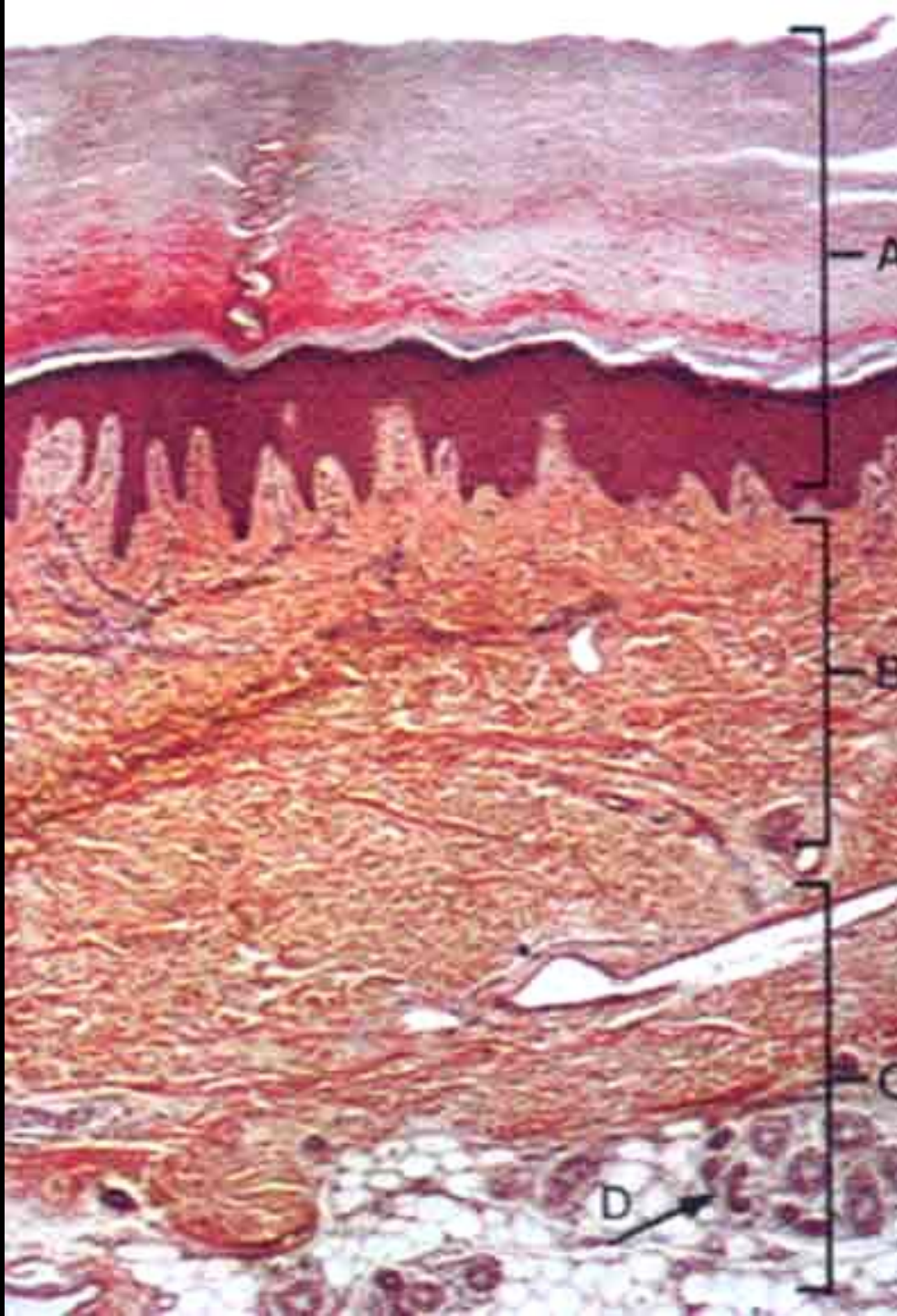
kožní deriváty – vlasy, nehty, kožní žlázy

Kůže

epidermis

dermis (corium)

hypodermis
(tela subcutanea)

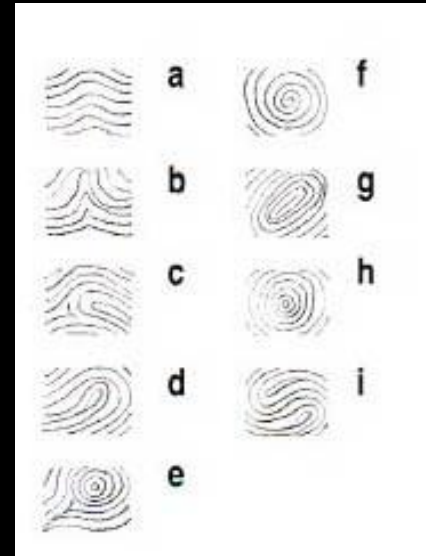


Kůže – funkce

- ochrana (bariéra mezi vnitřním a vnějším prostředím)
- termoregulace
 - potní žlázy
 - změny průtoku krve
- vypařování vody – perspiratio insensibilis
- vylučování (exkrece)
- vstřebávání léčiv
- imunita
- metabolismus (7-dehydrocholesterol → vitamín D₃)
- emoce a psychika

Kůže – reliéf

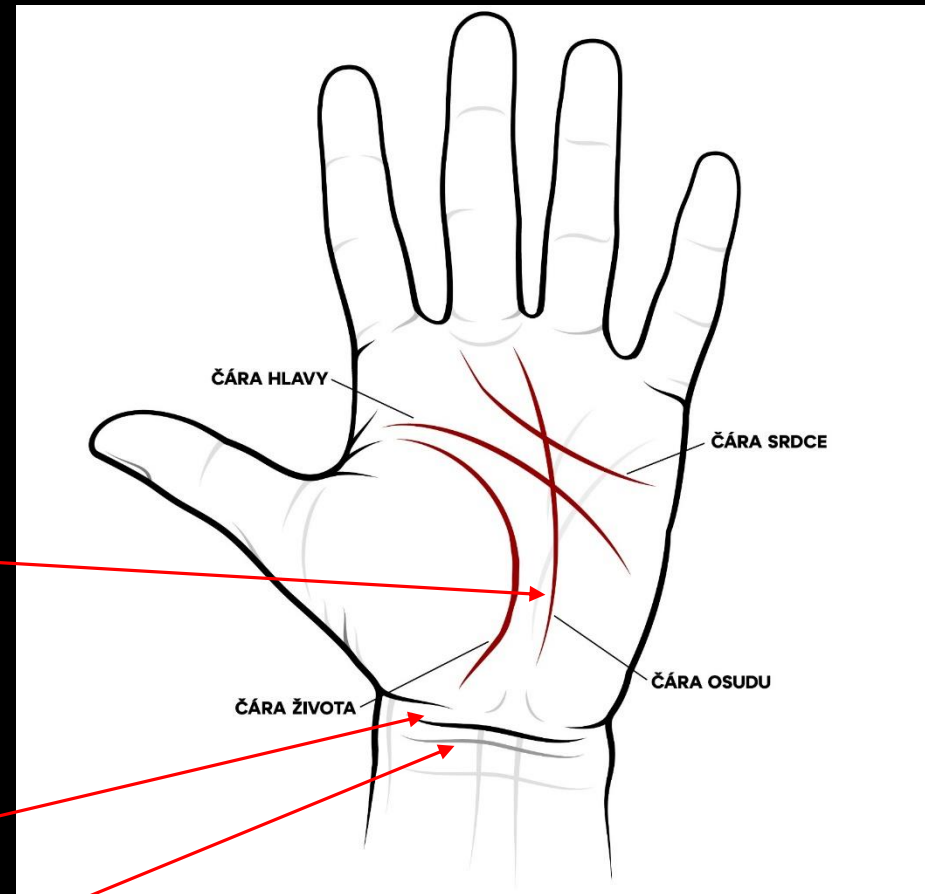
- **kožní rýhy** (*sulci cutis*) – mezi nimi rhombická kožní políčka



- **hmatové lišty** (*cristae cutis*)
 - 9 typů podle *Purkyněho*
 - → daktyloskopie
- **hmatové polštářky** (*toruli tactiles*) – 10 na ruce (např. thenar)
- **ohybové rýhy** (*lineae distractiones*)
 - rýhy u kloubů, vrásky, sulcus mentolabialis, nasolabialis, suprapalpebralis, infrapalpebralis, rýhy na ruce, sulcus gluteus, crena analis
- **kožní poutka** (*retinacula cutis*)
 - retinaculum caudale – v místě os cocygis

Ohybové rýhy (lineae distractiones) na ruce (chiromantie)

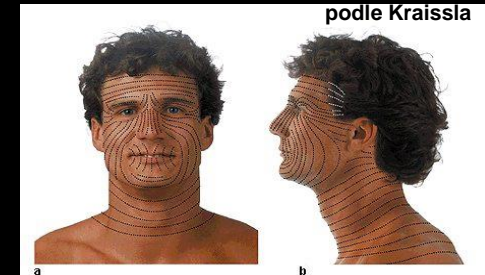
- linea oppositionis pollicis (*vitalis*)
- linea manus clausae (*cephalica, naturalis*)
- linea occlusionis dig. trium ulnarium (*mensalis*)
- linea axialis manus
- sulcus cutaneus intercarpalis (*linea rasceta*) – nejdálnejší zápěstní
- *linea restricta* – prostřední zápěstní



Čáry štěpitelnosti

= Langerovy kožní linie; cleavage lines; tension lines

- běží ve směru vláken ve škáře (*stratum reticulare*)
- kolmé na směr největšího tahu
- odpovídají vráskám na povrchu kůže
- důležité v plastické chirurgii i při vedení kožních řezů

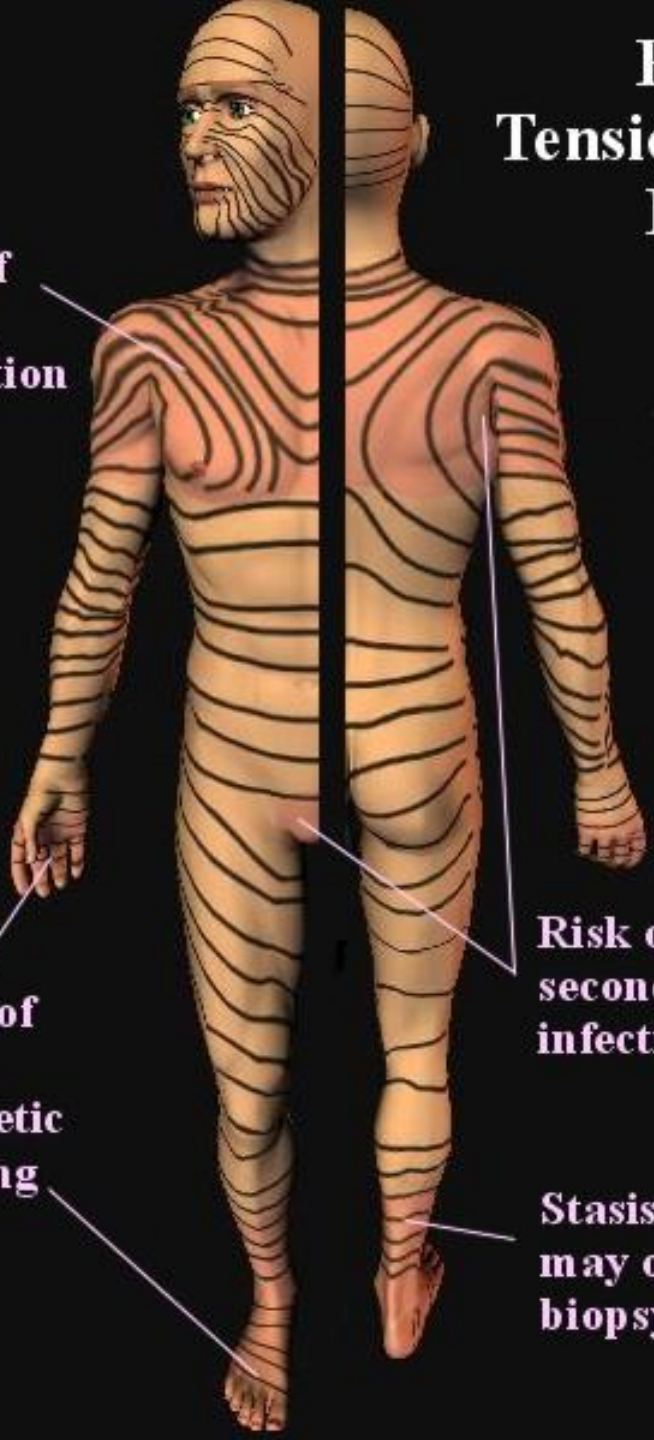


- Kraisslovy čáry ("lines of greatest tension")
 - definovány na živých - kolmé na průběh svalů
- Borgesovy čáry
 - podle rýh vytvořených ochablou kůží

Kraisslovy + Borgesovy čáry → lepší výsledek

Relaxed Skin Tension Lines and Biopsy Notes

Risk of
keloid
formation



Tension Lines
in the female
breast

Risk of
poor
cosmetic
healing

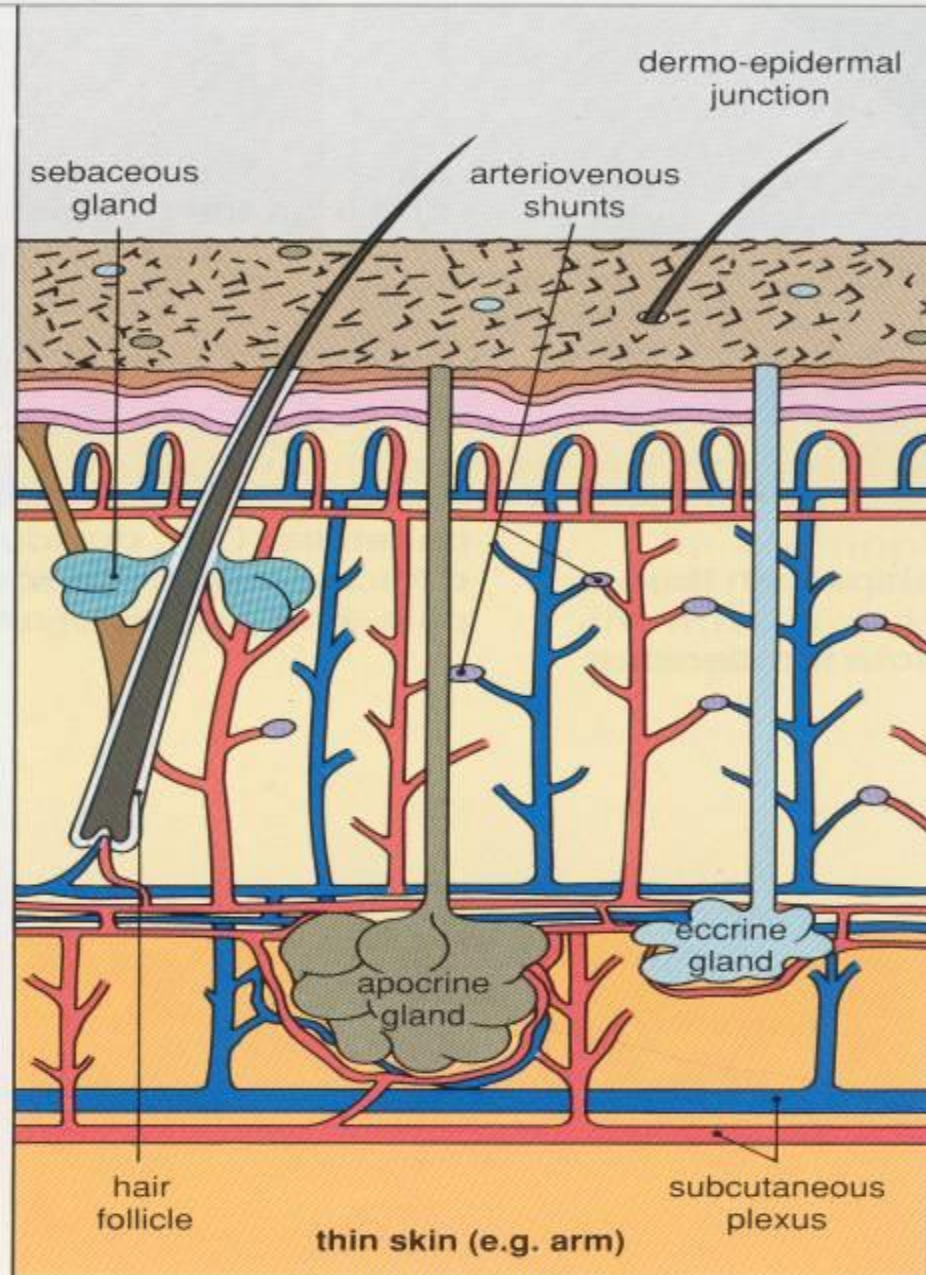
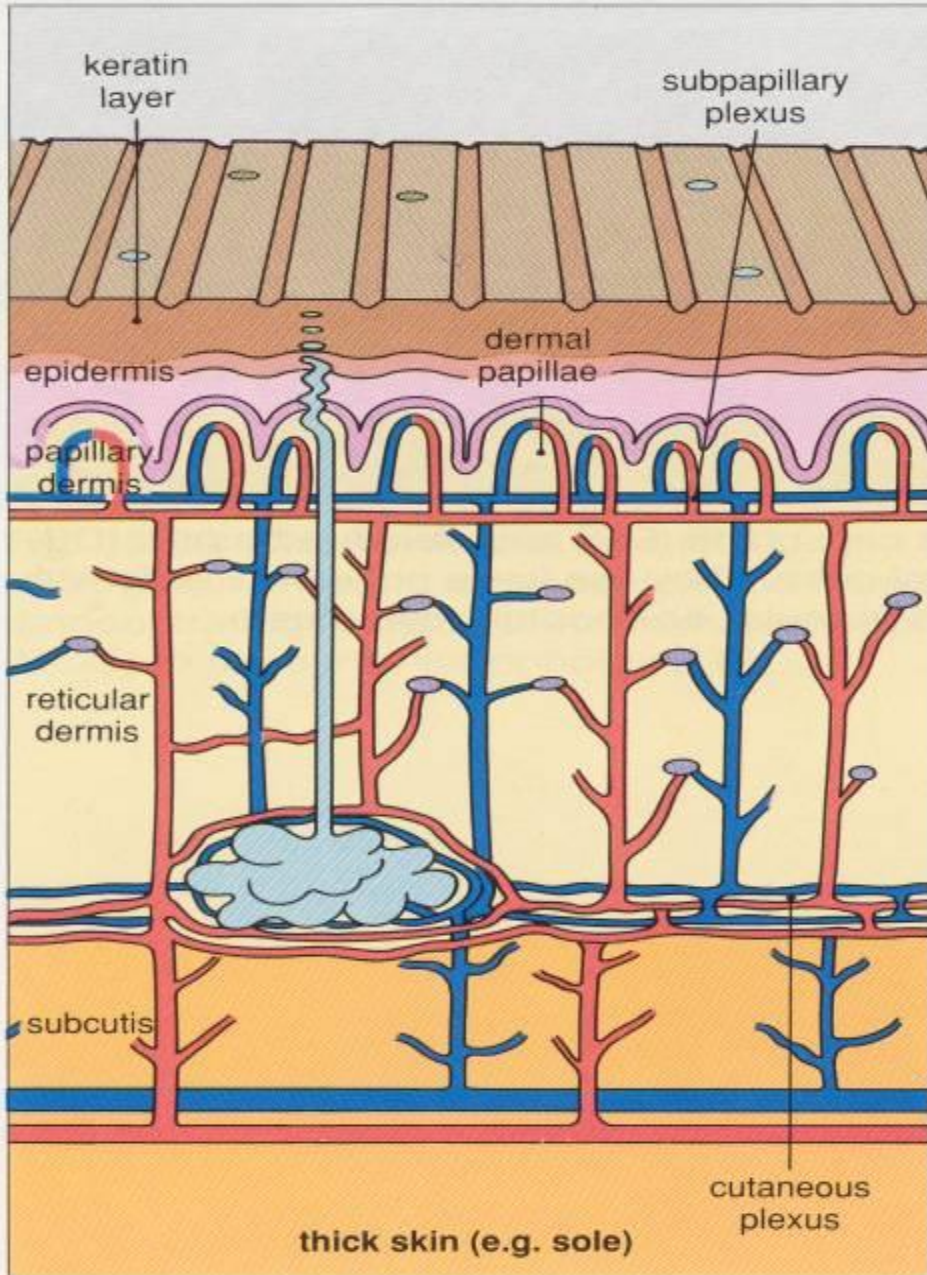
Risk of
secondary
infection

Stasis changes
may obscure
biopsy

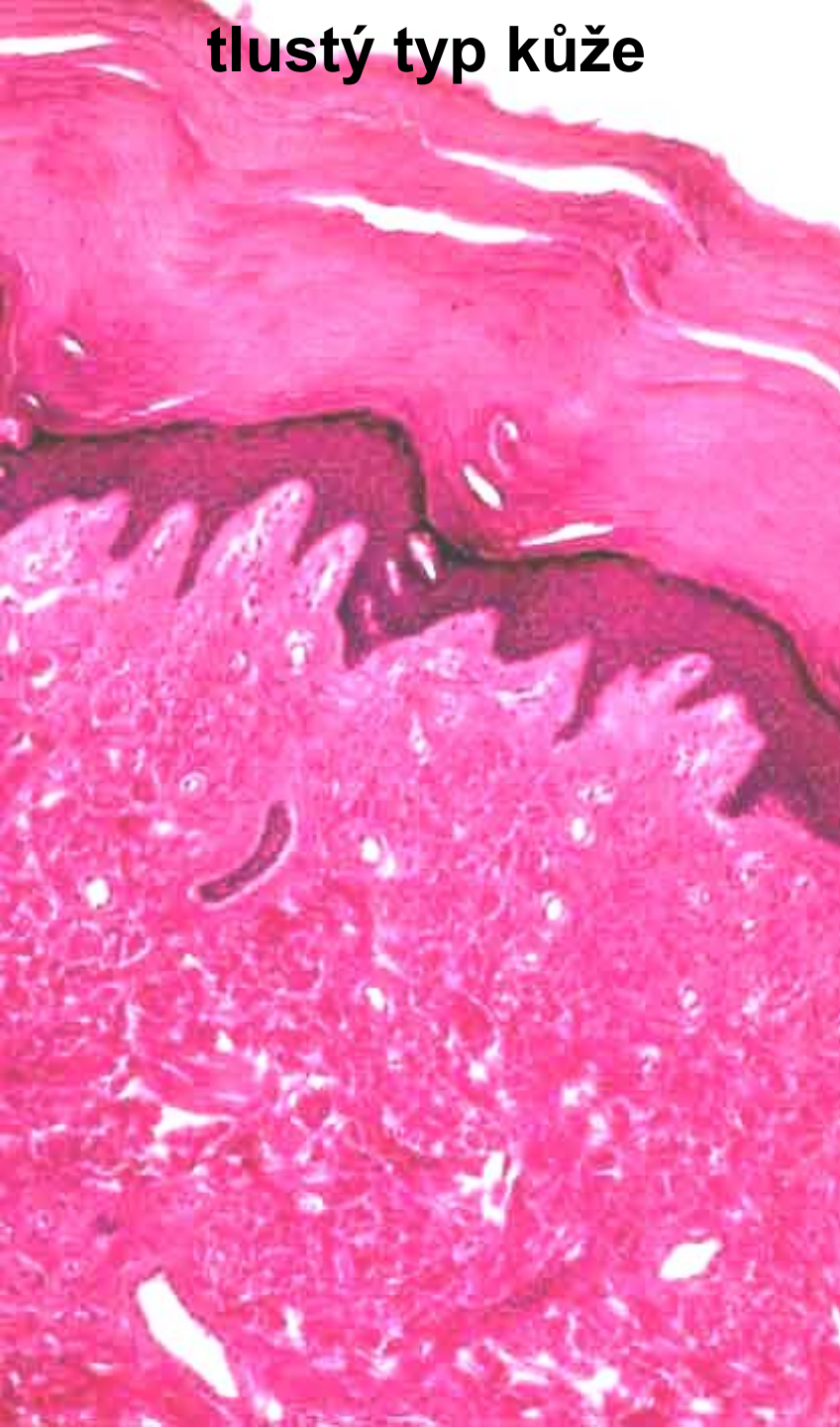
Typy kůže

- tlustý typ
 - dlaně a chodidla
 - 400-800 μm silná epidermis
- tenký typ (*ochlupená kůže*)
 - 75-150 μm silná epidermis
 - chybí stratum lucidum
- celková tloušťka závisí na topografii
 - záda – 4 mm
 - vlasatá část hlavy – 1,5 mm
 - obojí je tenký typ kůže

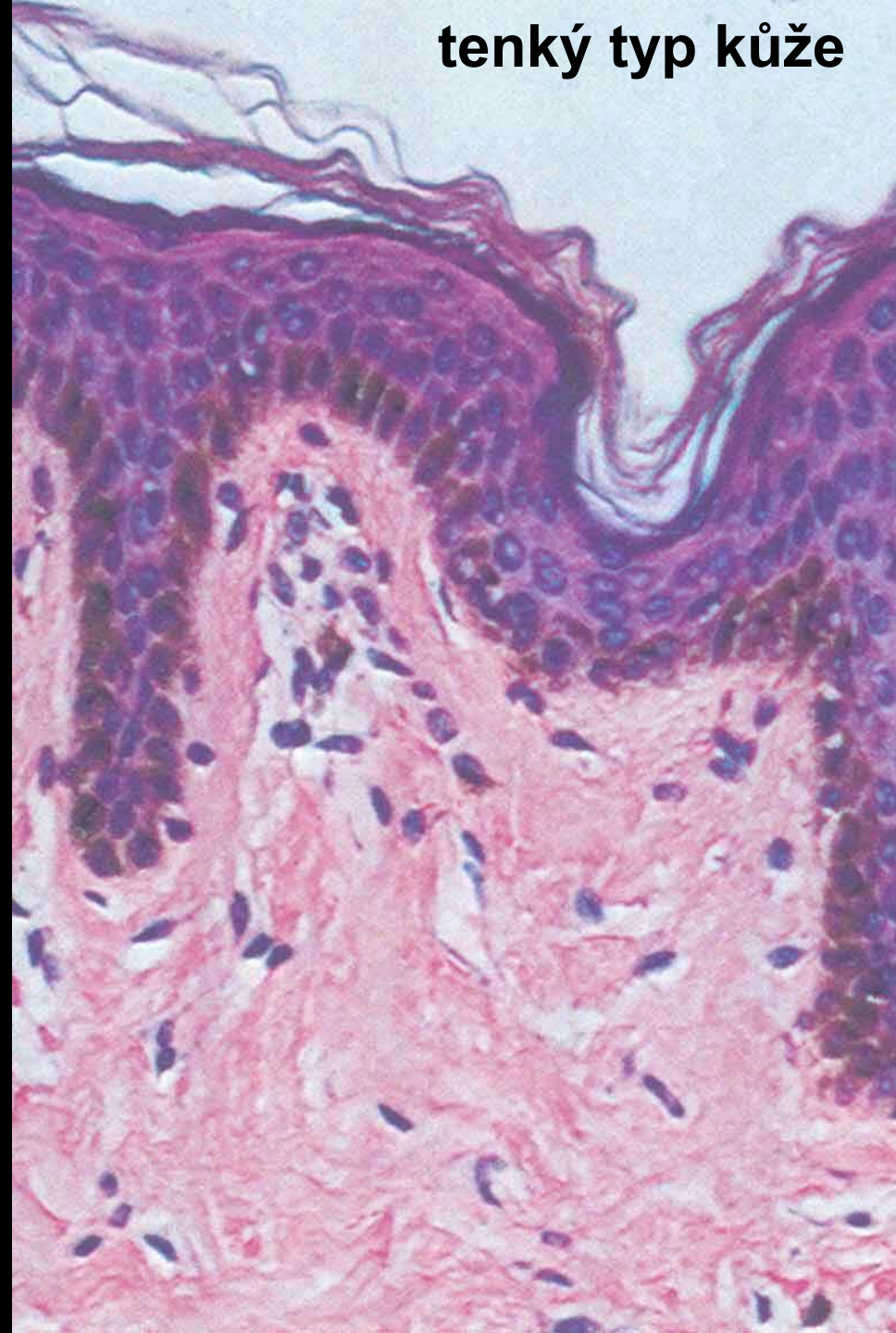
Typy kůže



tlustý typ kůže

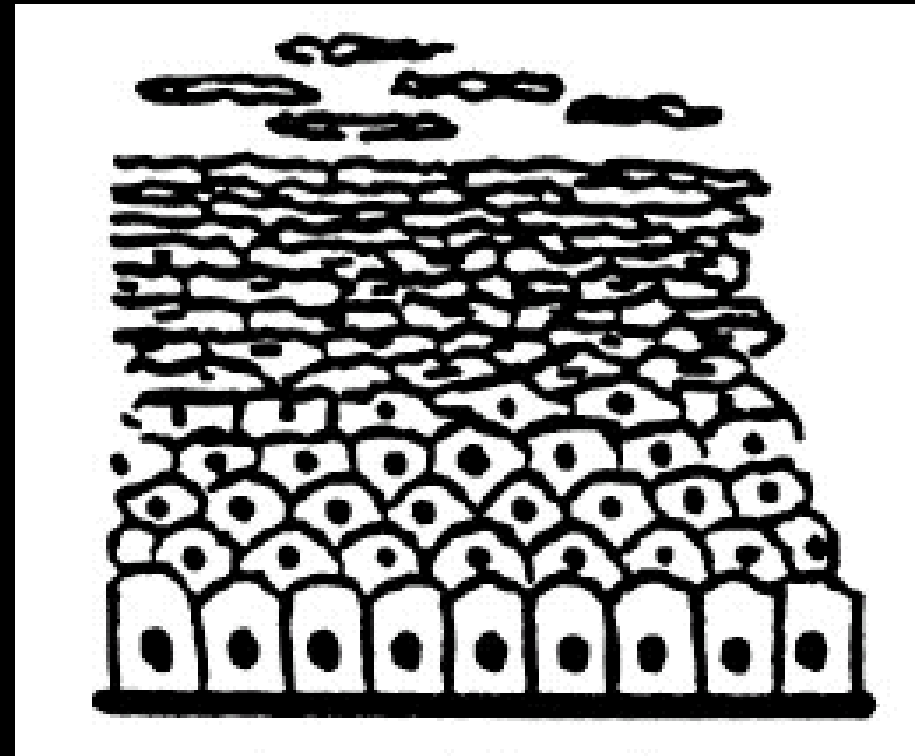


tenký typ kůže



Pokožka – *Epidermis*

- keratinocyty
- 5(6) vrstev
 - stratum basale
 - stratum spinosum
 - stratum granulosum
 - stratum lucidum
 - stratum corneum
 - (stratum disjunctum)
- melanocyty
- Langerhansovy buňky
- Merkelovy buňky



Epidermis

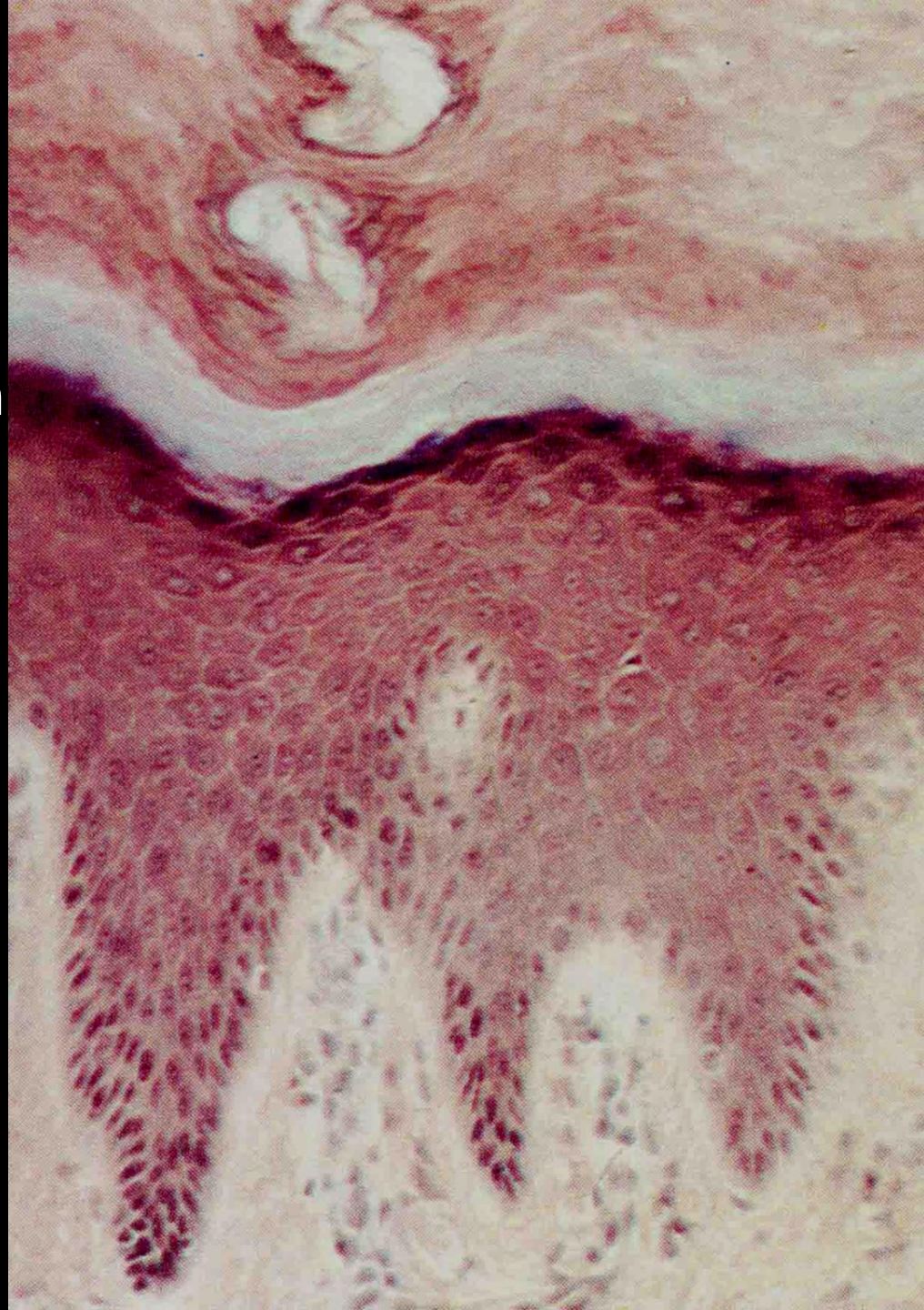
stratum corneum

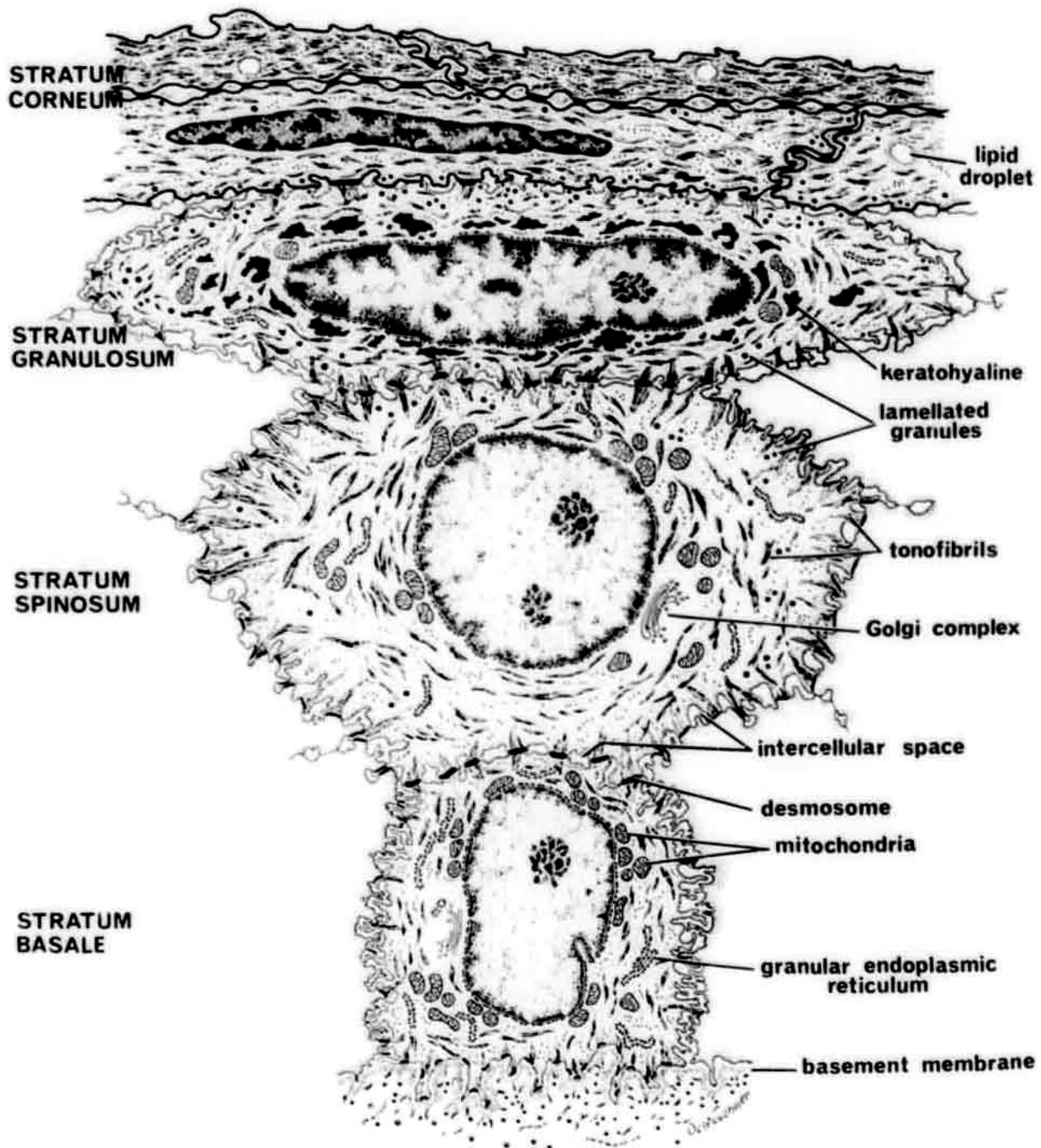
stratum lucidum

stratum granulosum

stratum spinosum

stratum basale





Stratum germinativum Malpighi

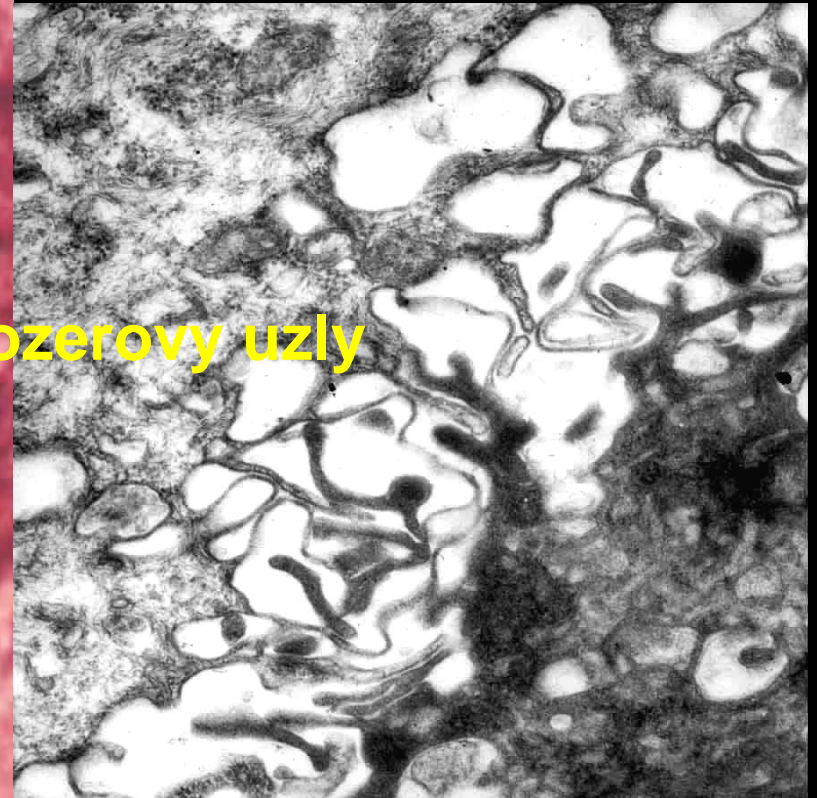
stratum spinosum

P

Bizzozzerovy uzly

stratum basale

B



celá epidermis se obnoví za 15-30 dní
lupenka (psoriasis) – zrychleno na 7 dní

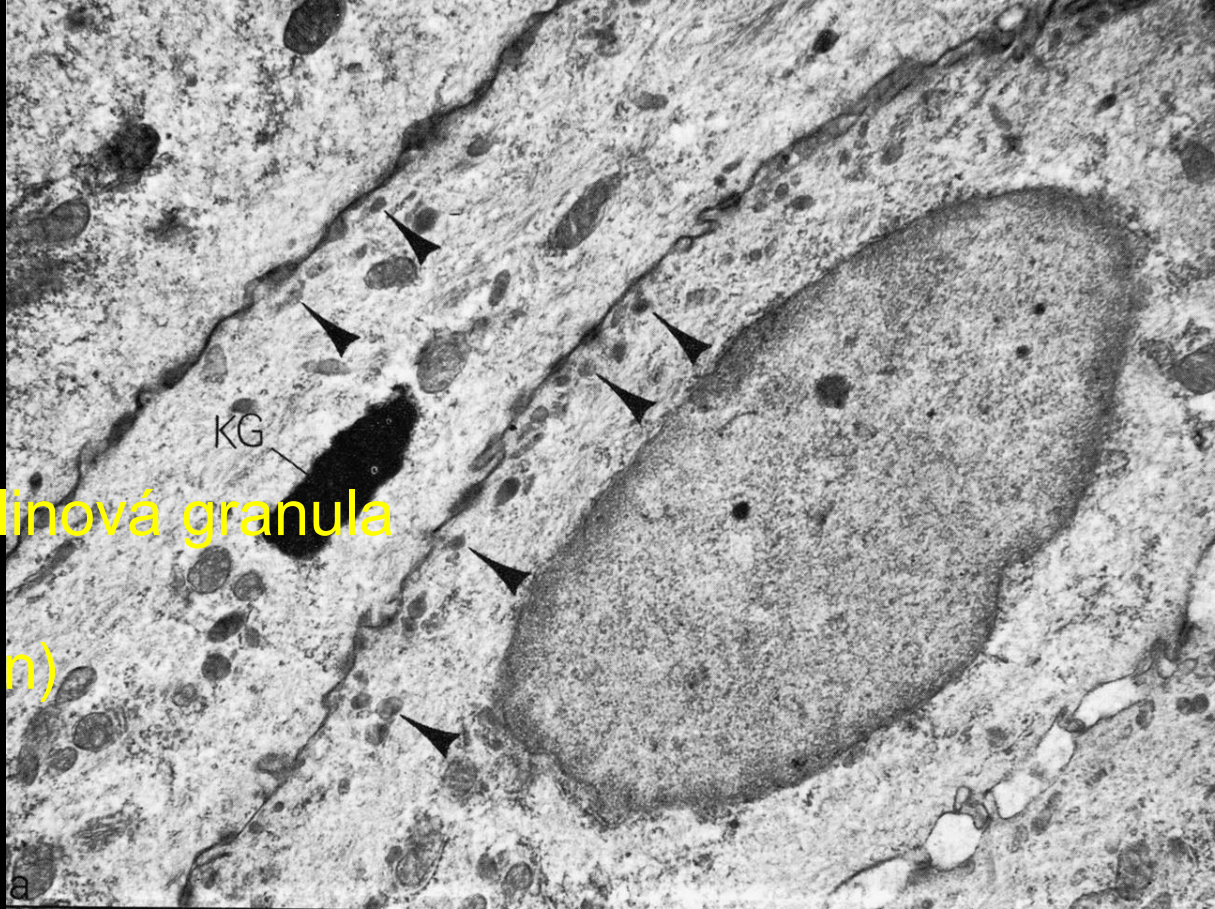
Lupenka (*Psoriasis*)



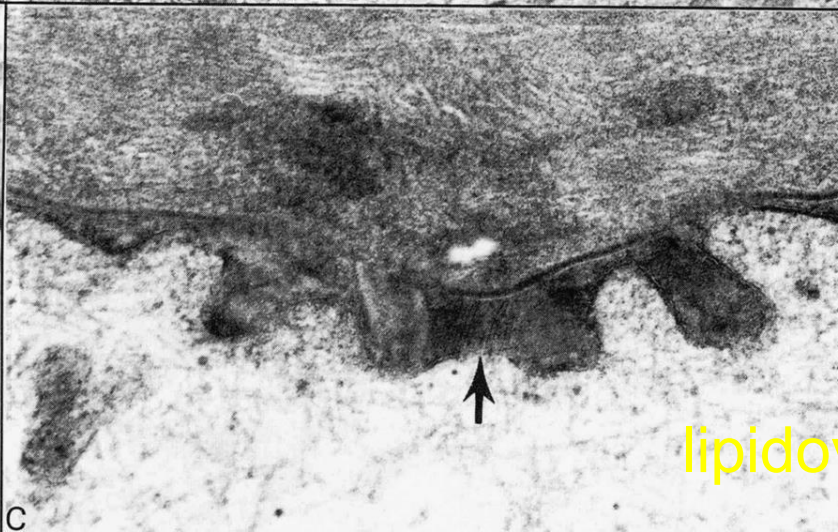
stratum granulosum



keratohyalinová granula
(filagrin,
trichohyalin)

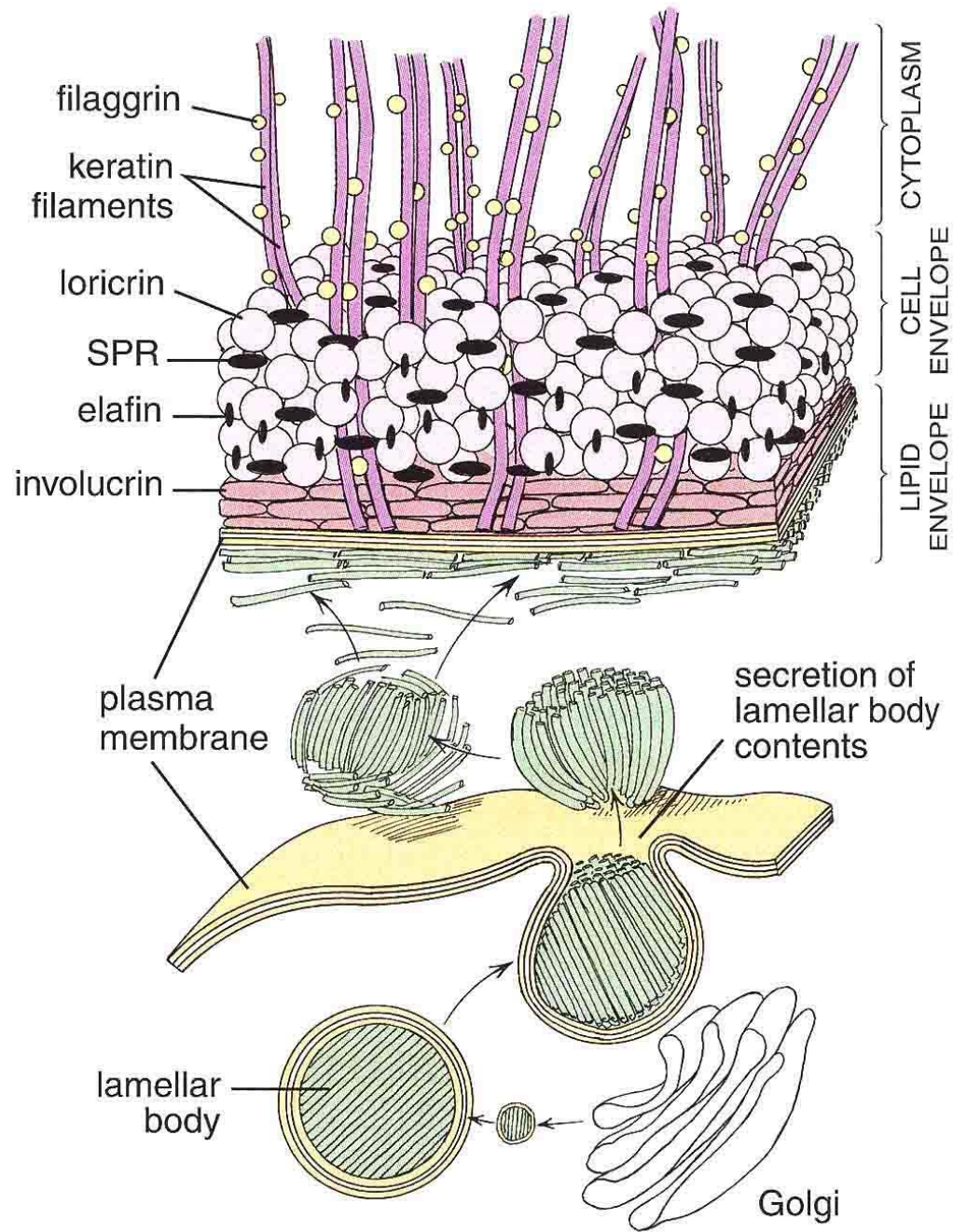


lamelární granula
(Odlandova tělíska)



lipidová obálka

lipidová obálka
(tmelová substance)



C

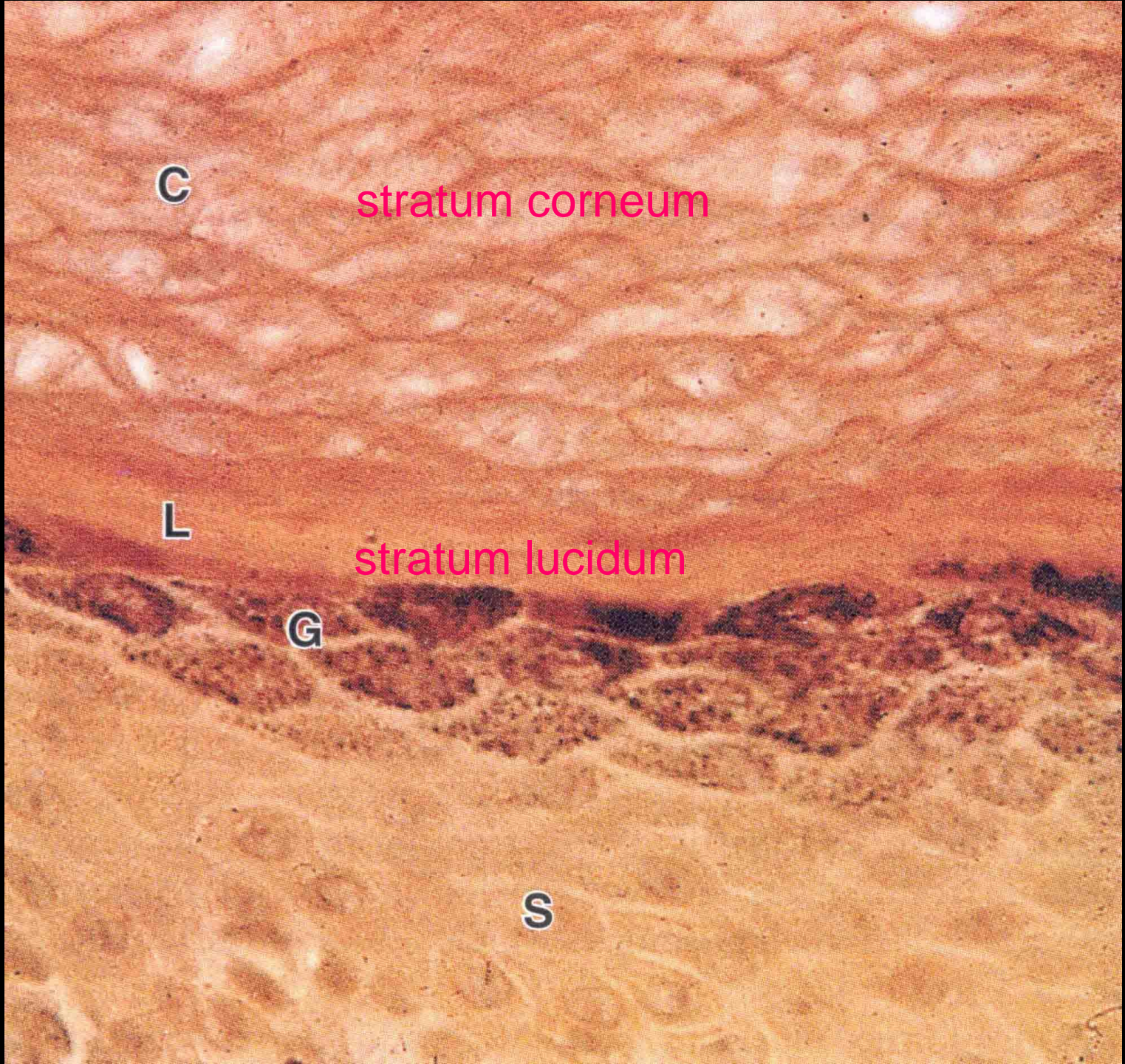
stratum corneum

L

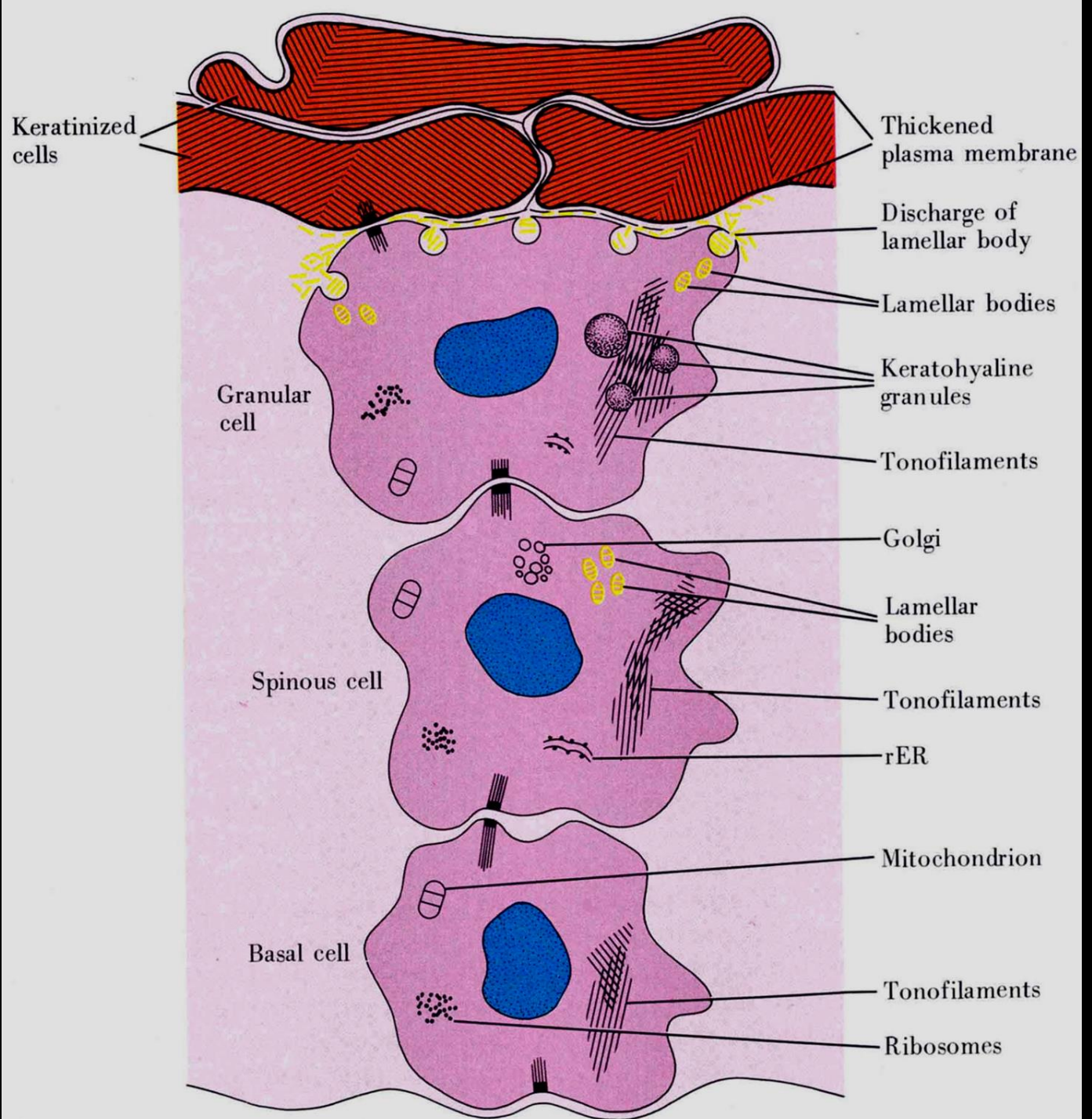
stratum lucidum

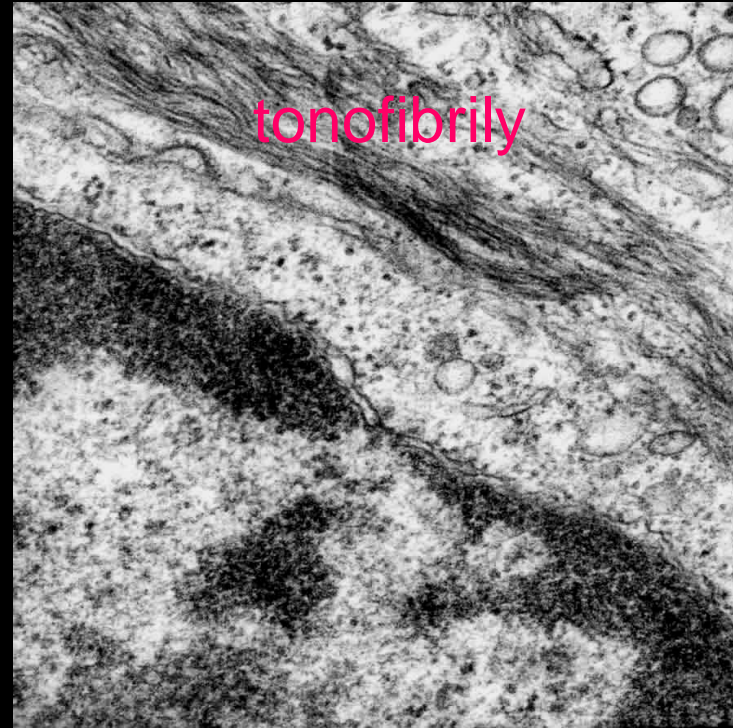
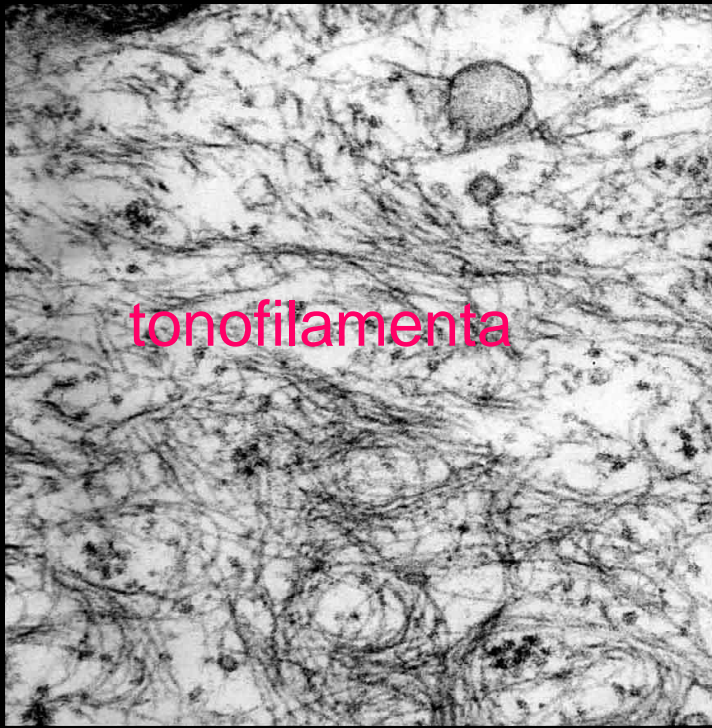
G

S

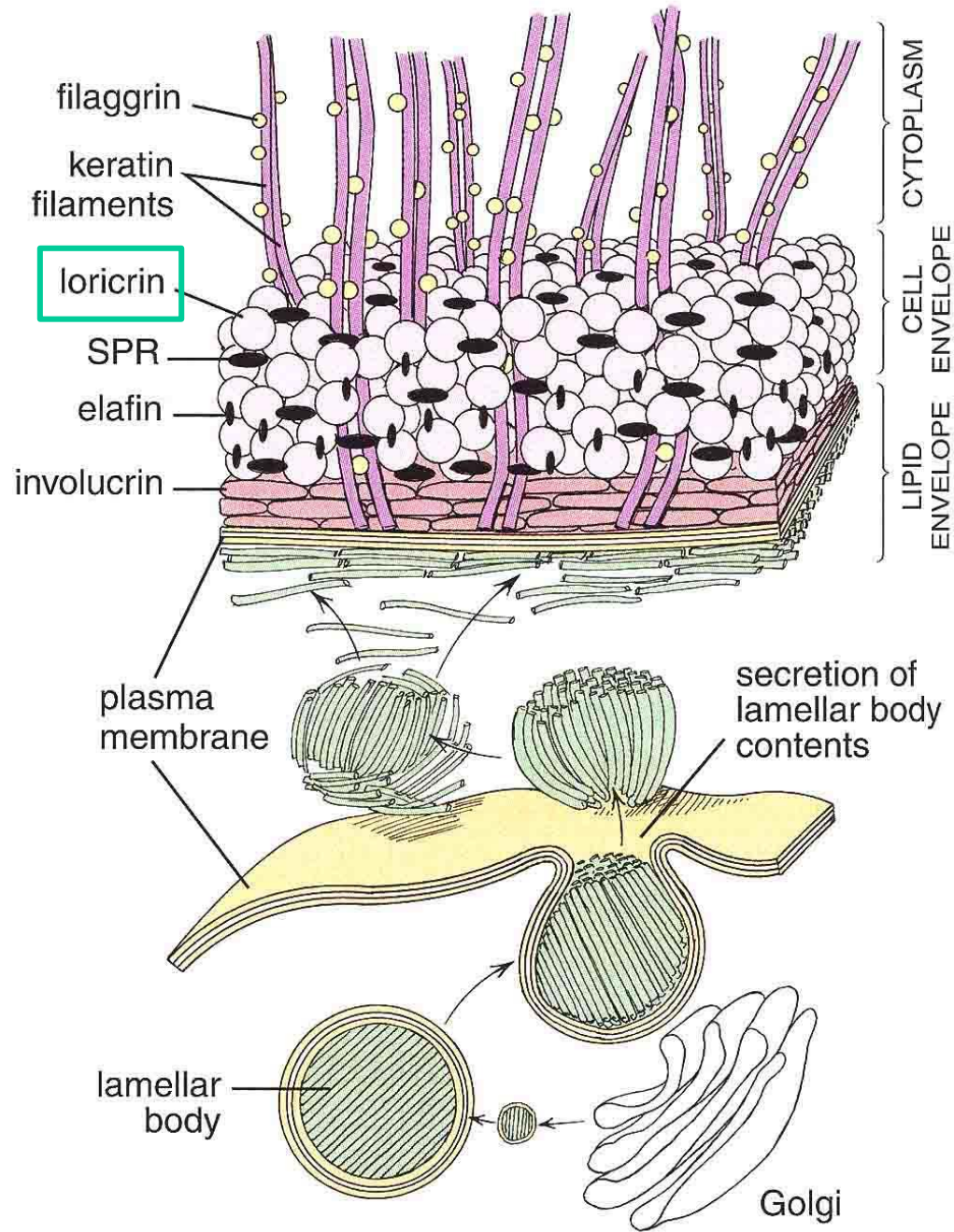


Keratinizace





buněčná obálka

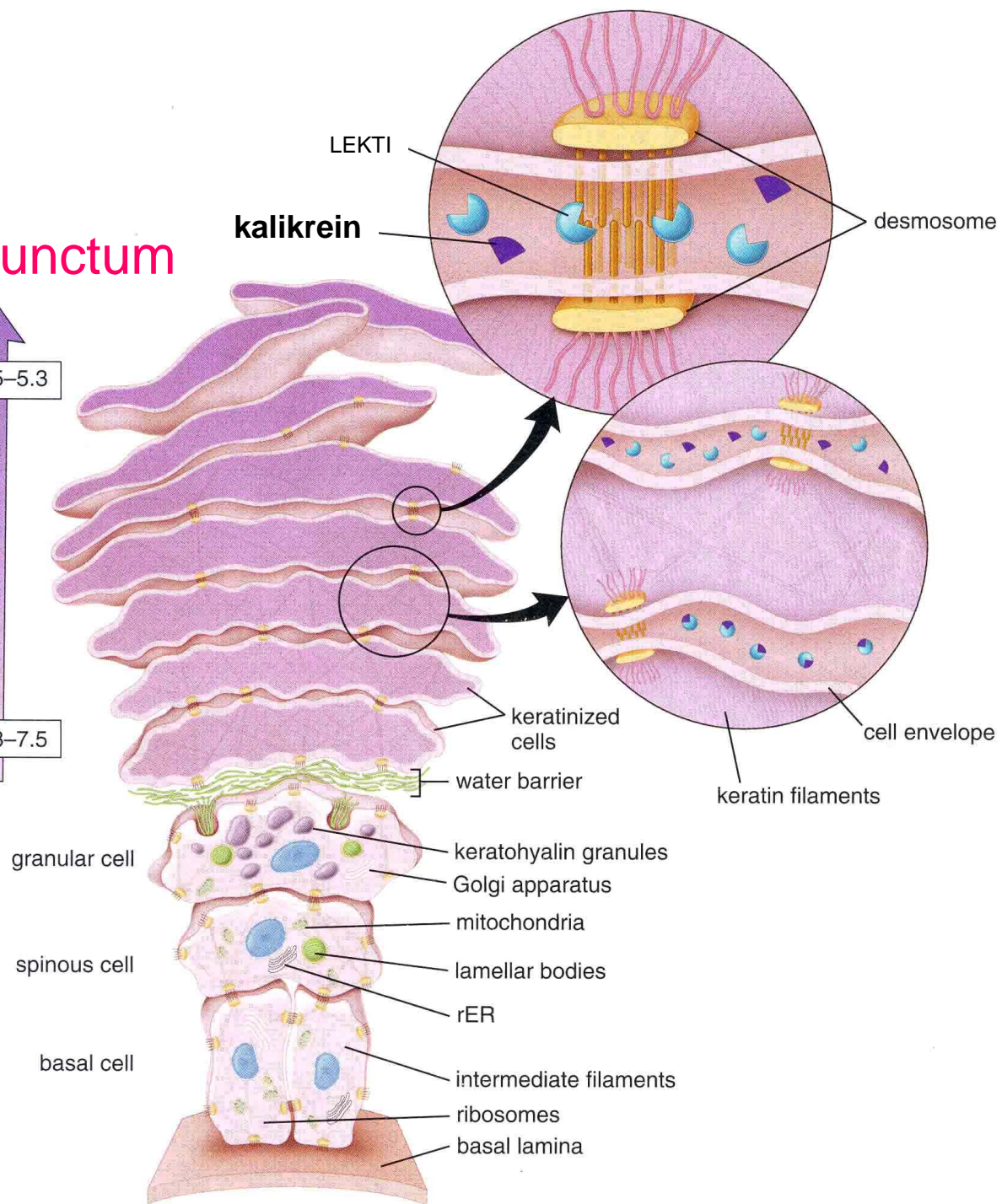


stratum disjunctum

deskvamace

pH 4.5-5.3

pH 6.8-7.5

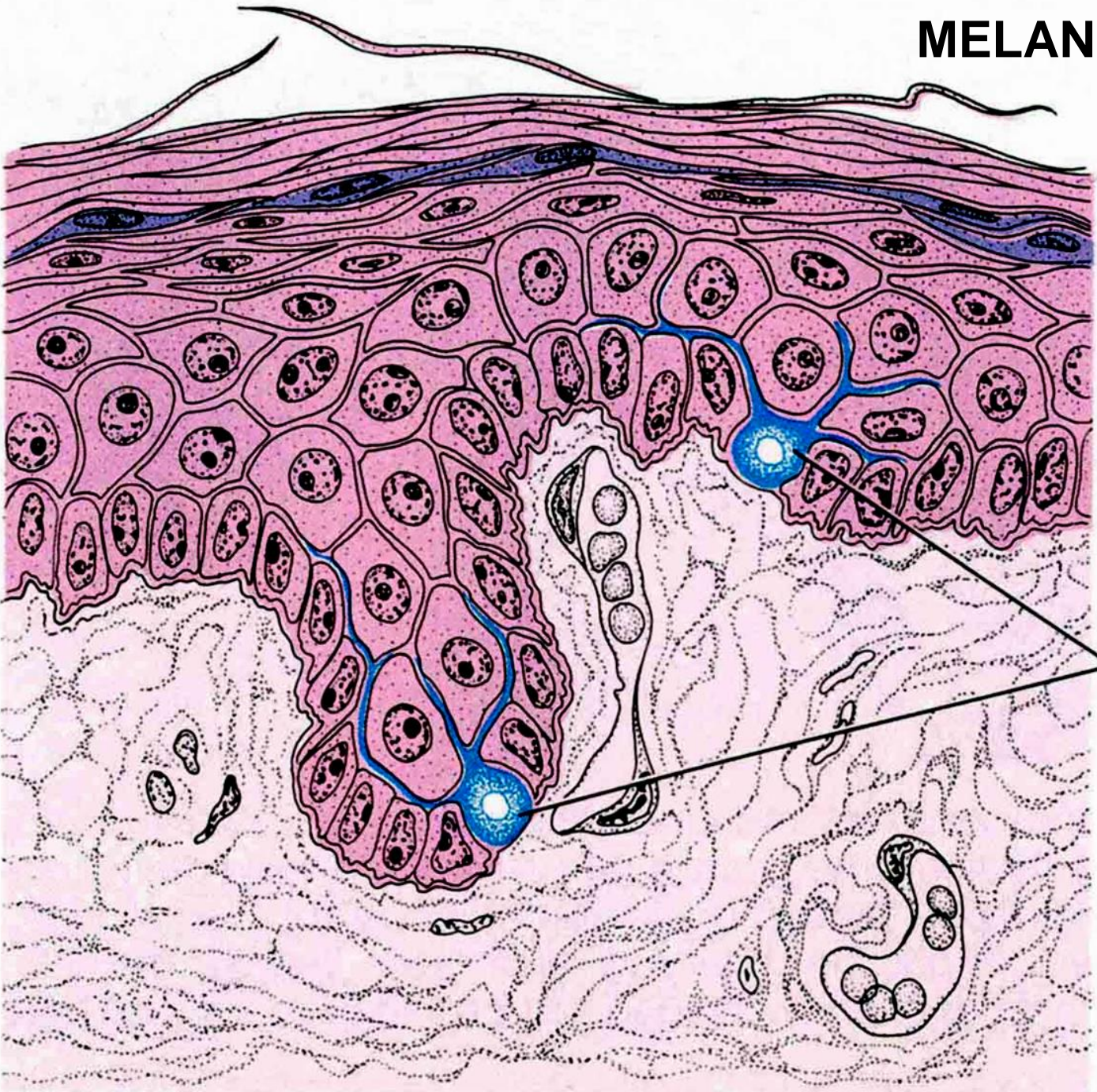


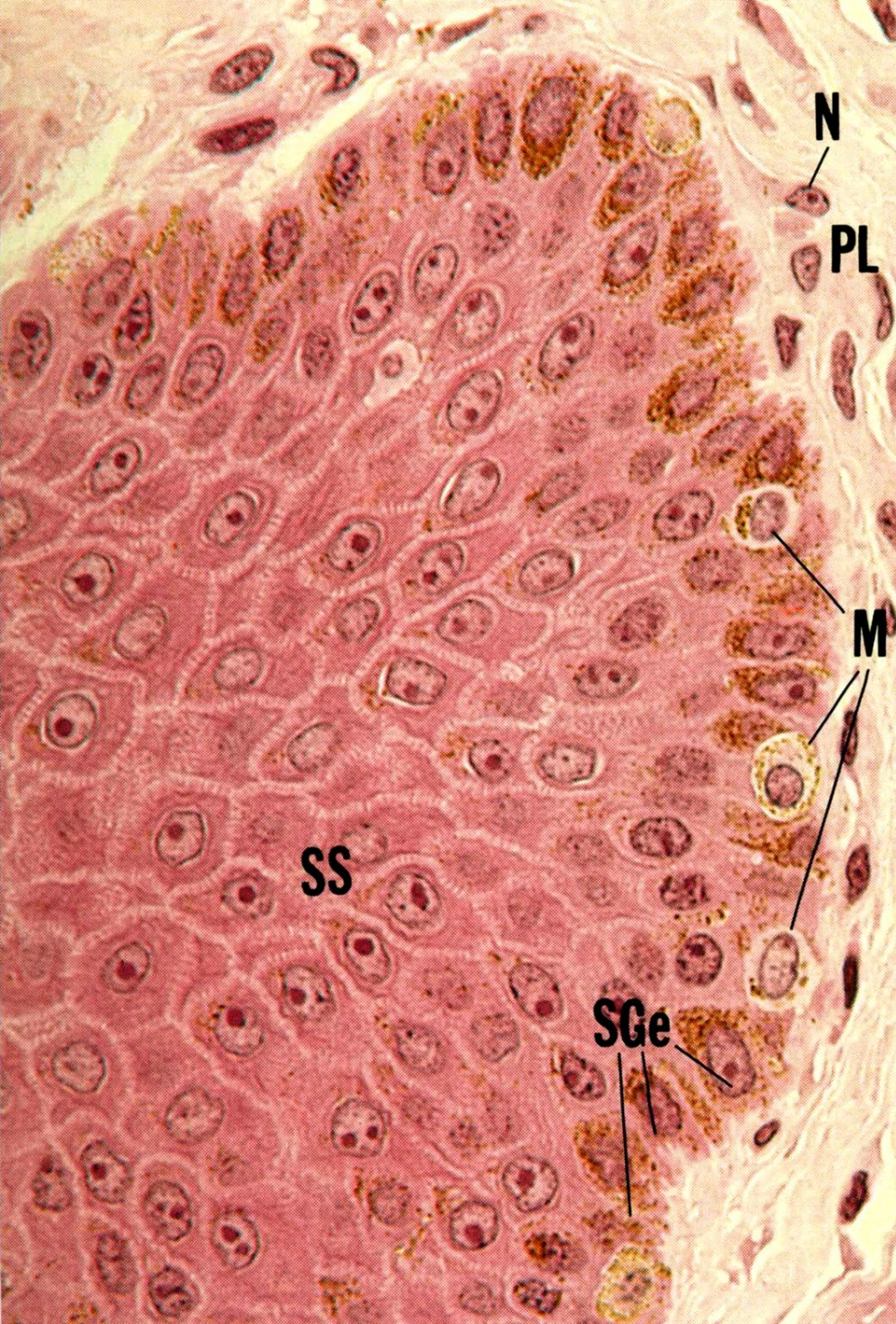
MELANOCYTY

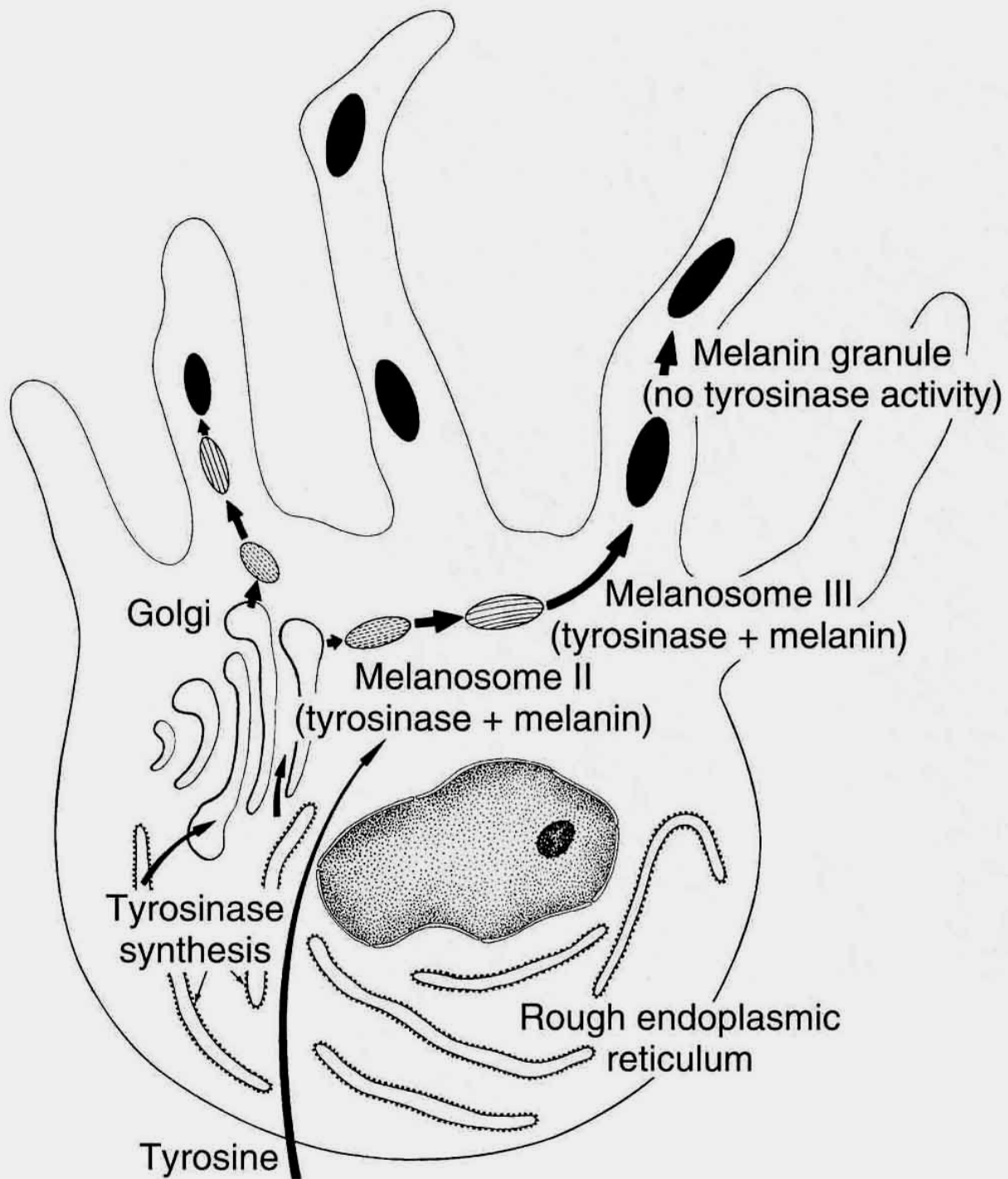
Epidermis

Dermis

Melanocytes

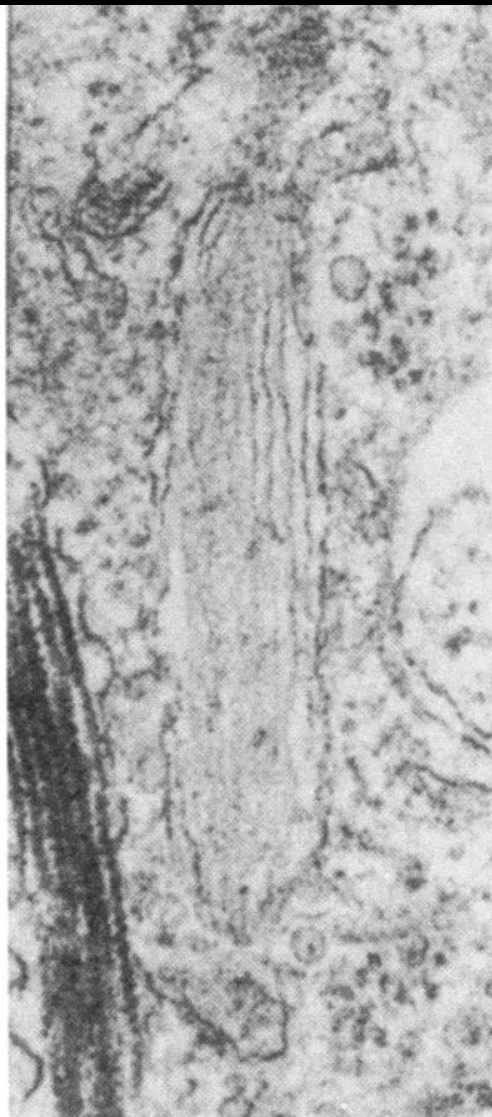








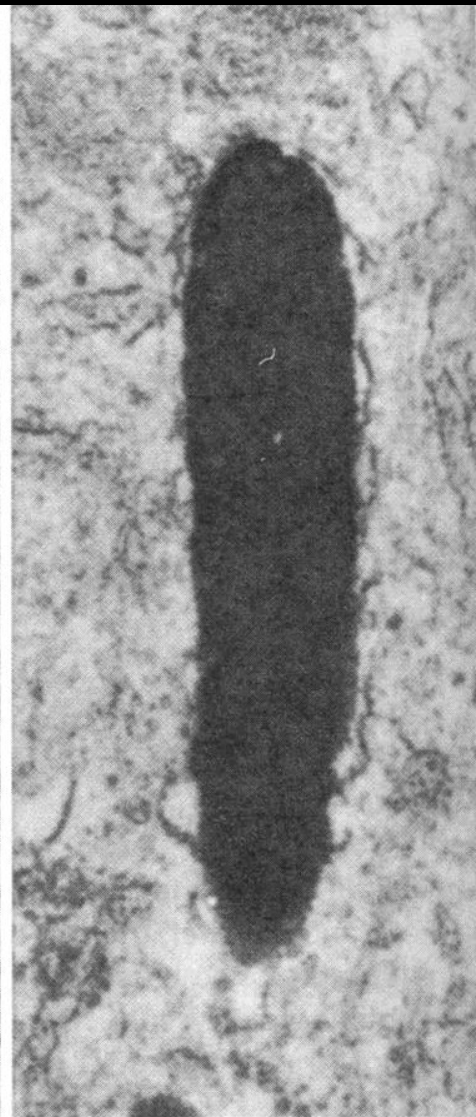
I



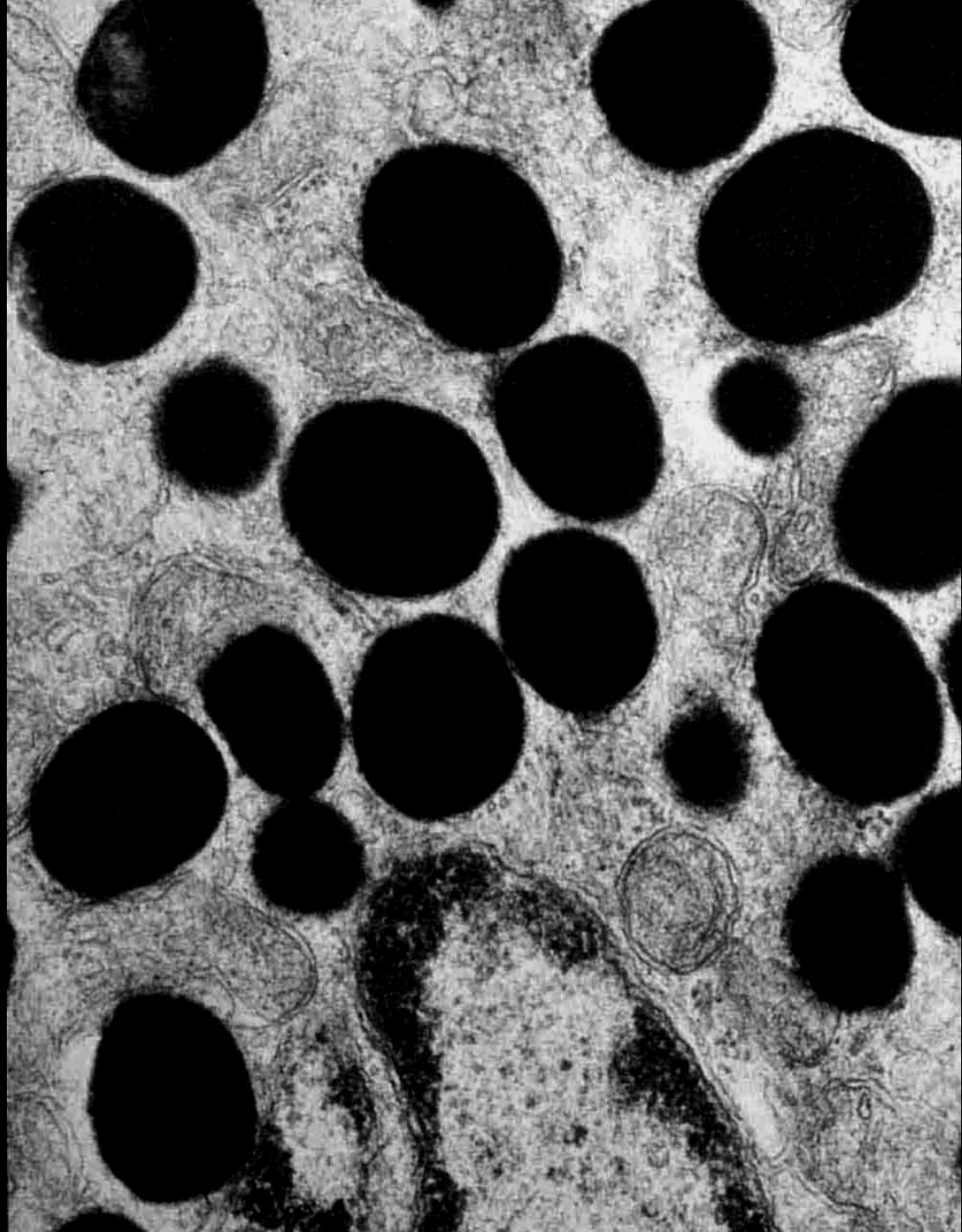
II



III



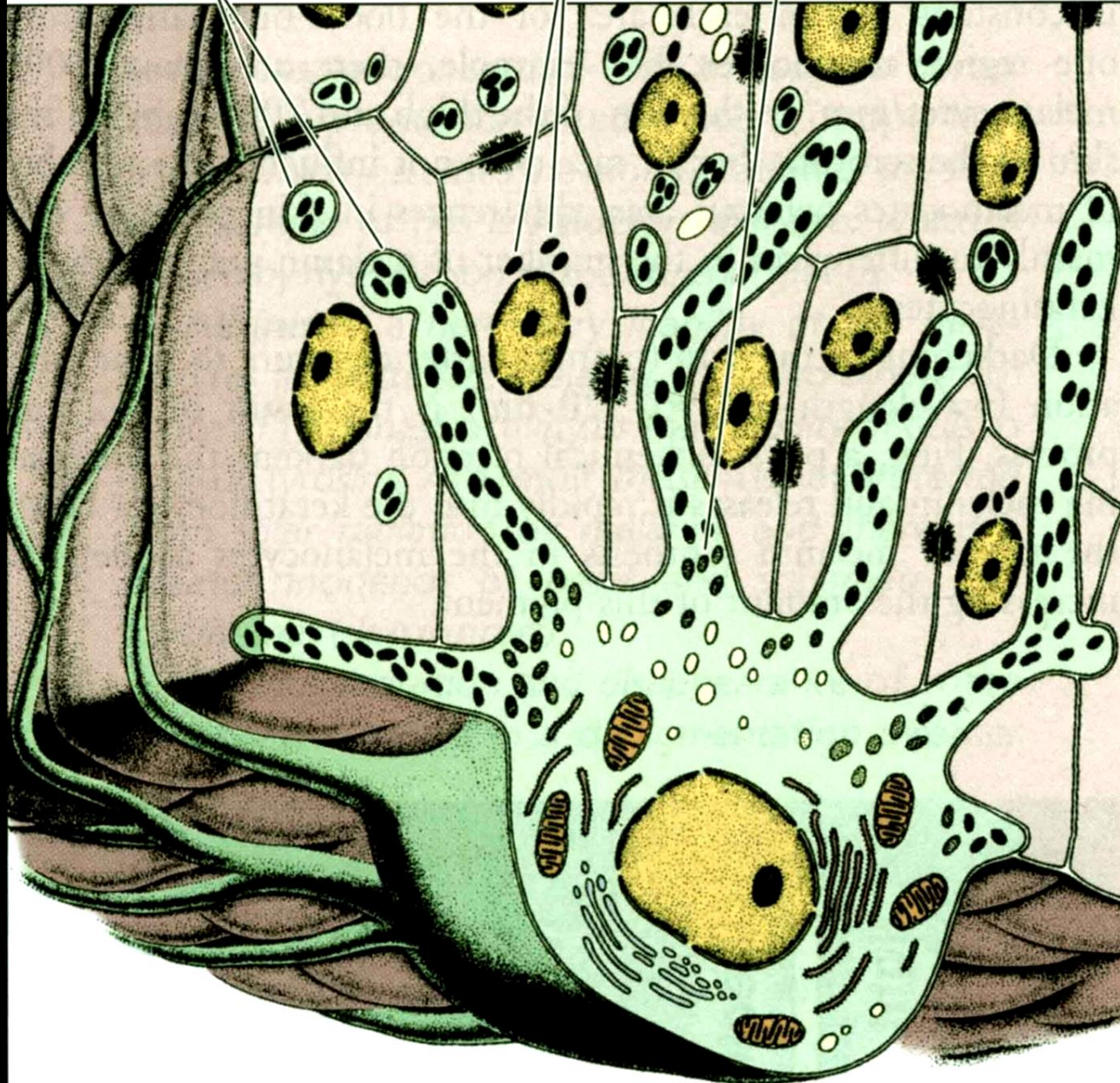
IV



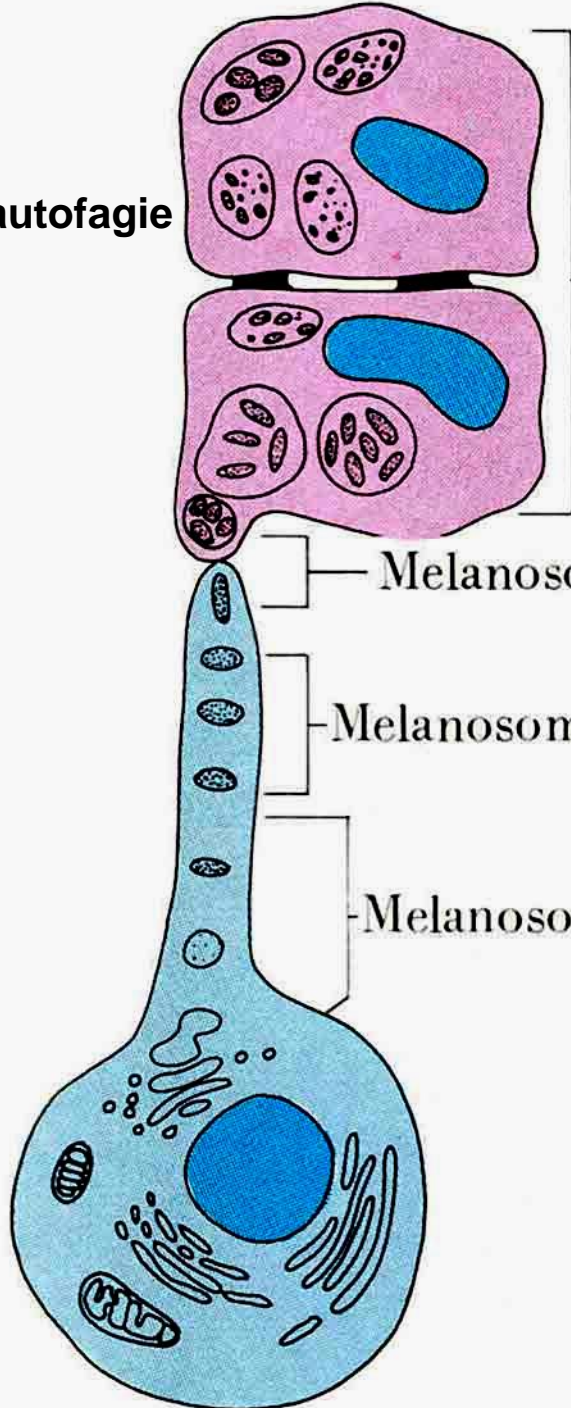
Budding melanin granules

Melanin granules

Developing melanin granule



autofagie

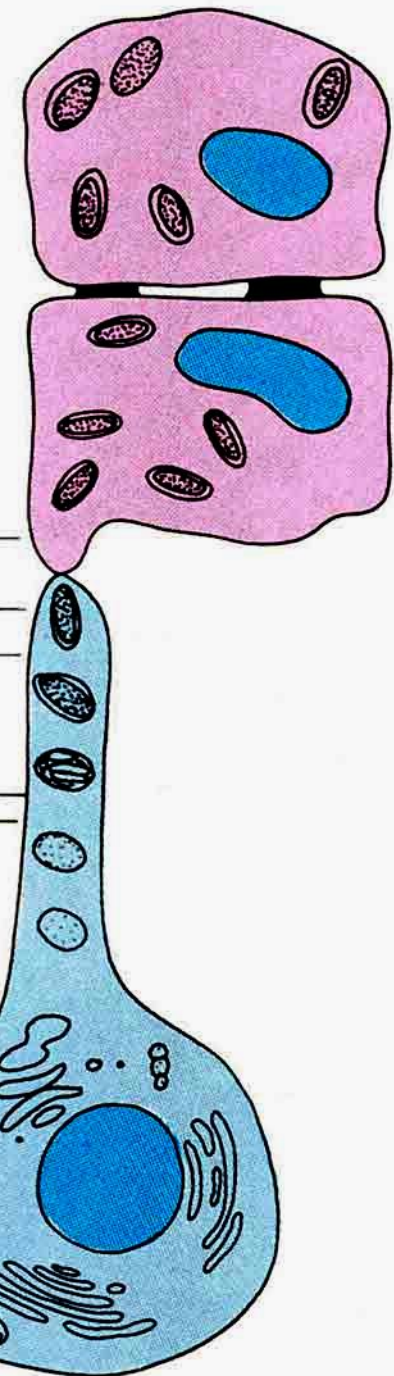


4
Melanosome
degradation

3
Melanosome secretion

2
Melanosome melanization

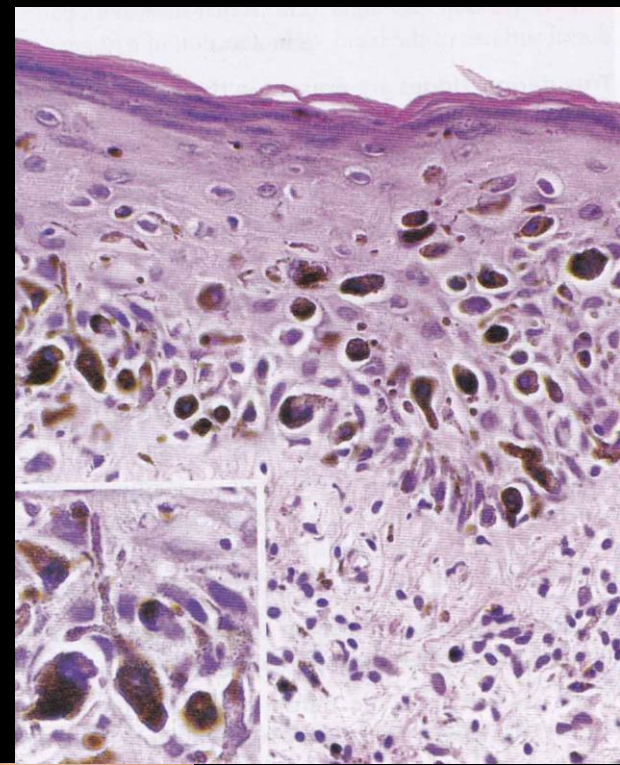
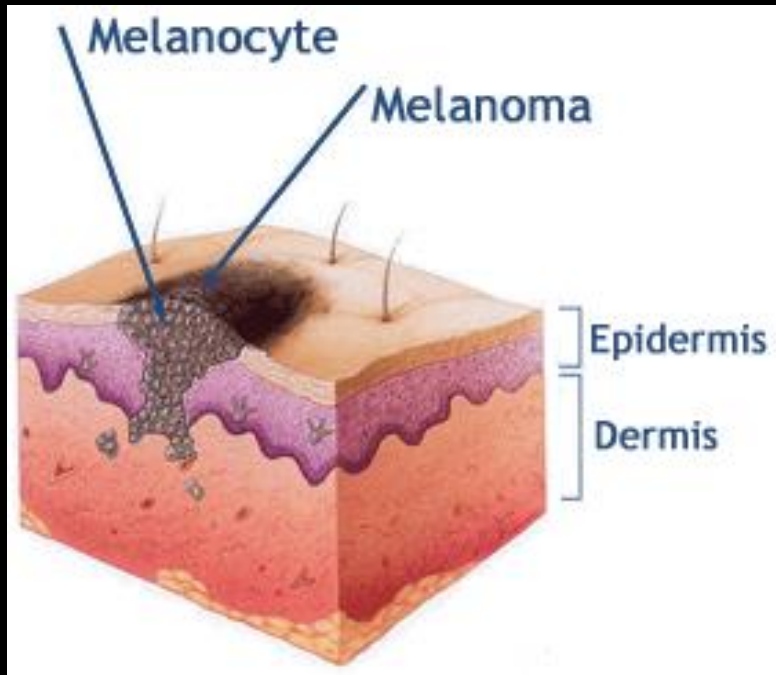
1
Melanosome formation



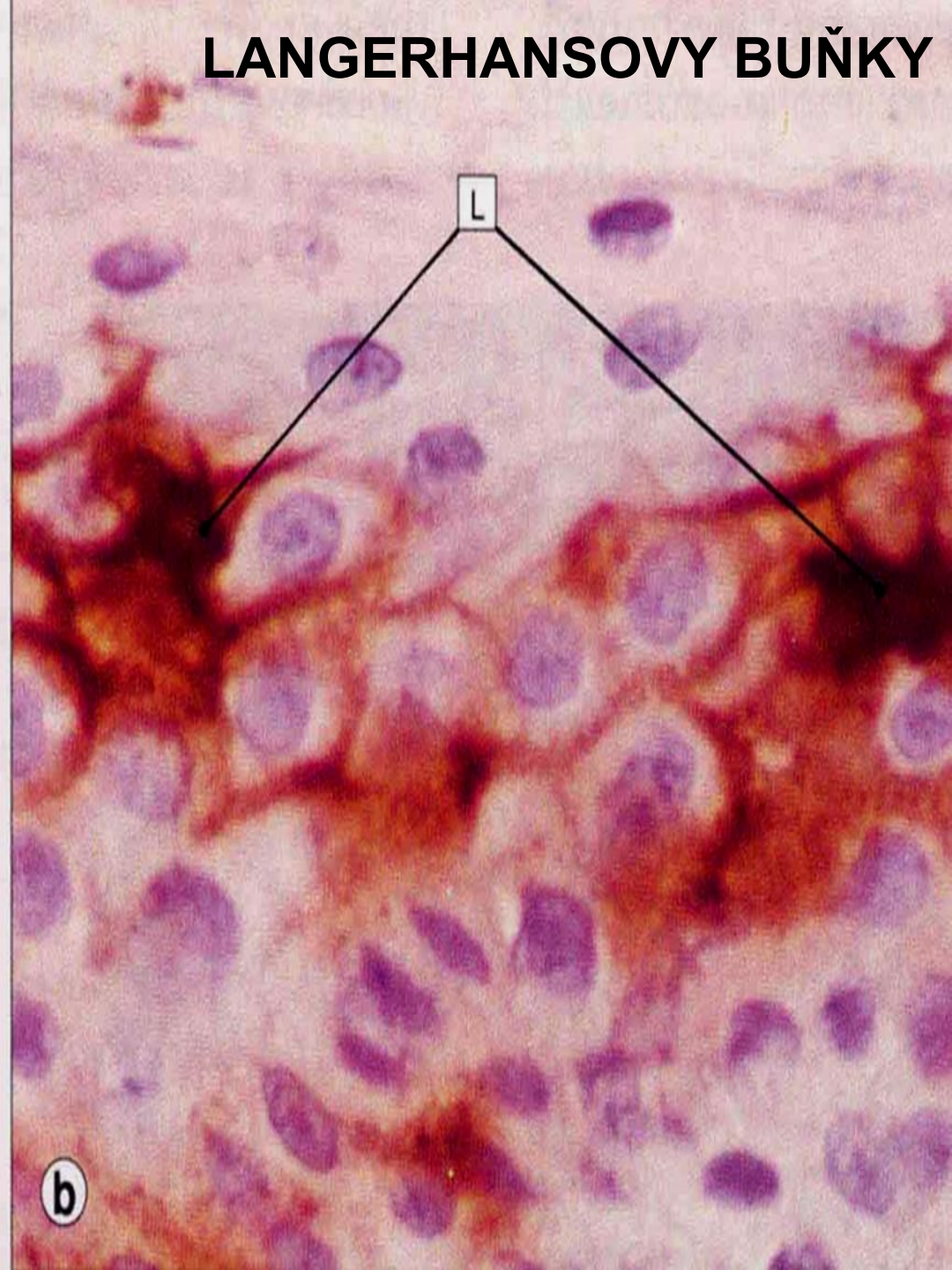
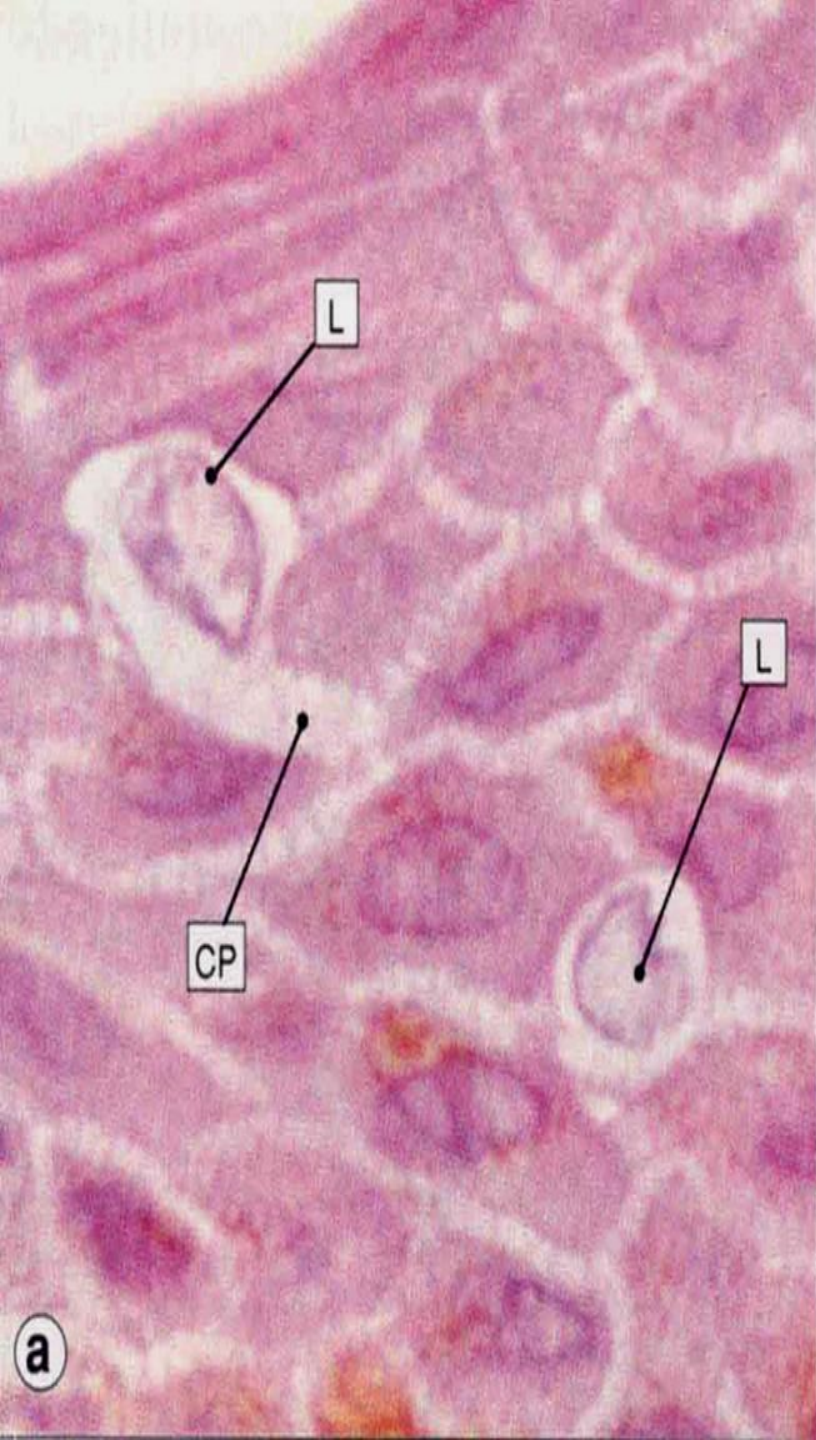
černoch

běloch

Maligní melanom



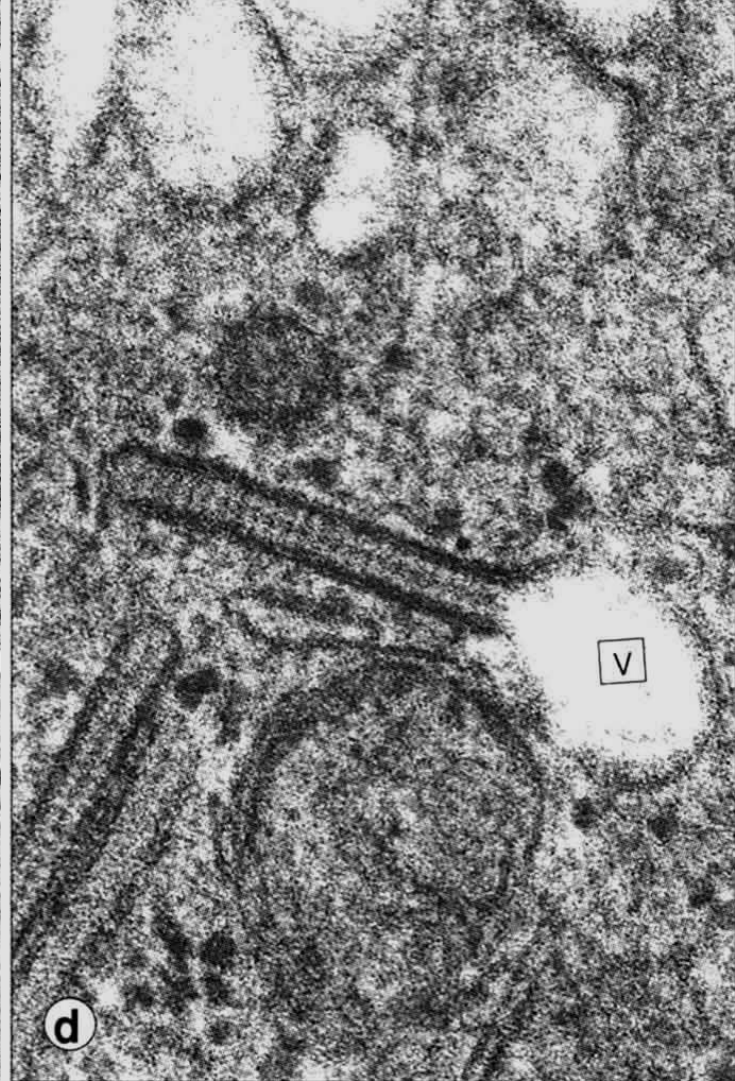
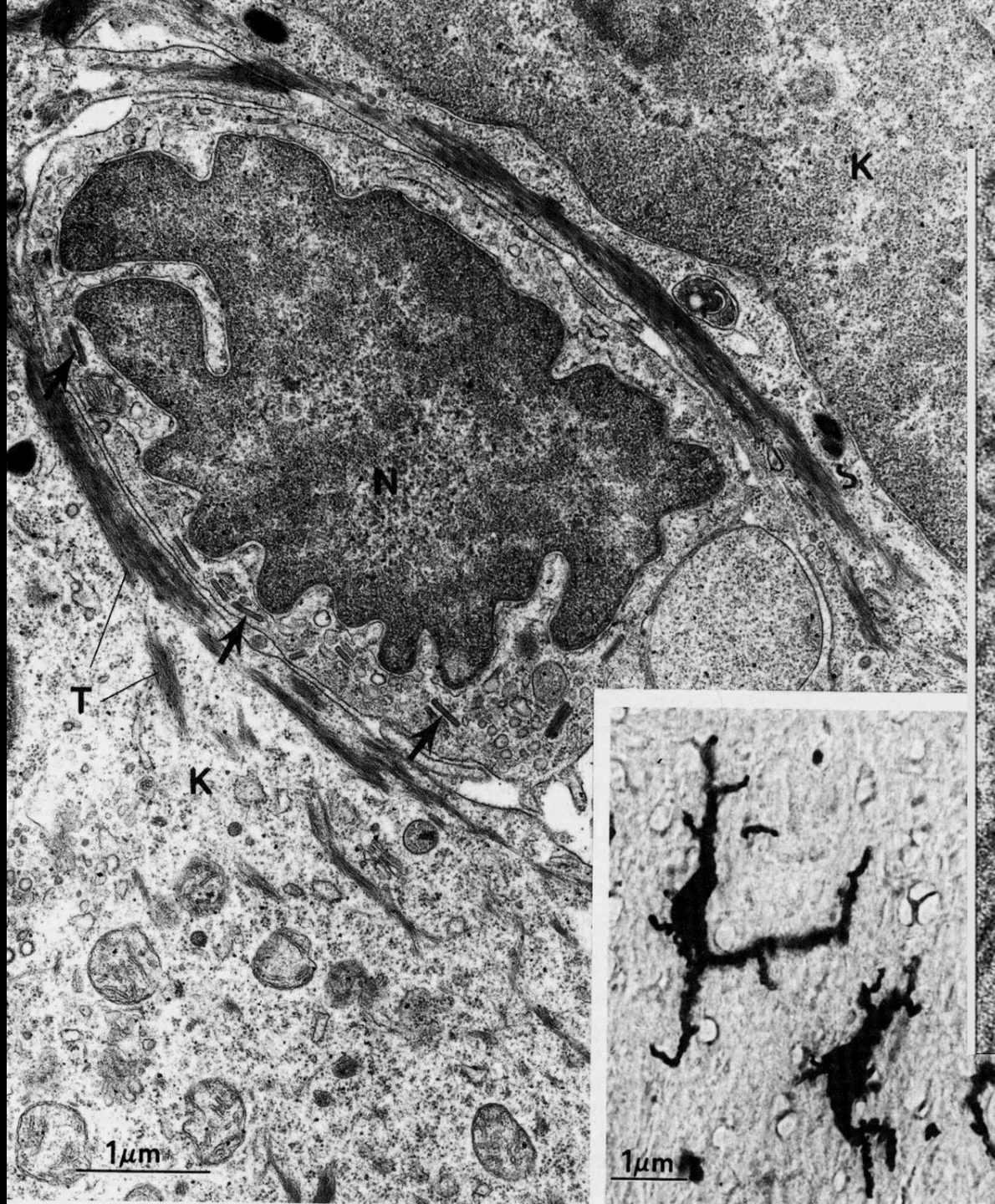
LANGERHANSOVY BUŇKY



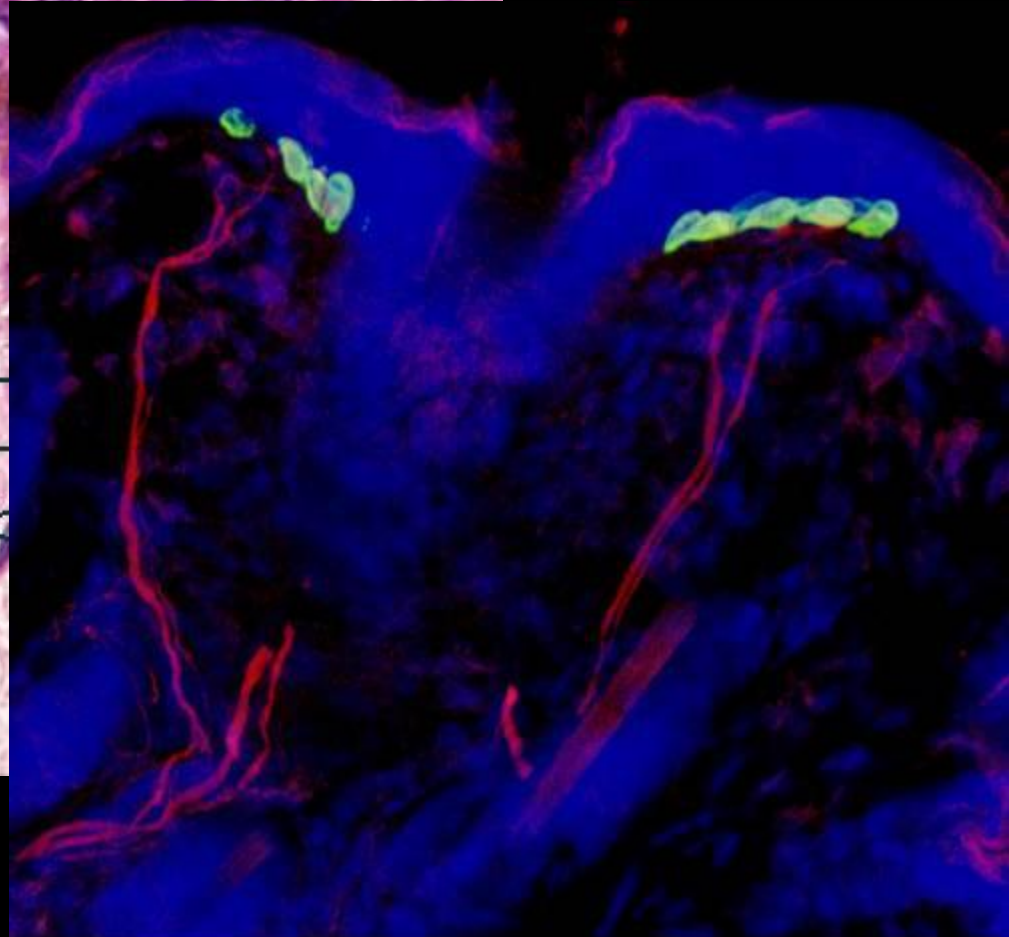
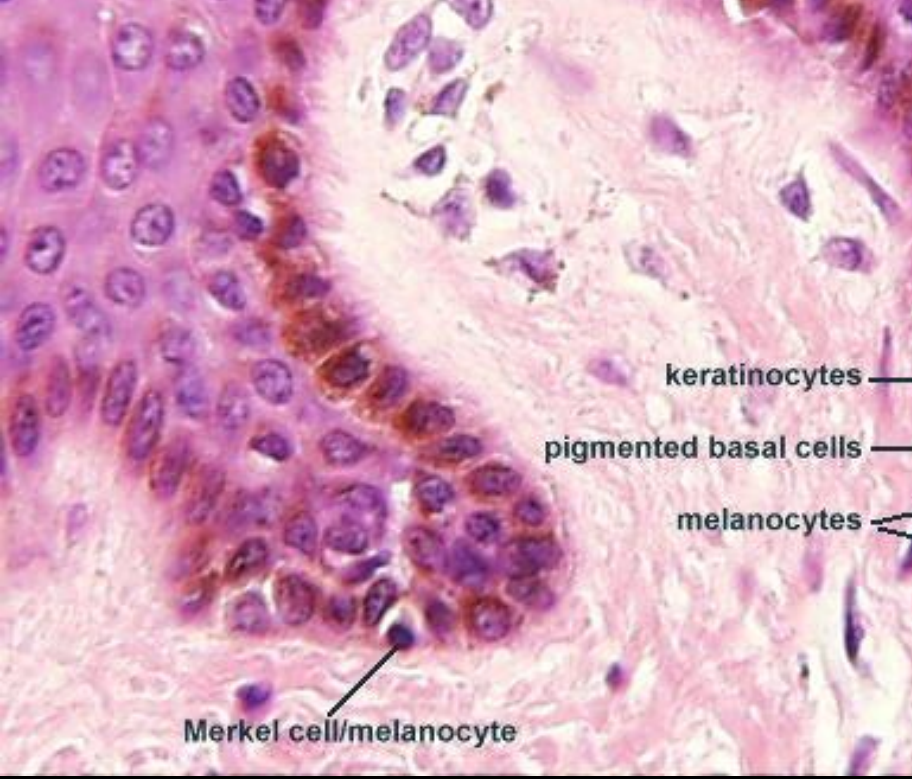
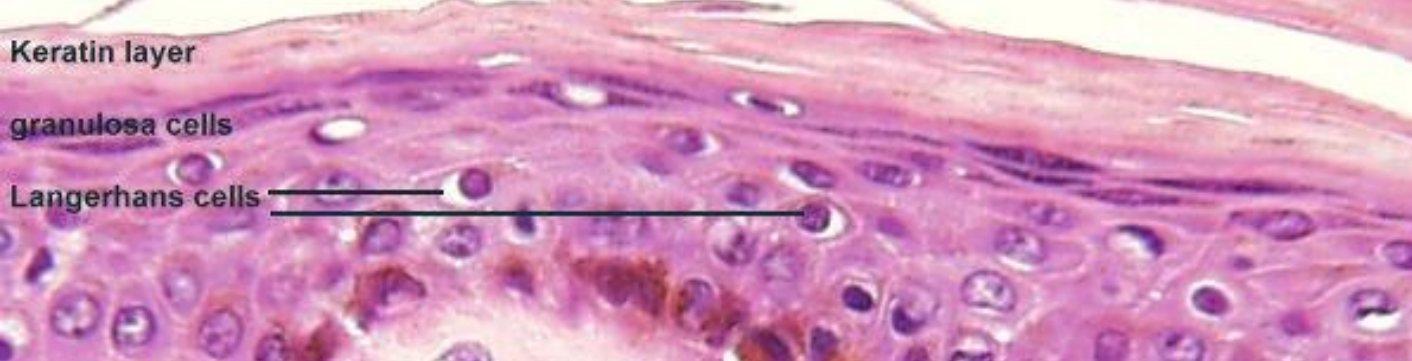
a

b

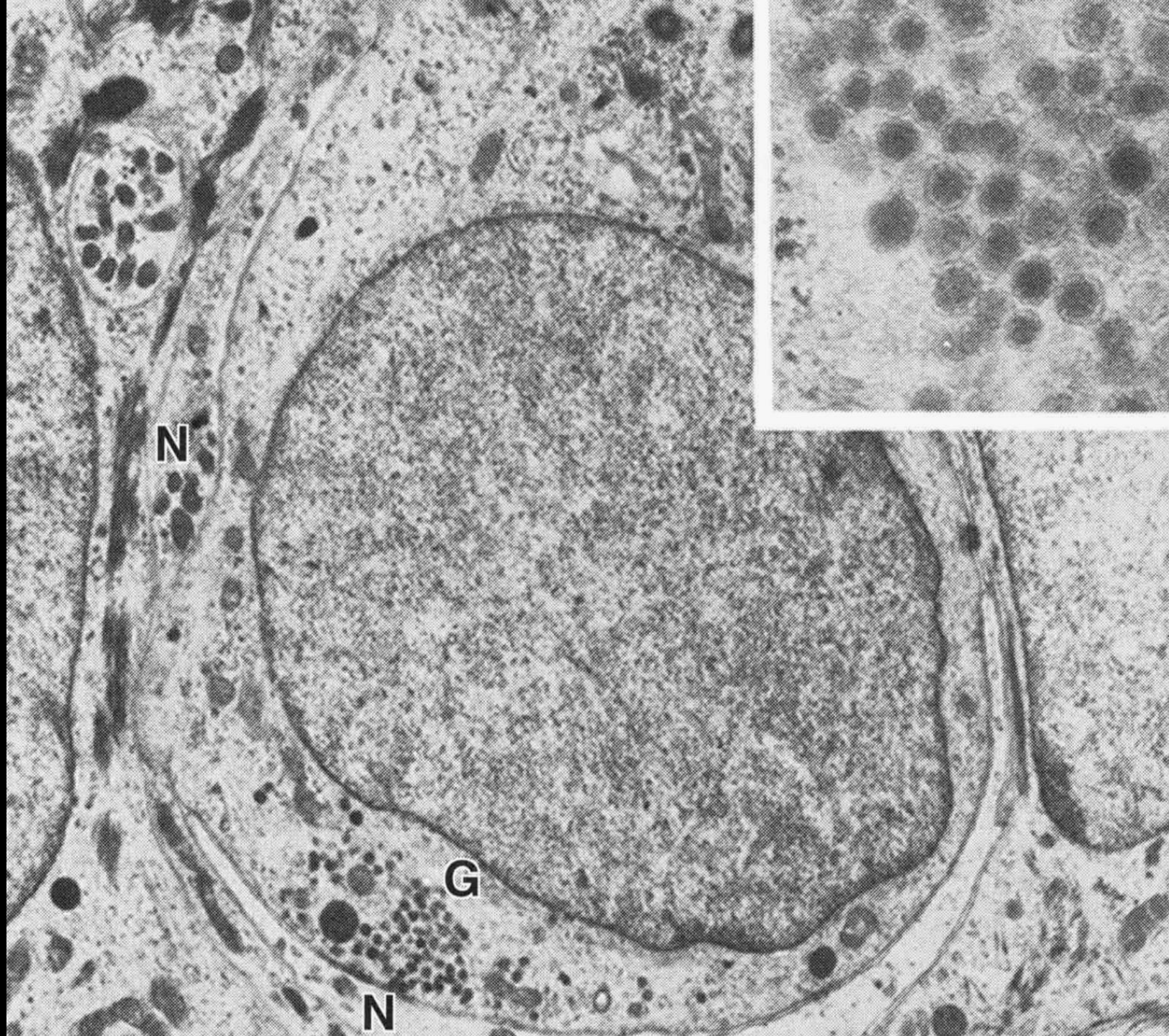
Birbeckova granula



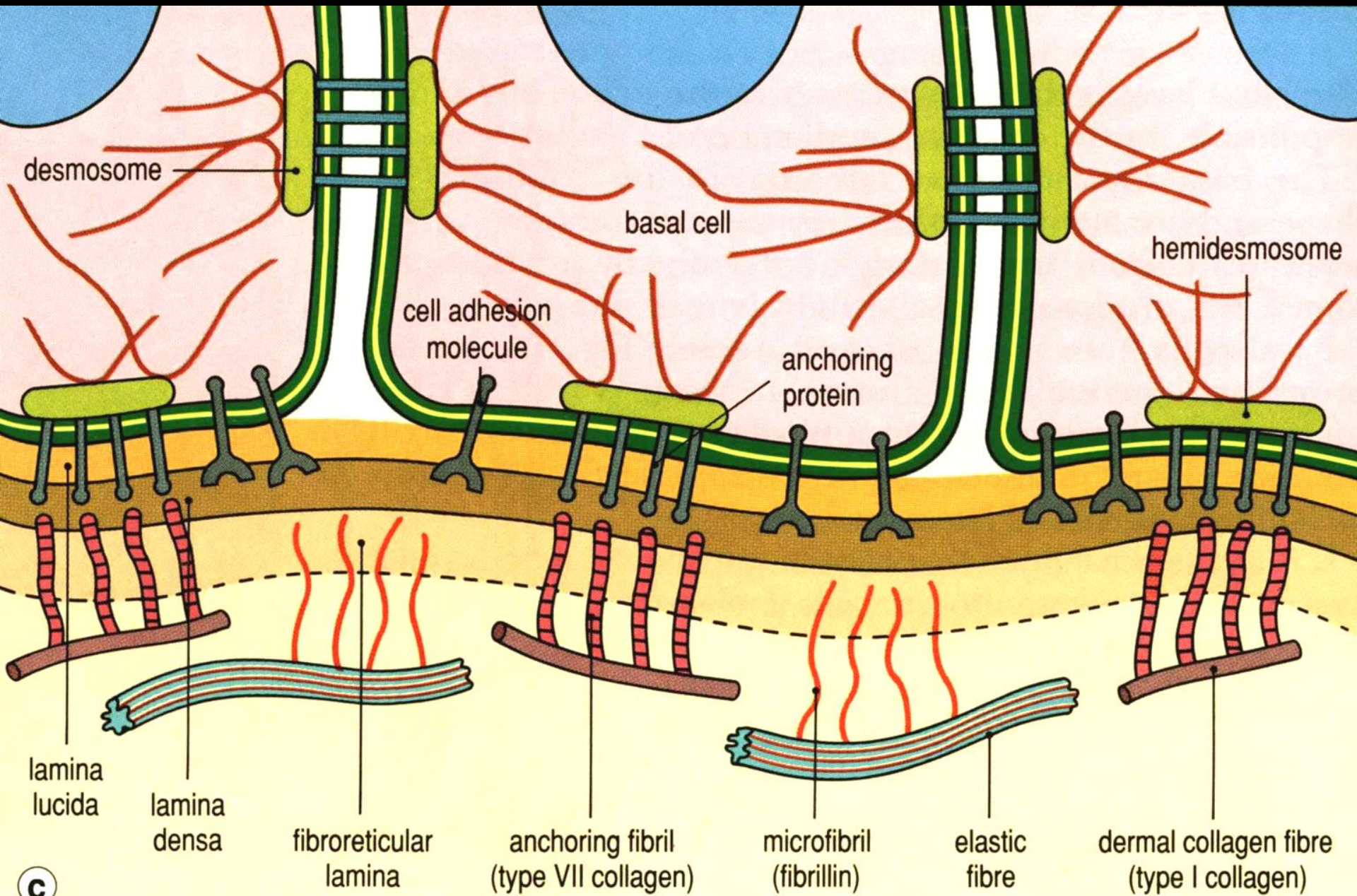
MERKELOVY BUŇKY

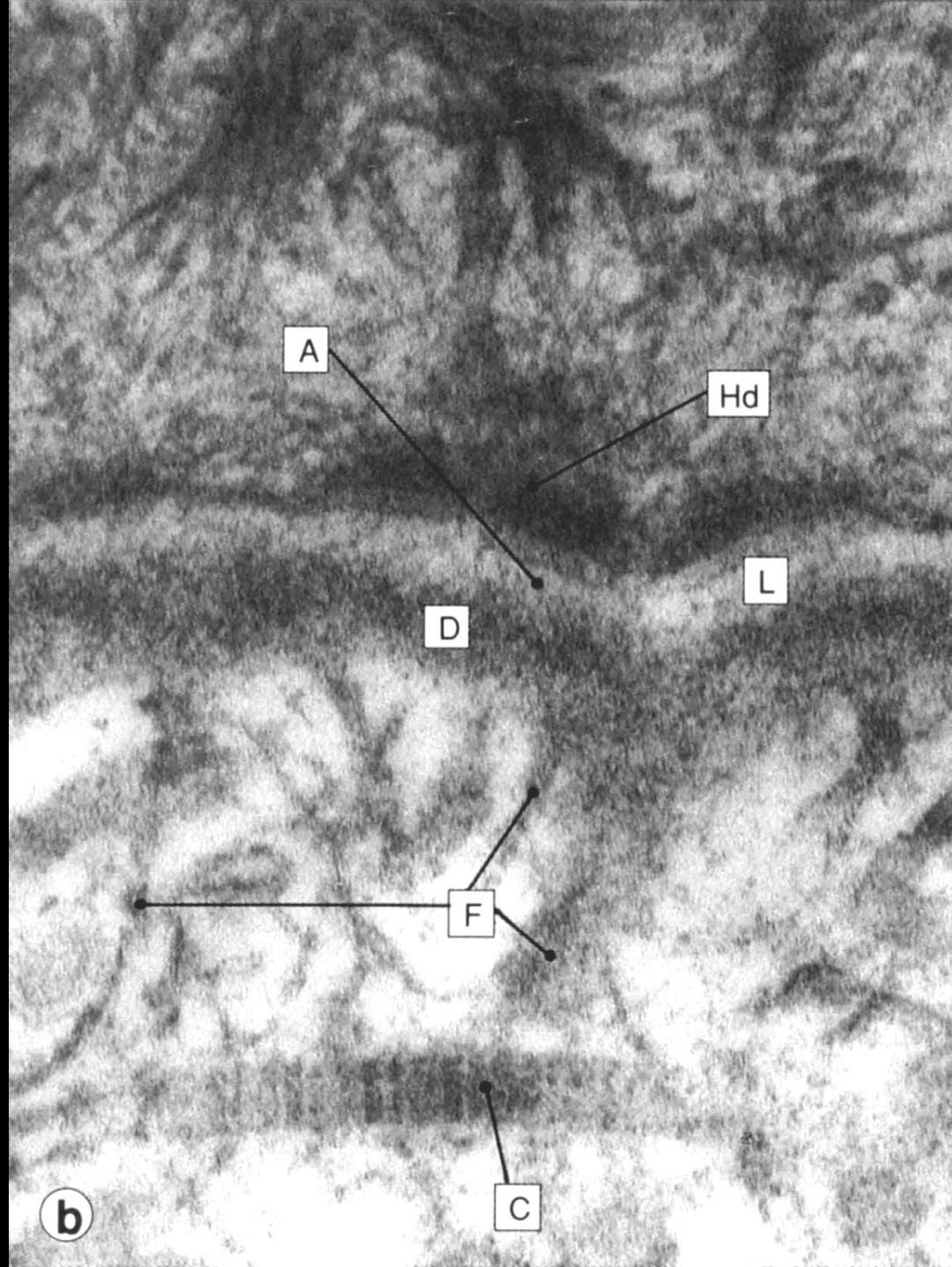


Skin touch dome with Merkel cells and innervating neurites



Dermo-epidermální junkce





Dermis

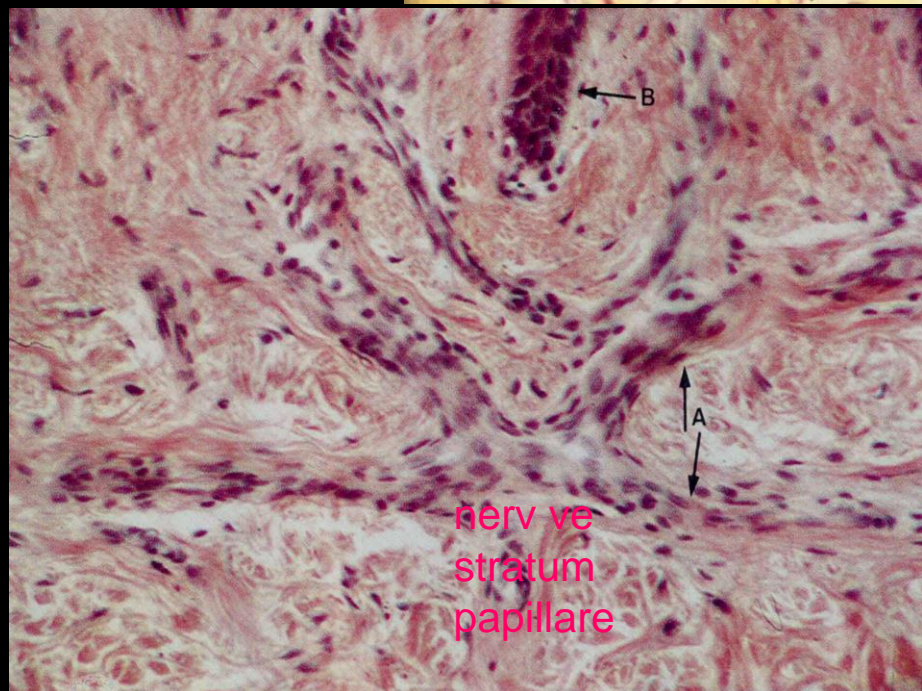
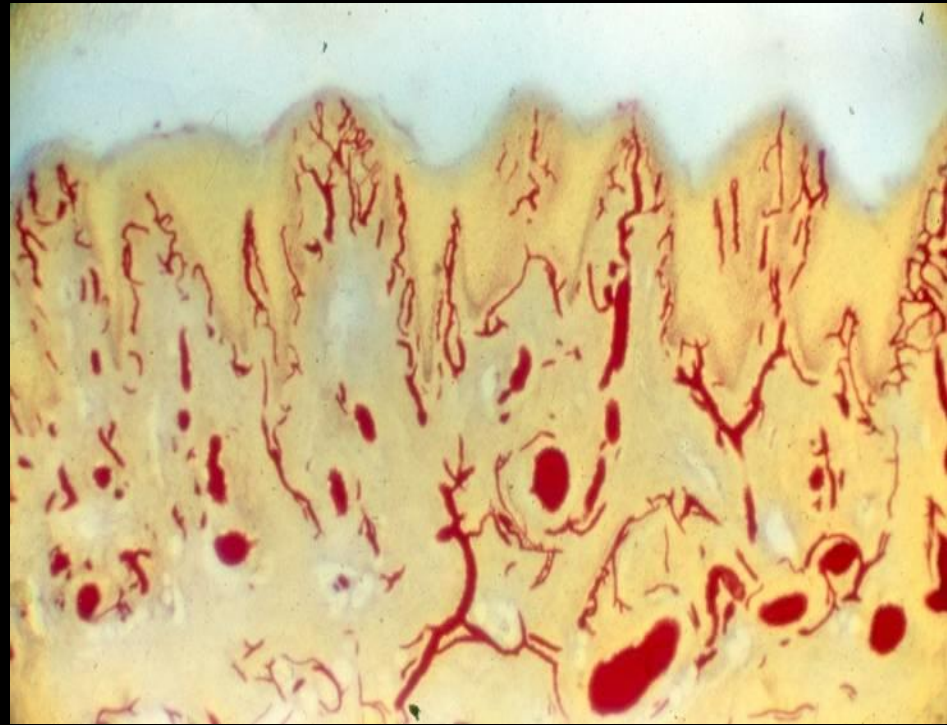
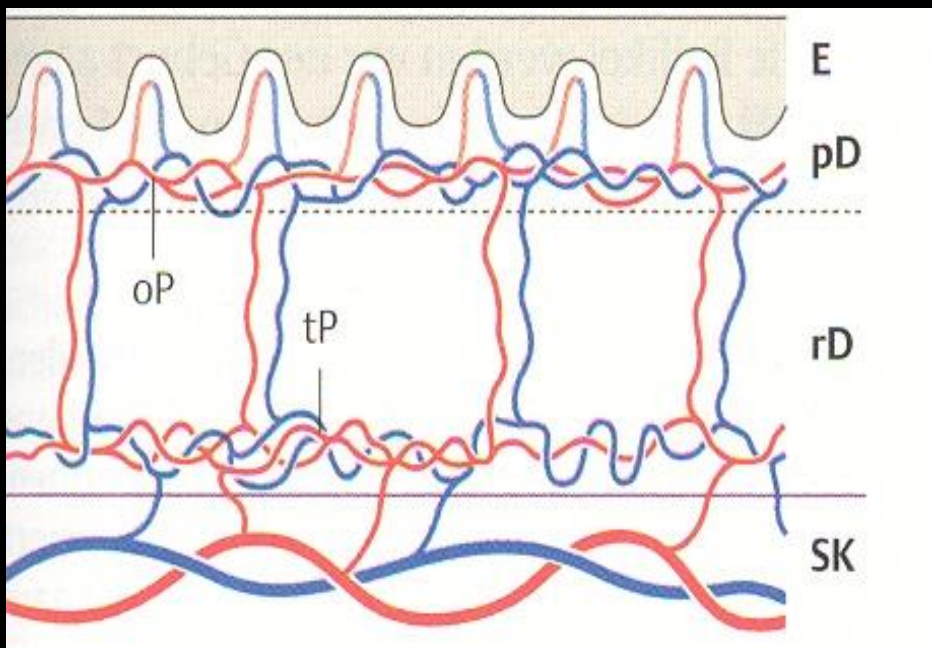


stratum papillare

stratum reticulare

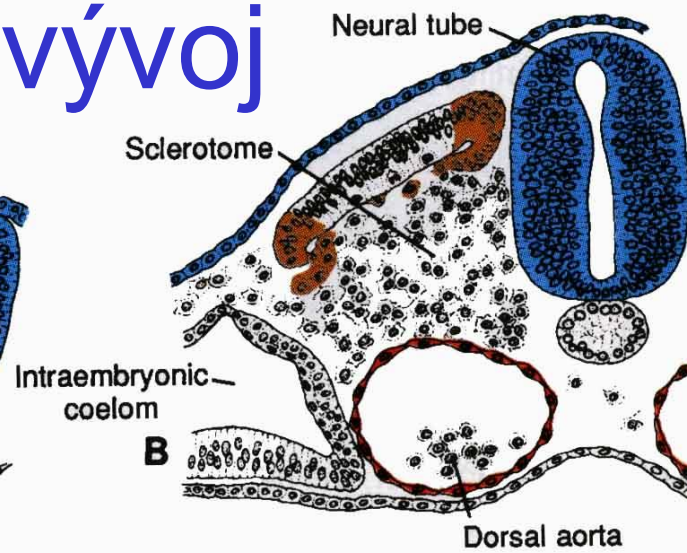
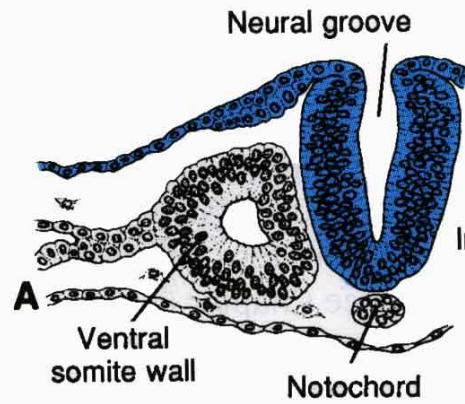
Kůže – zásobení

- tepny – hluboká a povrchová síť
 - vždy konstantní stopka pro určitou část ➤ kožní laloky pro replantace
 - kapiláry - a-v anastomózy
- žíly - stejné
- míza – kapiláry ➤ subkapilární síť ➤ kolektory
- nervy – *chybí parasimpatikus !*
 - nervová zakončení (volná x tělíška)
 - 5. smysl = hmat – somatosenzitivní vlákna
 - sympatická postgangliová vasomotorická vlákna – adrenergní – visceromotorická vlákna
 - *sympatická vlákna pro potní žlázy – cholinergní !*

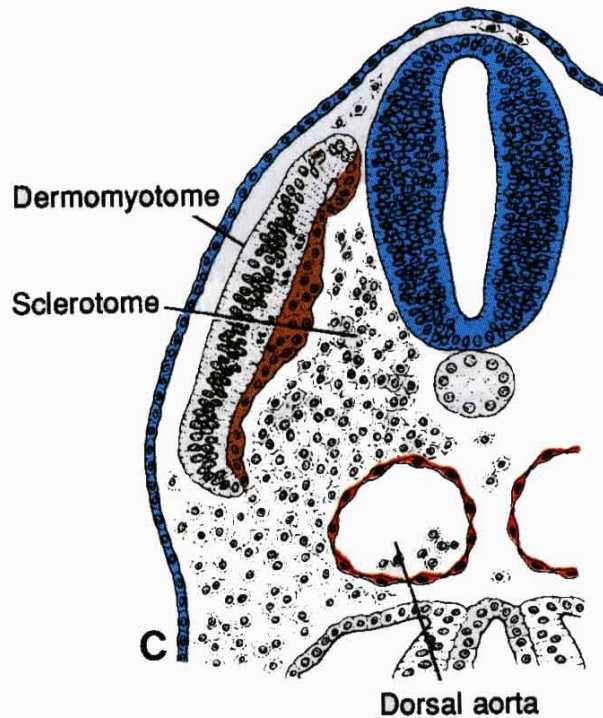


Kůže – vývoj

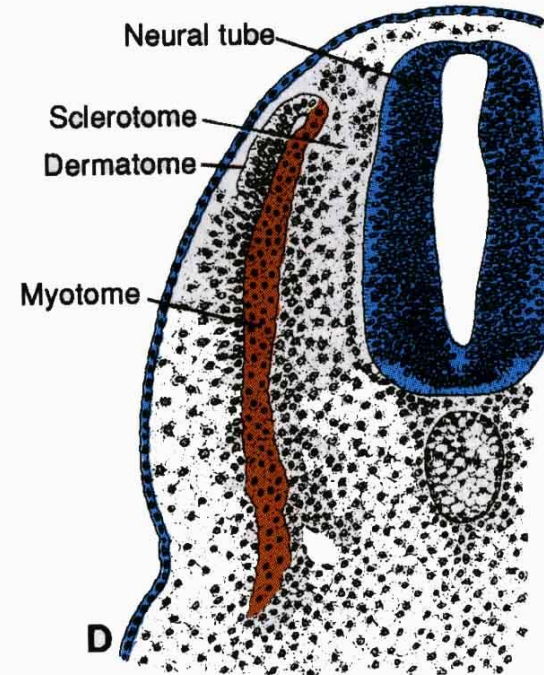
povrchový
ektoderm



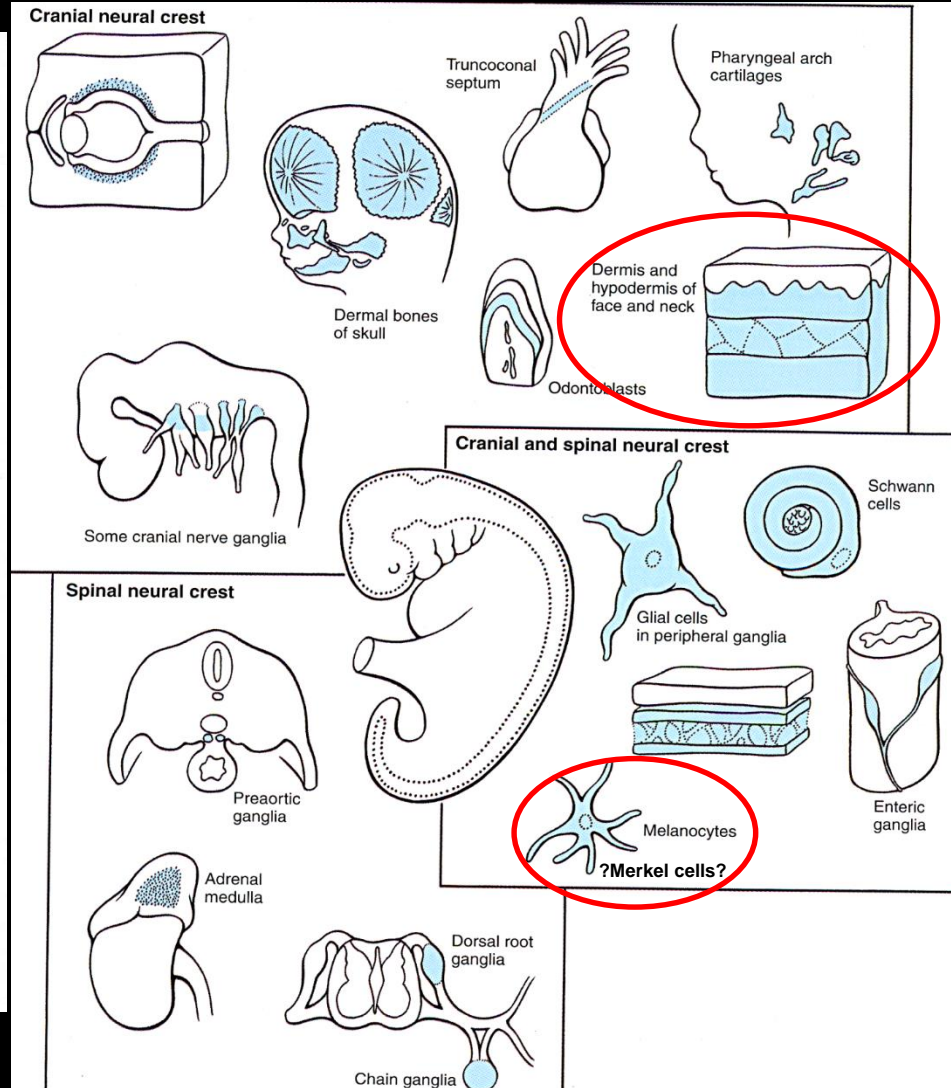
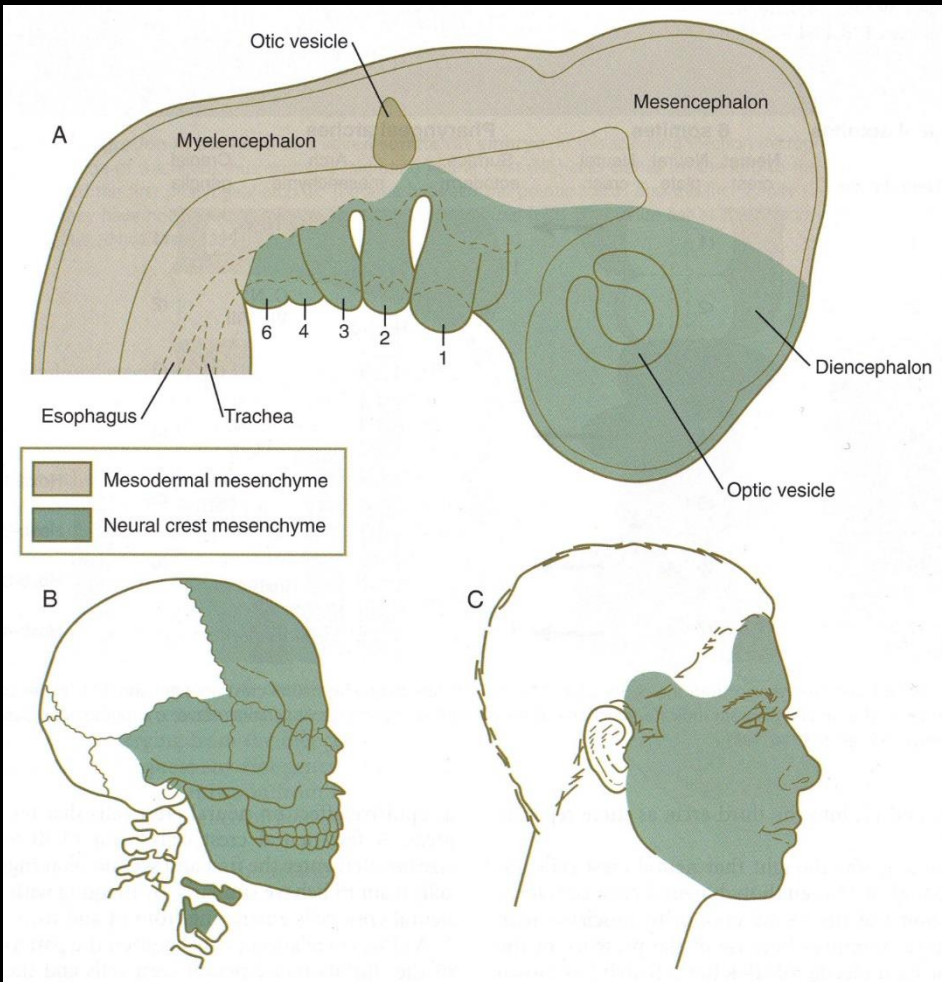
paraxiální
mesoderm

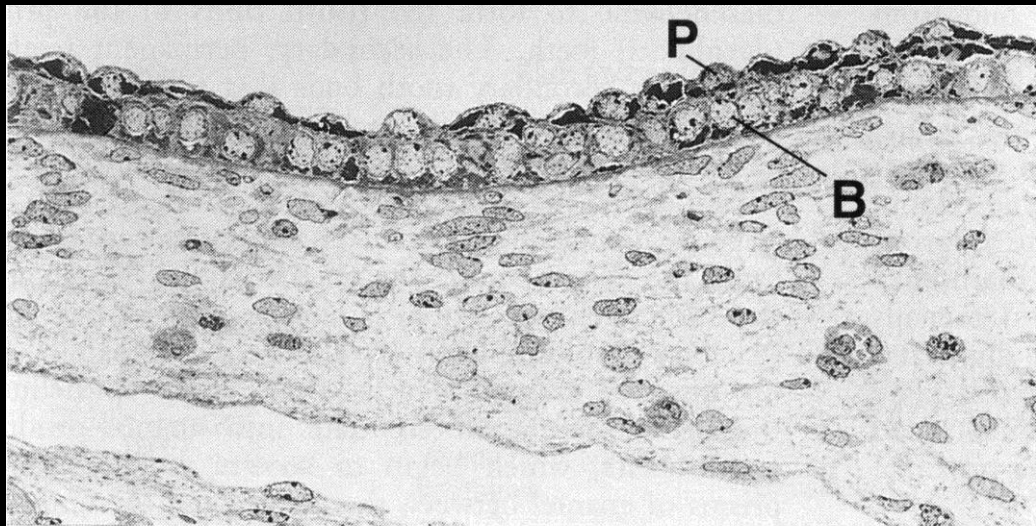
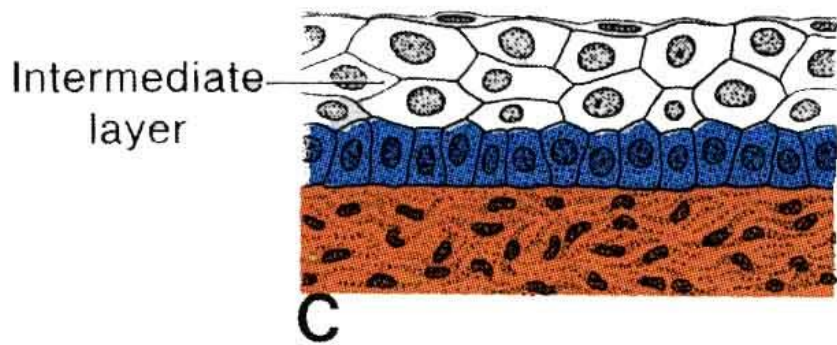
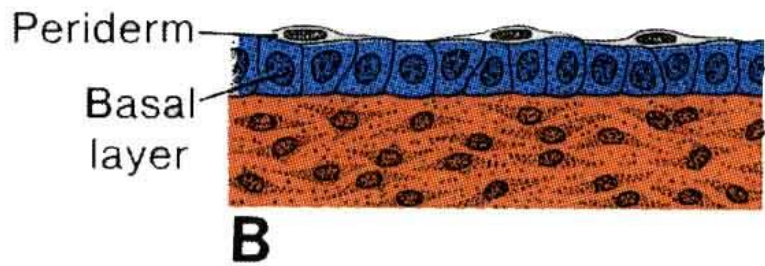
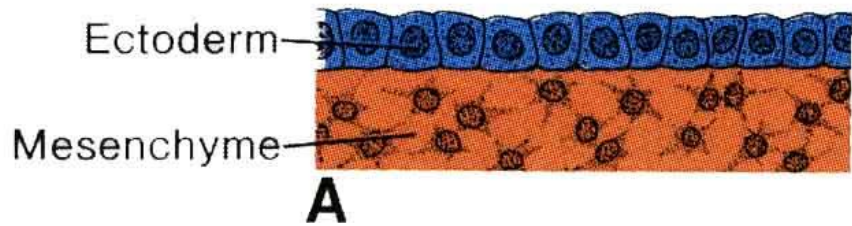


laterální
mesoderm

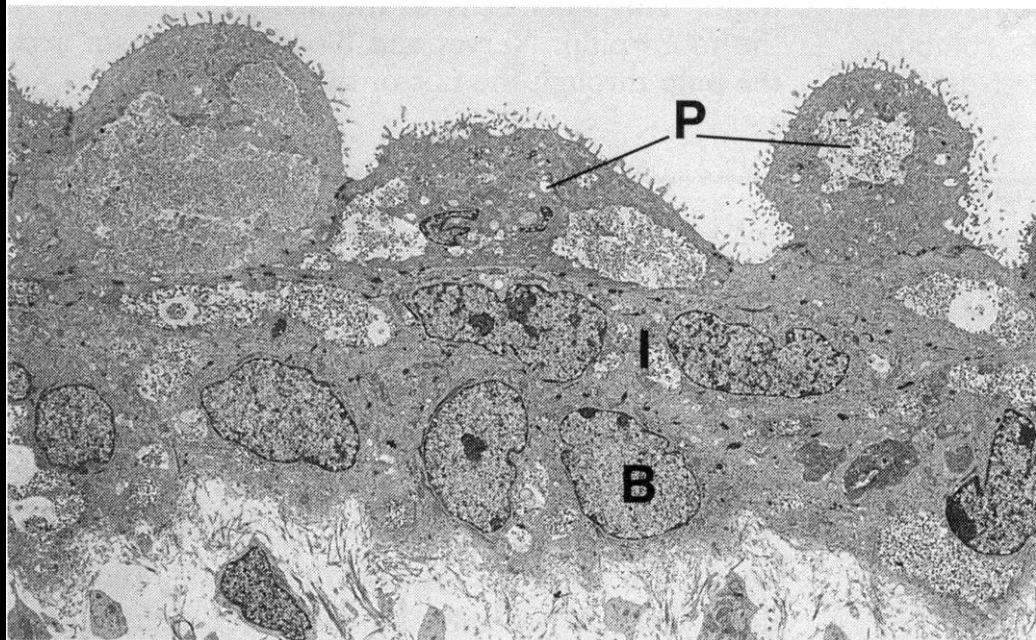


neurální lišta (ektomesenchym)

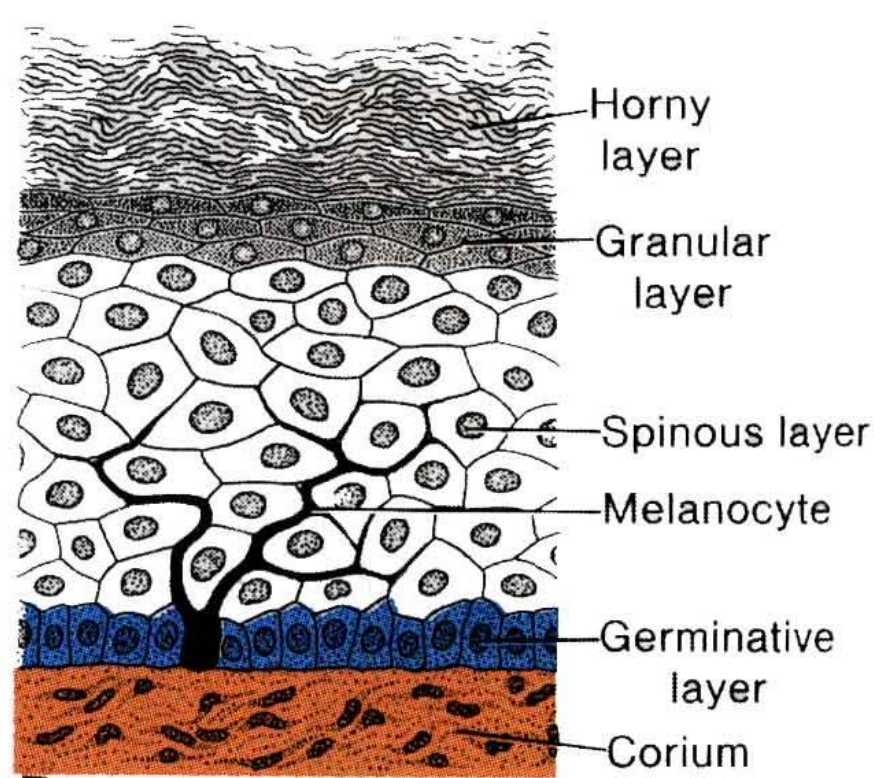




8 weeks



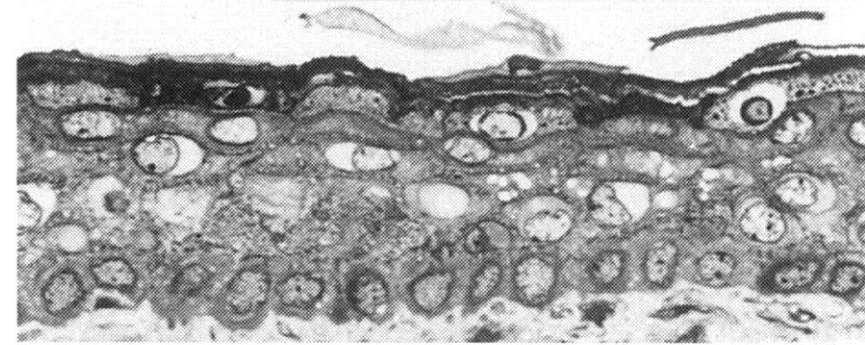
11 weeks



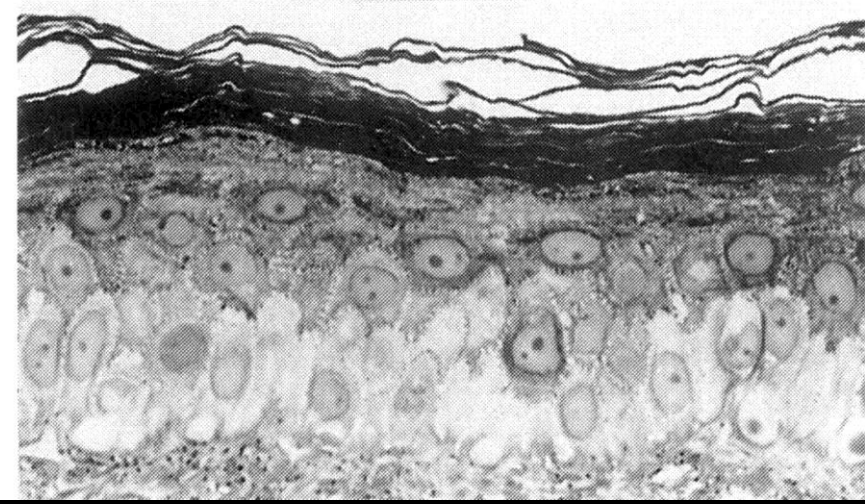
17 weeks



24 weeks



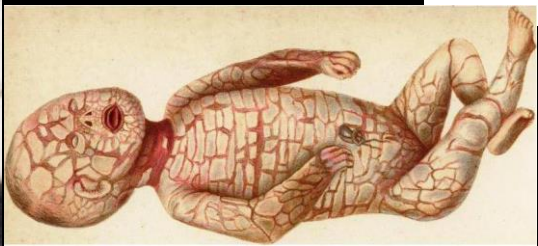
Adult



D



Ichthyosis



Harlekýnský plod

B

Kožní adnexa (deriváty)

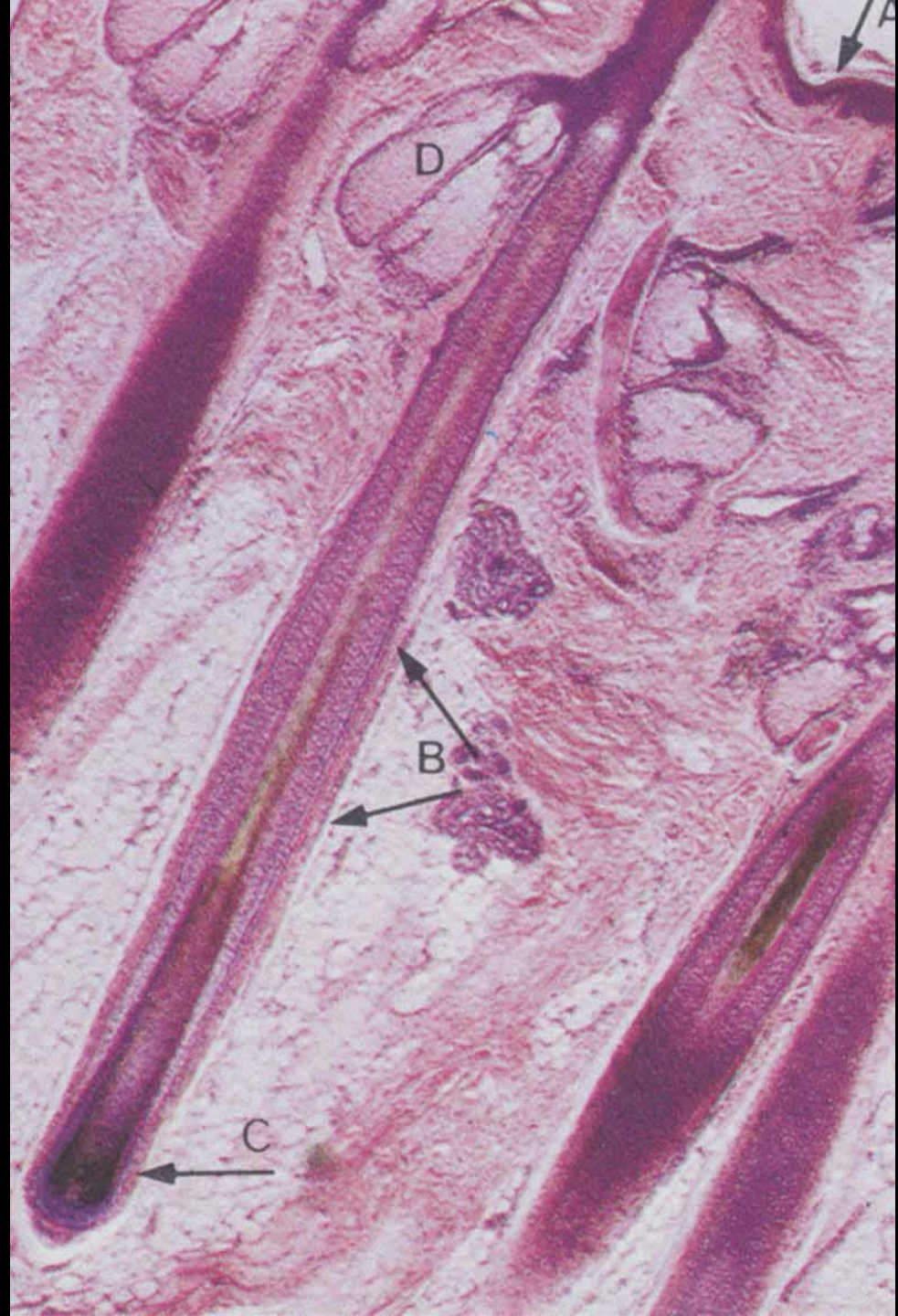
- **Vlasy (chlupy, vousy, řasy)**
- **Nehty**
- **Žlázy**
 - **mazové**
 - **potní**
 - **vlastní (ekrinní, merokrinní)**
 - **aromatické (apokrinní)**
 - **mléčné**

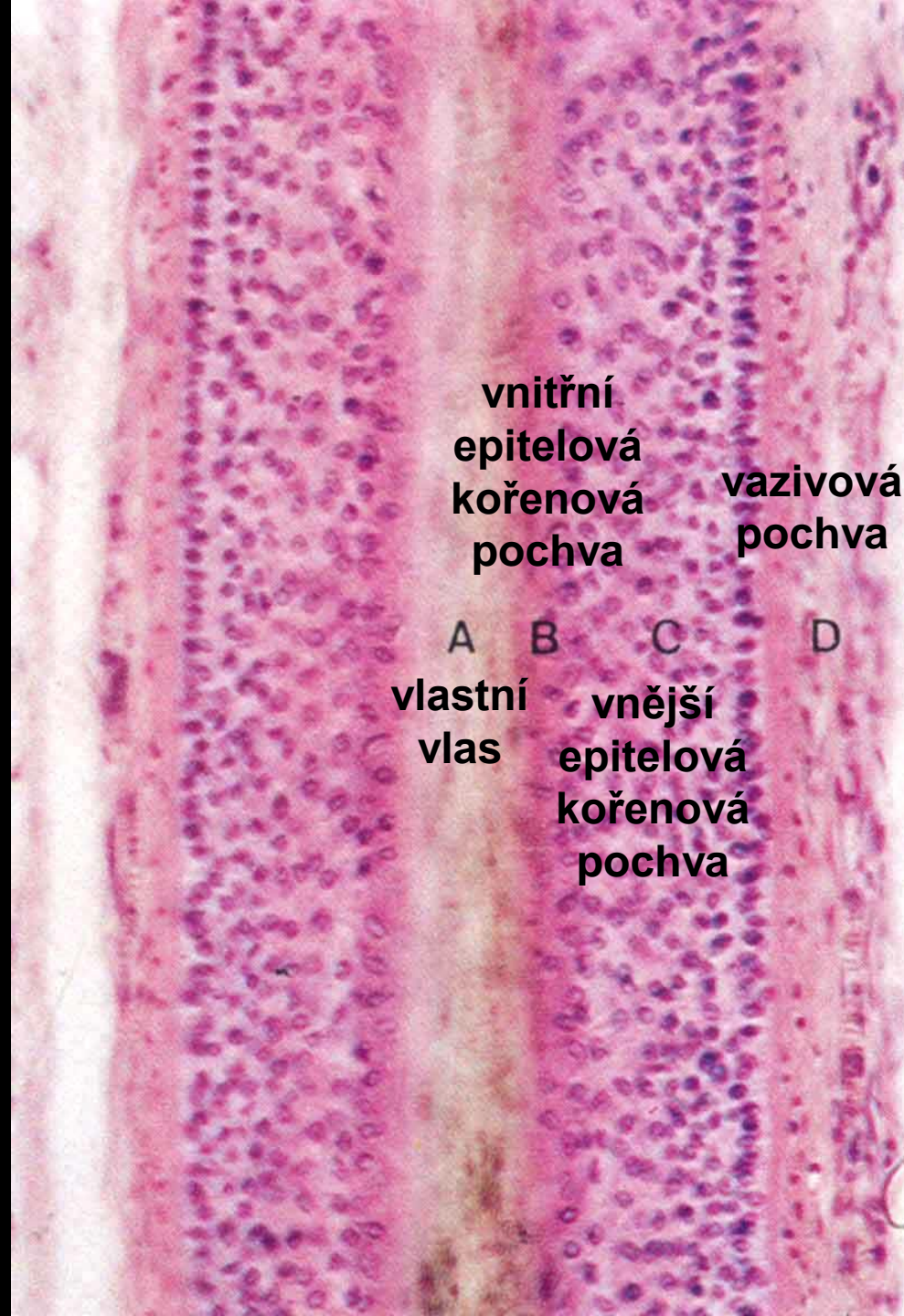
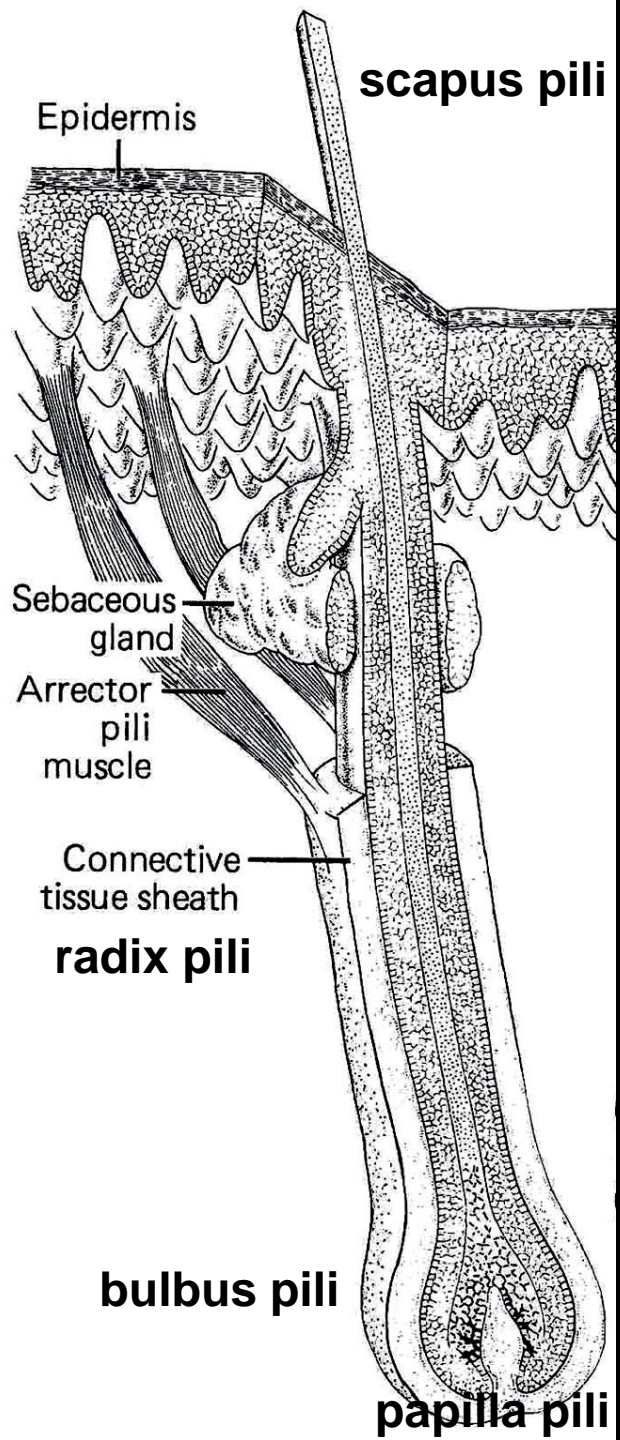
Vlasy

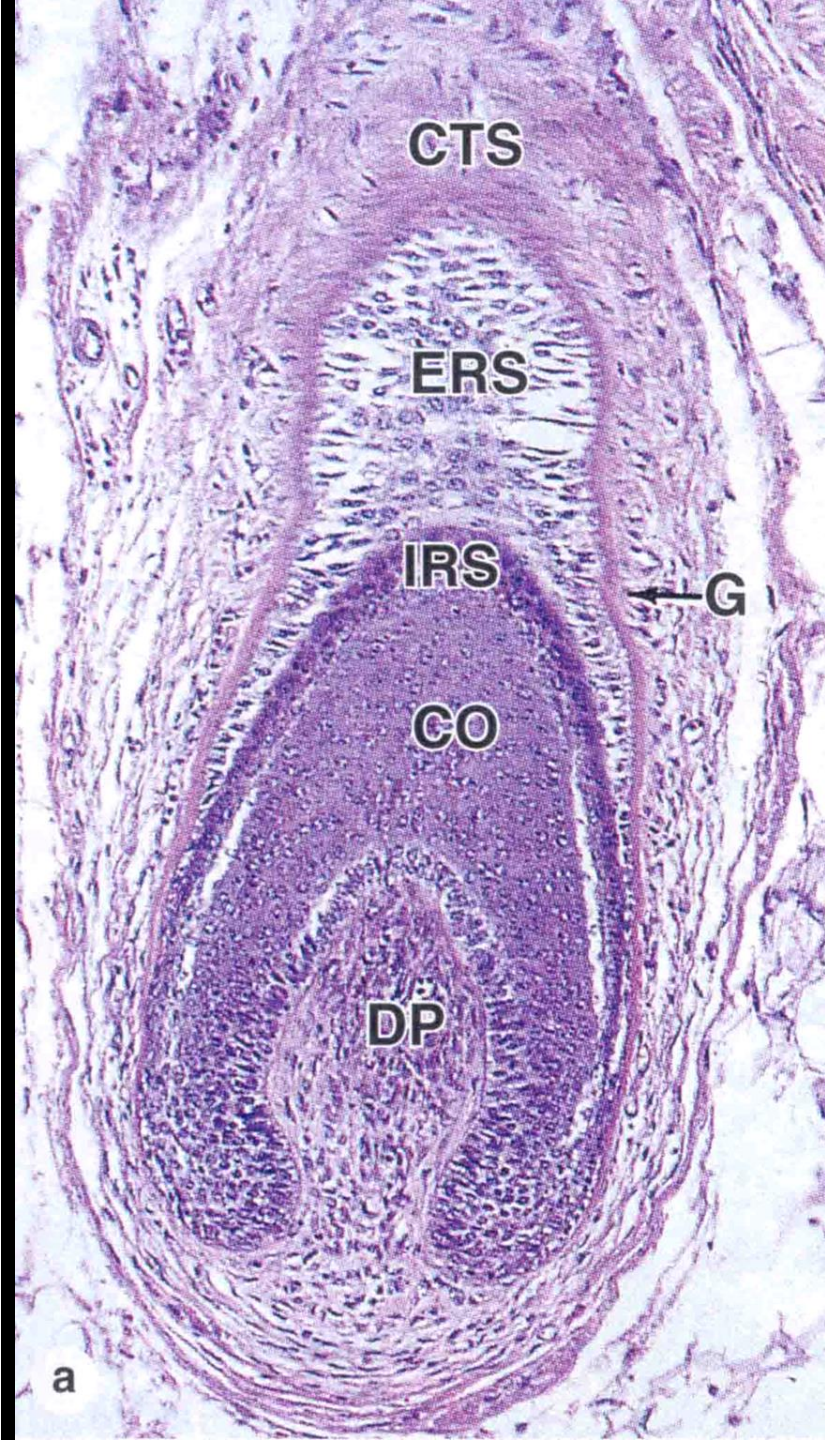
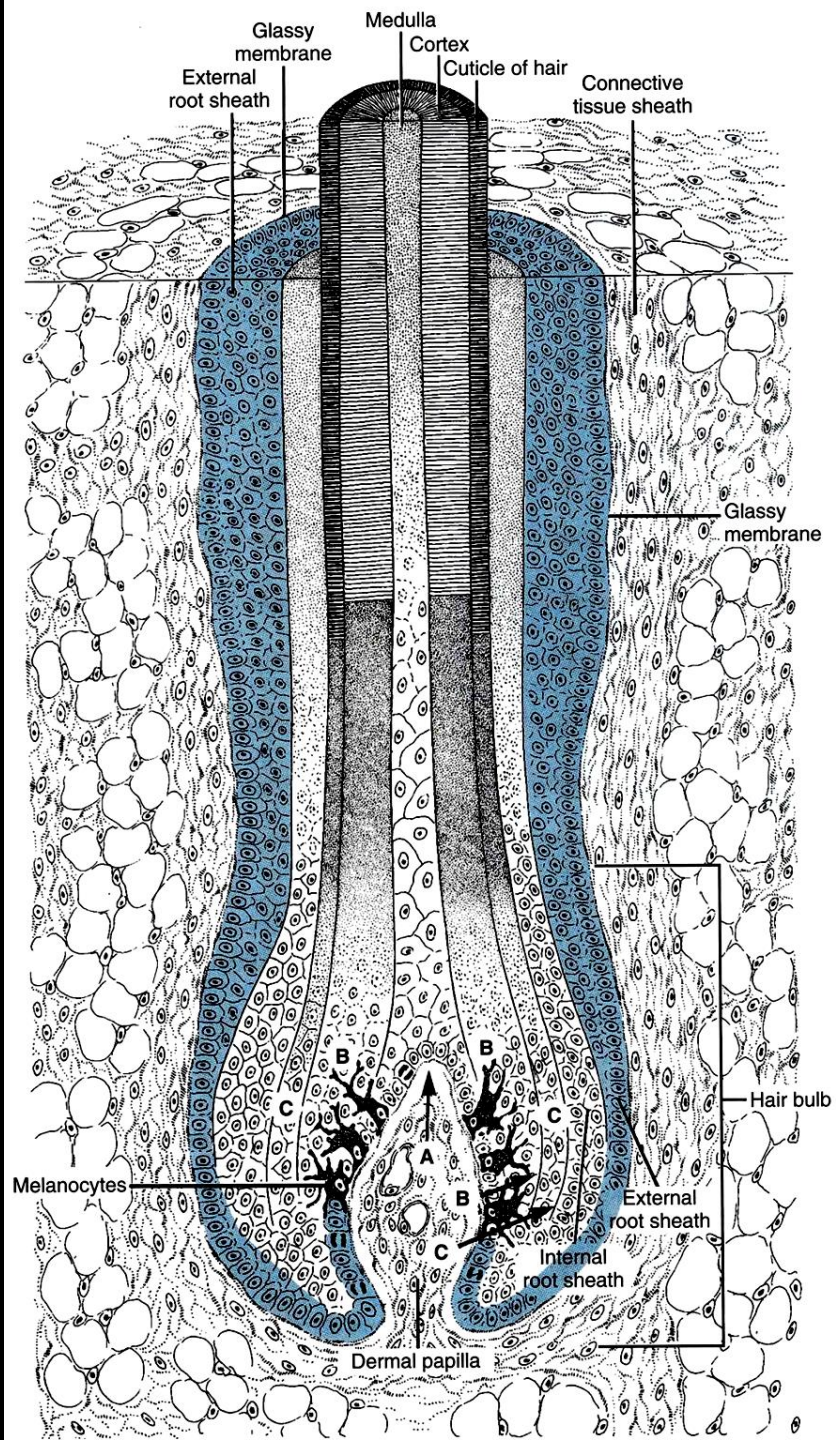
- chlupy (pili)
- vlasy (capilli)
- obočí (supercilia)
- řasy (cilia)
- vousy (barba)
- tragi (zevní zvukovod)
- vibrissae (nos)
- hirci (podpaží)
- pubes (ohanbí)
- hmatové (sinusové)

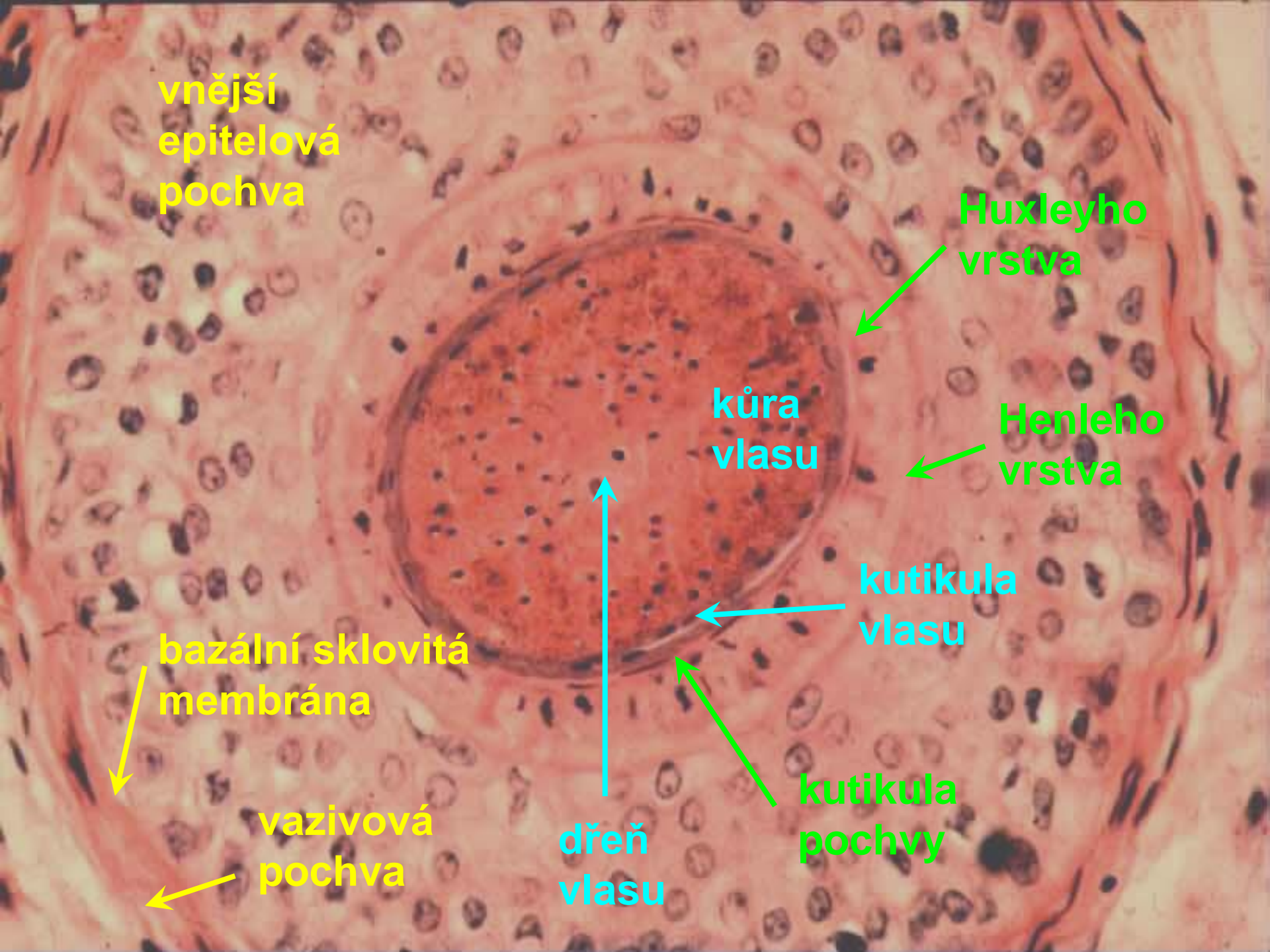
hlava 600 / mm²

tělo 60 / mm²









vnější
epitelová
pochva

Huxleyho
vrstva

kúra
vlasu

Henleho
vrstva

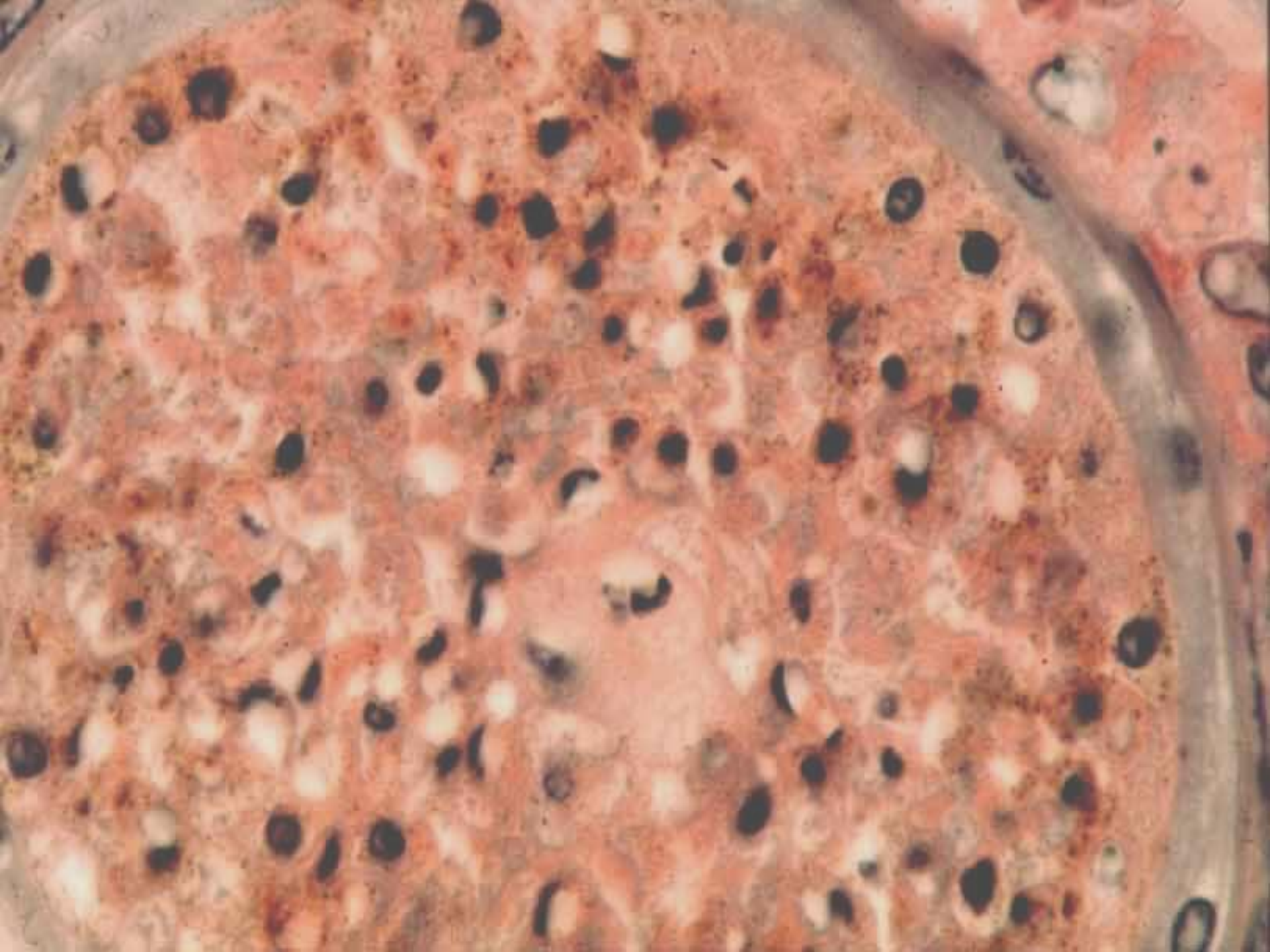
kutikula
vlasu

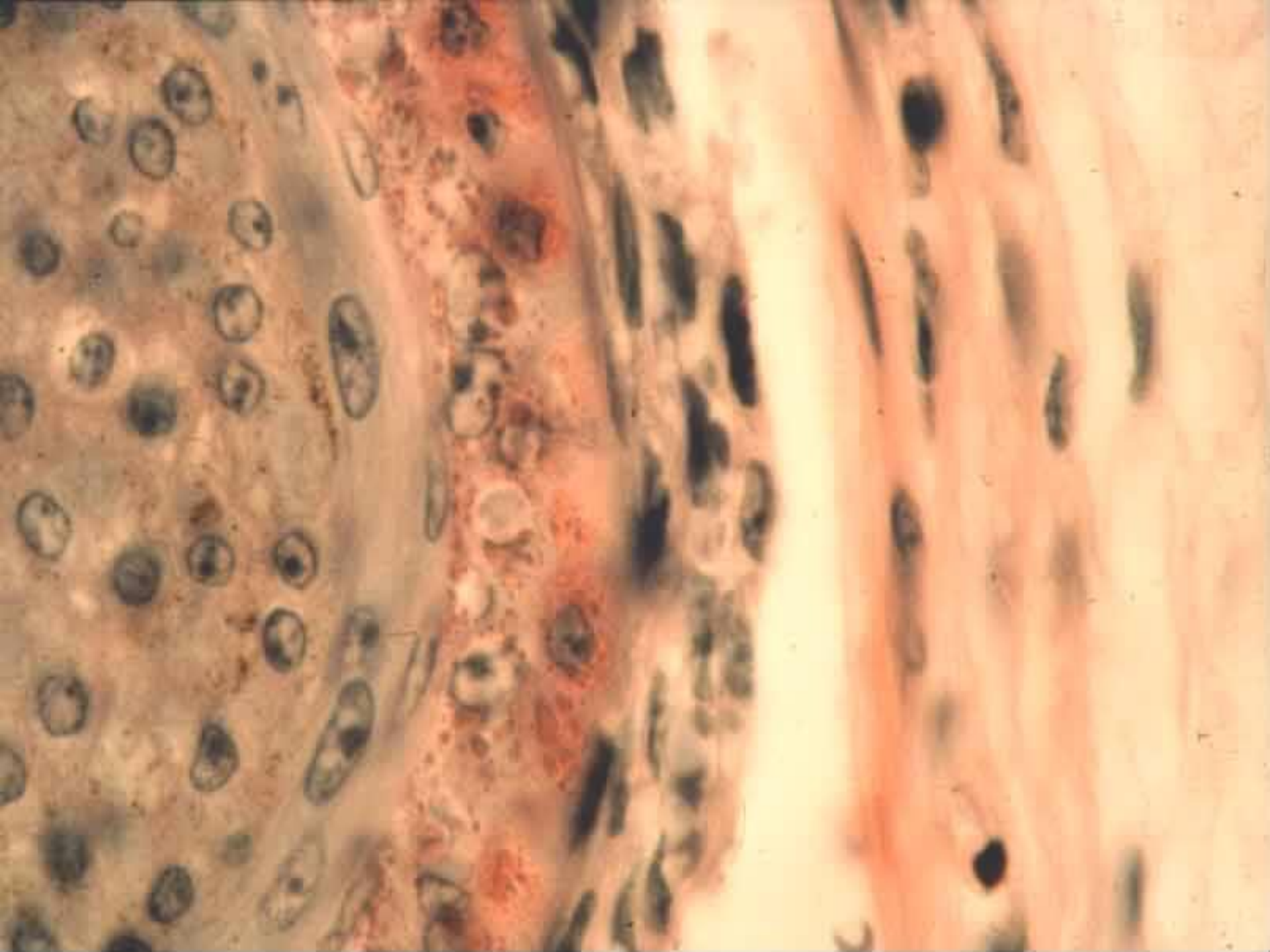
bazální sklovitá
membrána

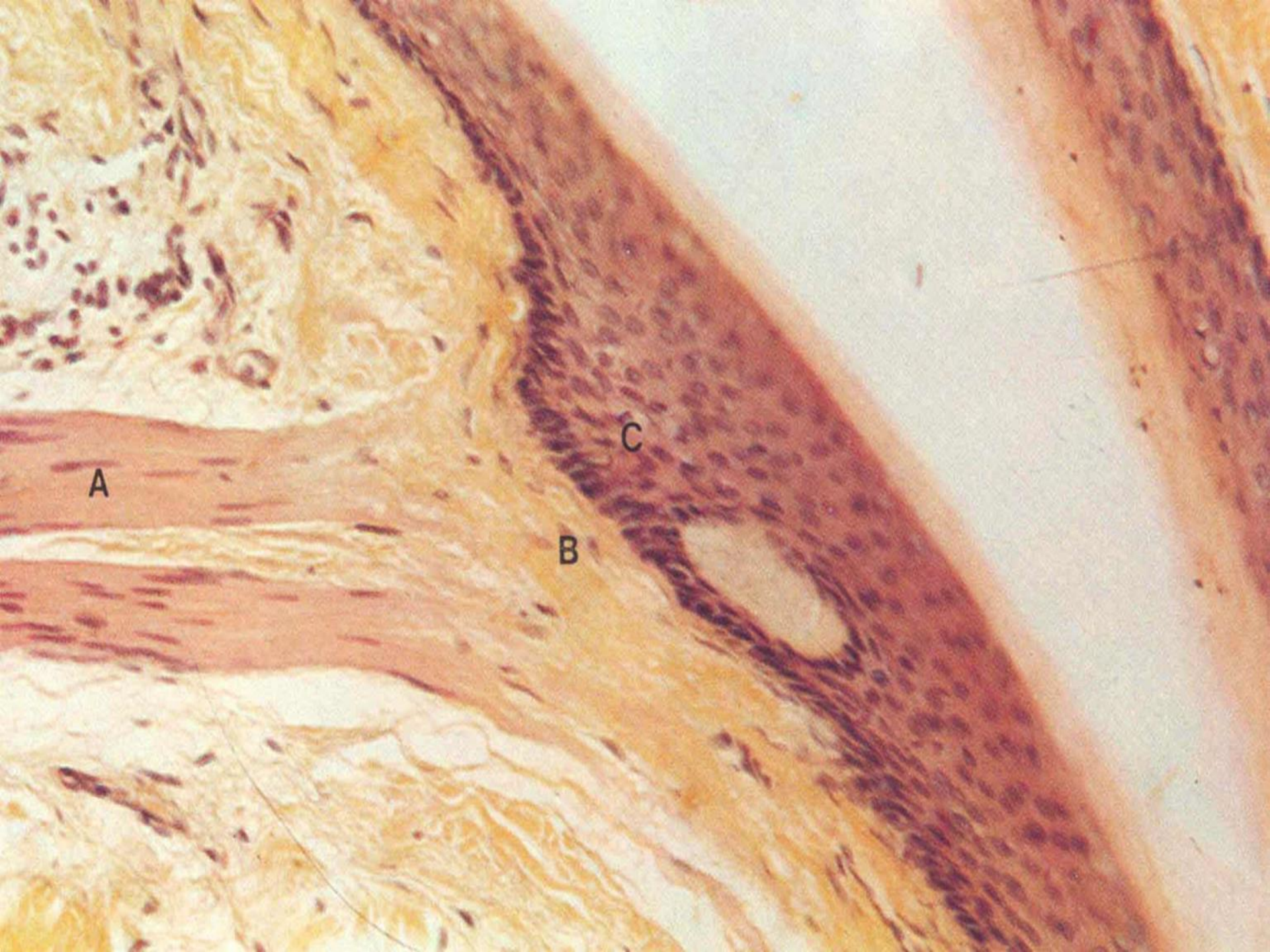
vazivová
pochva

dřeň
vlasu

kutikula
pochvy







A

B

C

Růst vlasu

- **anagen** - 3 roky/ 1000 dnů
- **katagen** - 3 týdny/ 10 dnů
- **telogen** - 3 měsíce/ 100 dnů

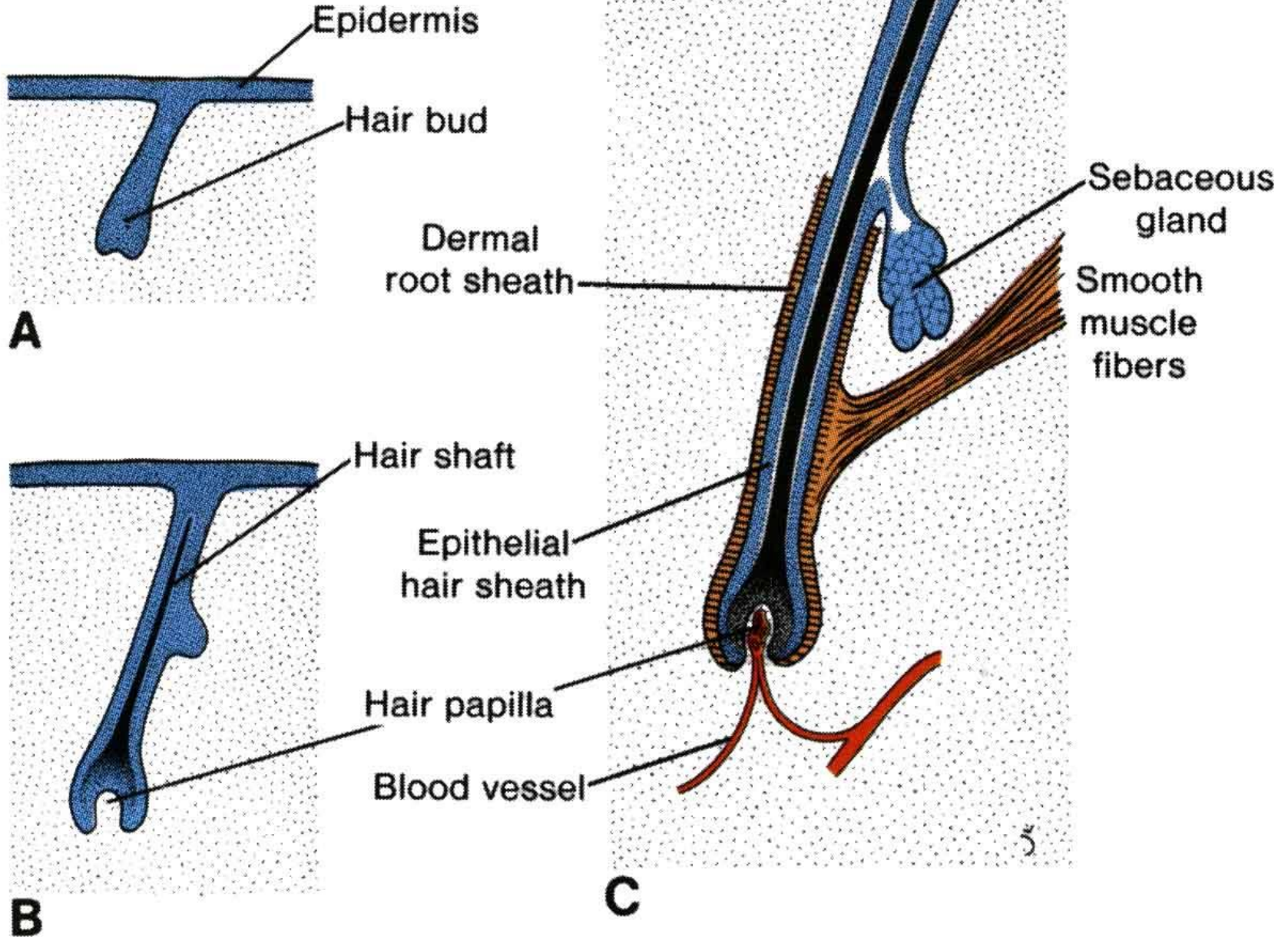
zánik cibulky a její obnovení, folikul zůstává
růst 0,4 mm/den

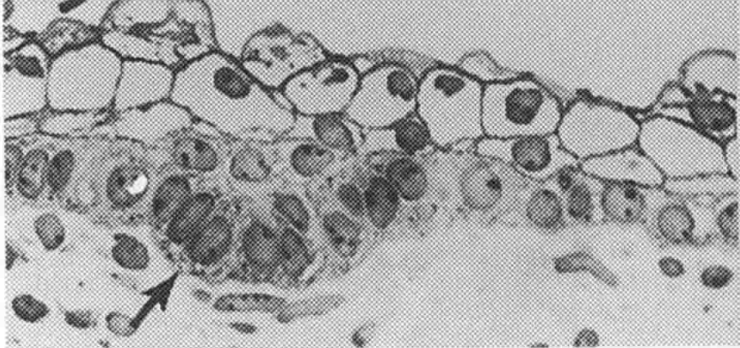
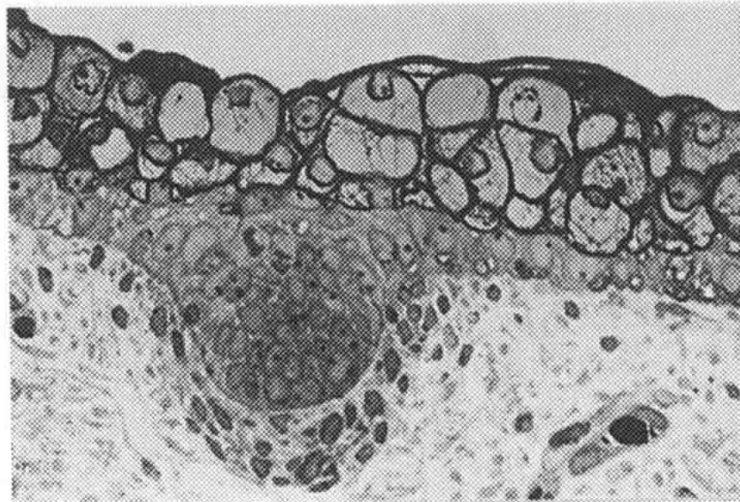
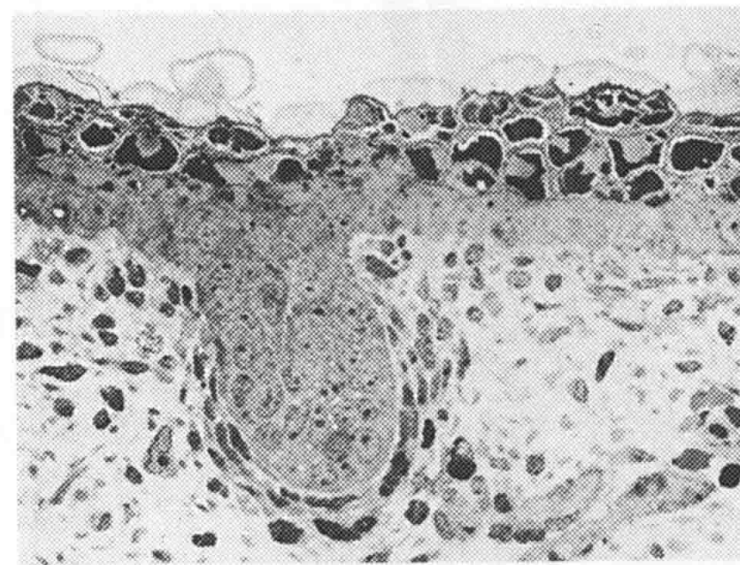
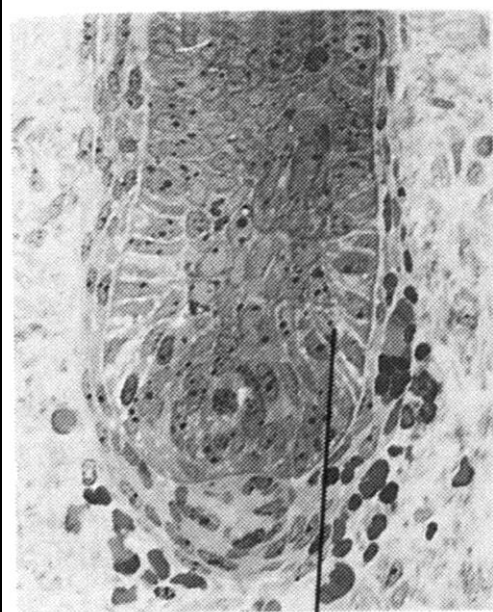
výpad – do 100 vlasů denně (z hlavy) – více
effluvium

alopecie – bezvlasá ložiska

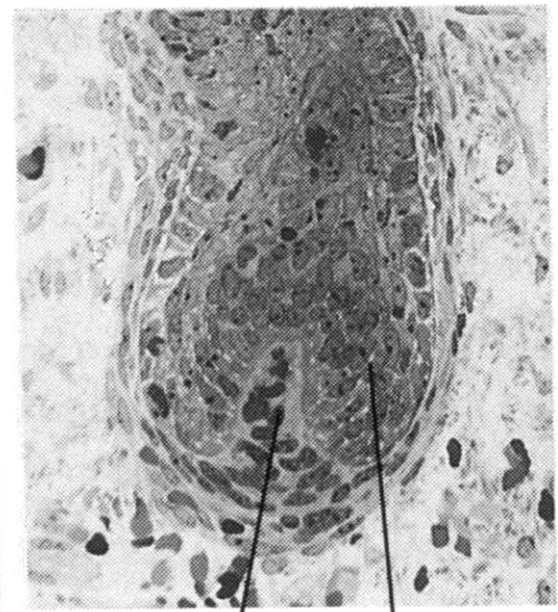
vlivy: hormonální, nutriční, toxické (infekce,
chemoterapie, autoimunitní)

Vývoj vlasů a mazových žláz



A**B****C****D**

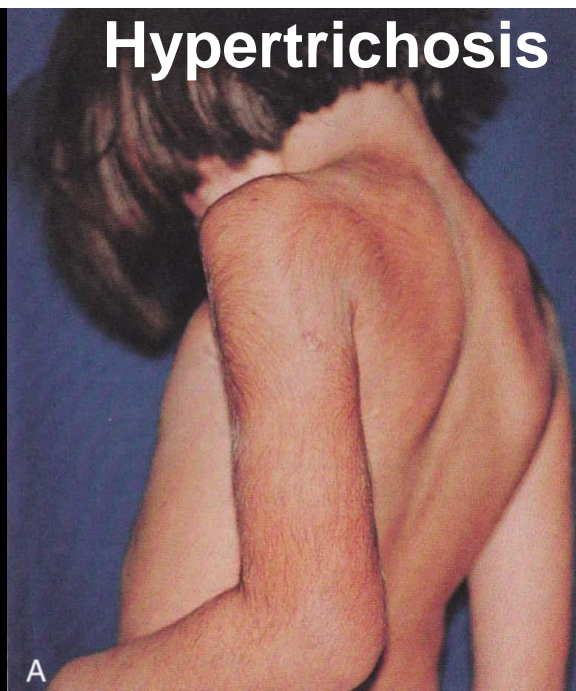
GM

E

DP

GM

Hypertrichosis

A

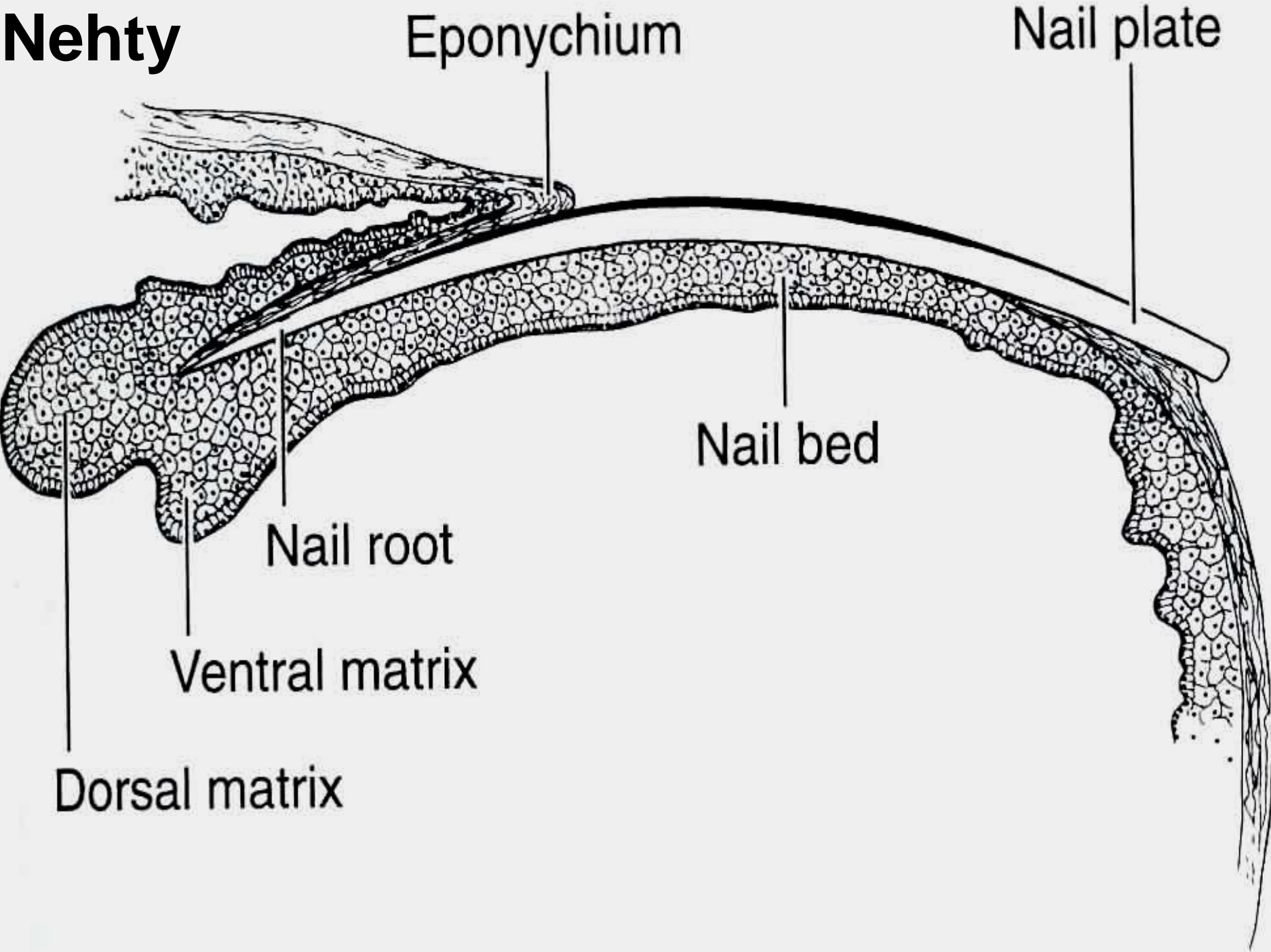


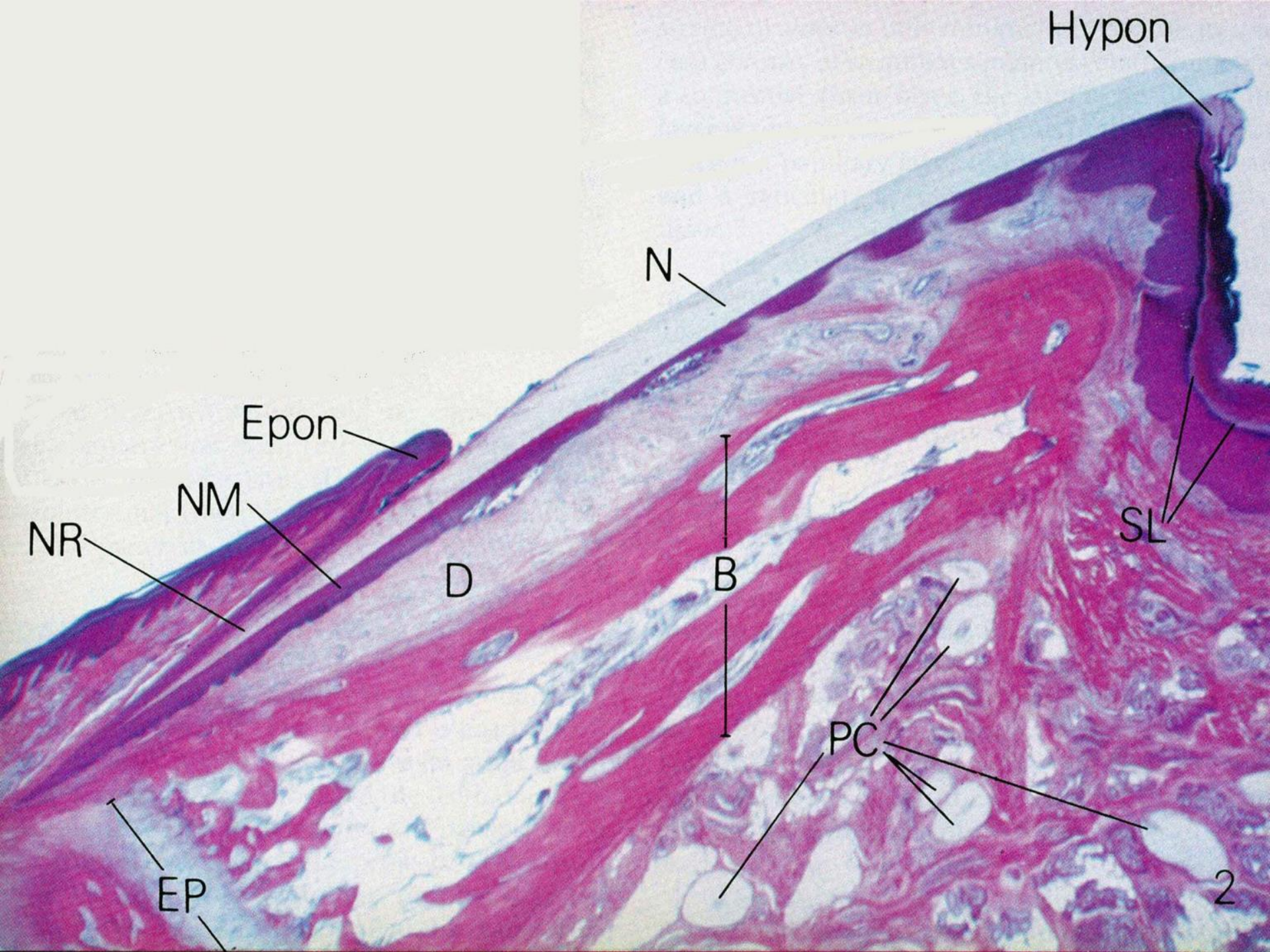
lanugo

vernix caseosa



Nehty

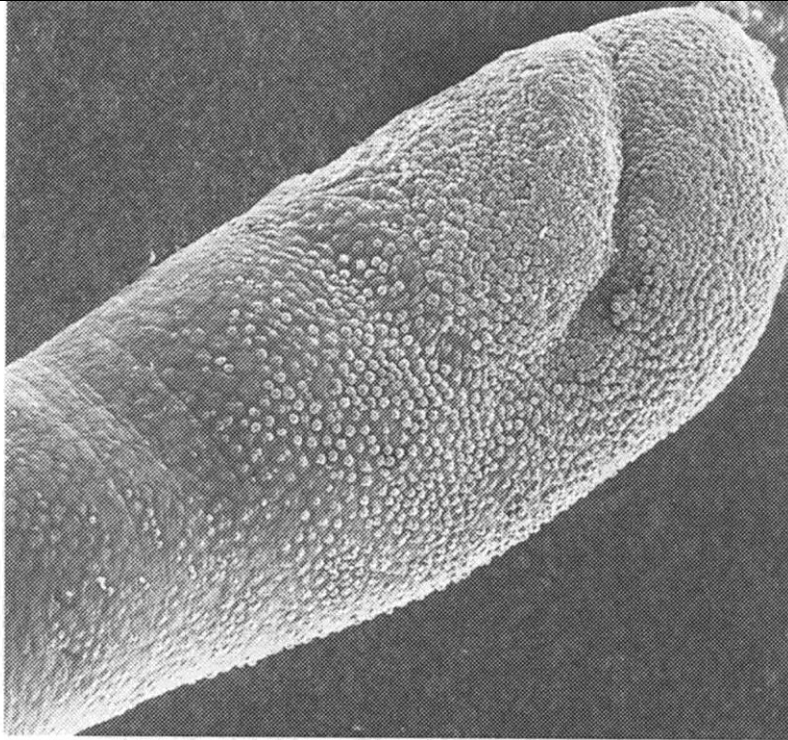




Vývoj nehtů

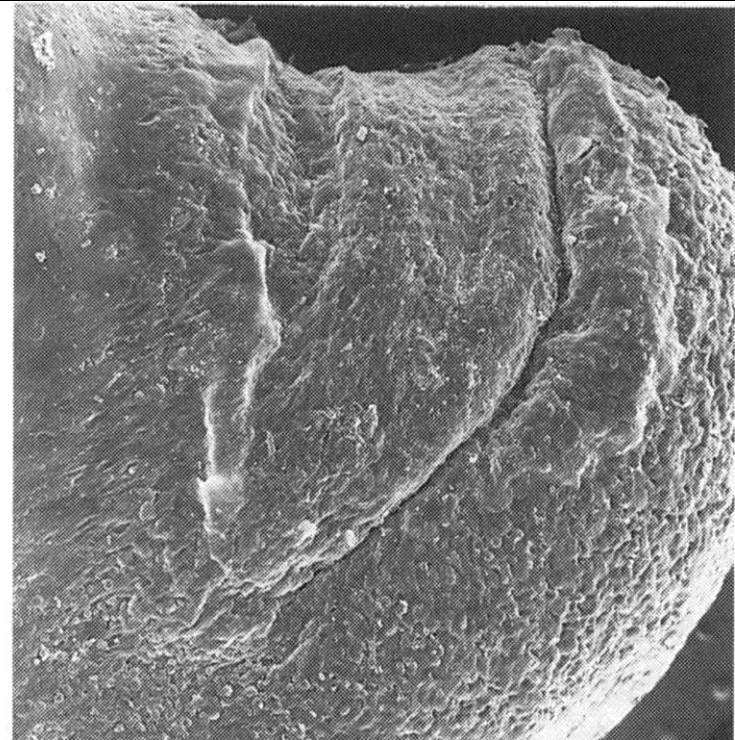
A

12 weeks



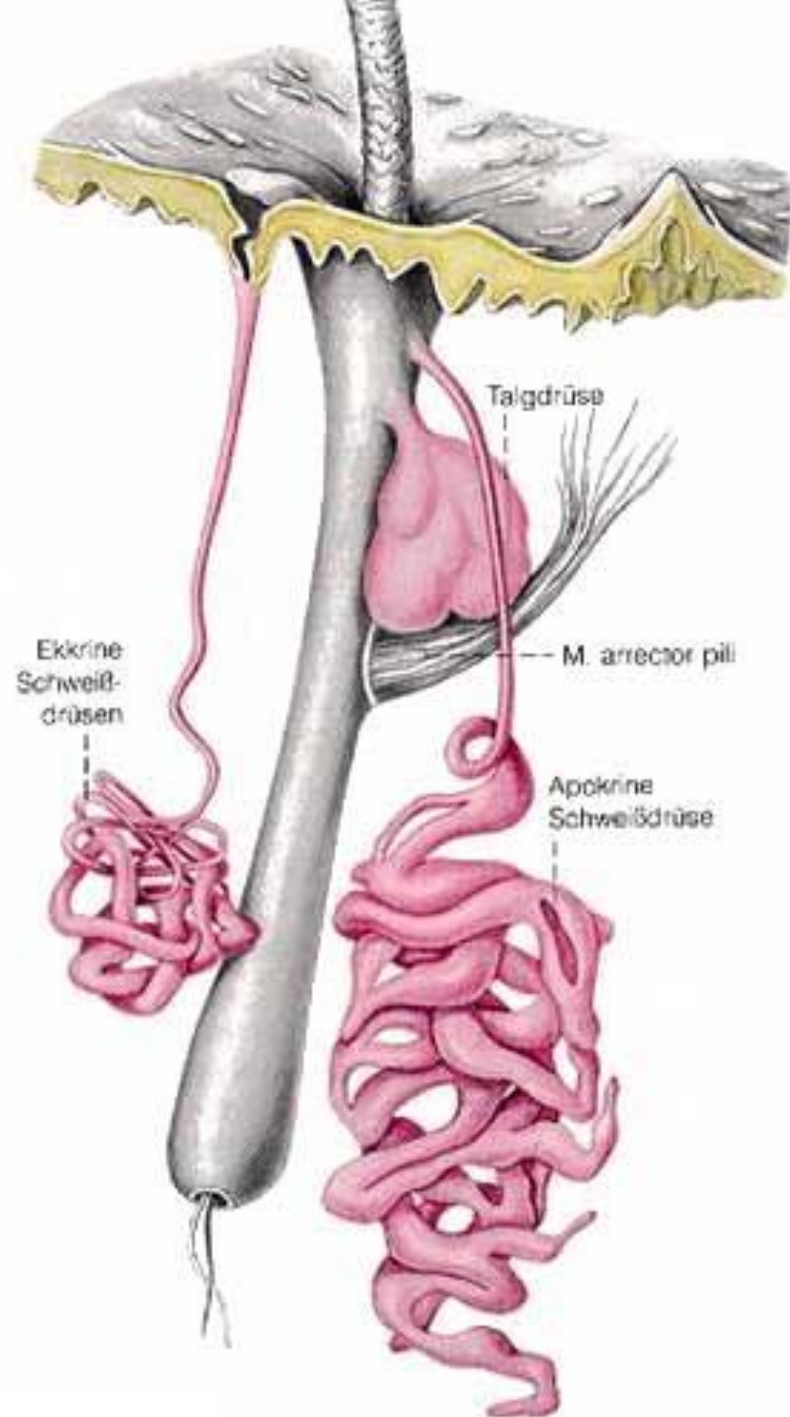
C

16 weeks



Kožní žlázy

- mazové
- potní vlastní (ekkrinní)
- potní pachové (aromatické, apokrinní)

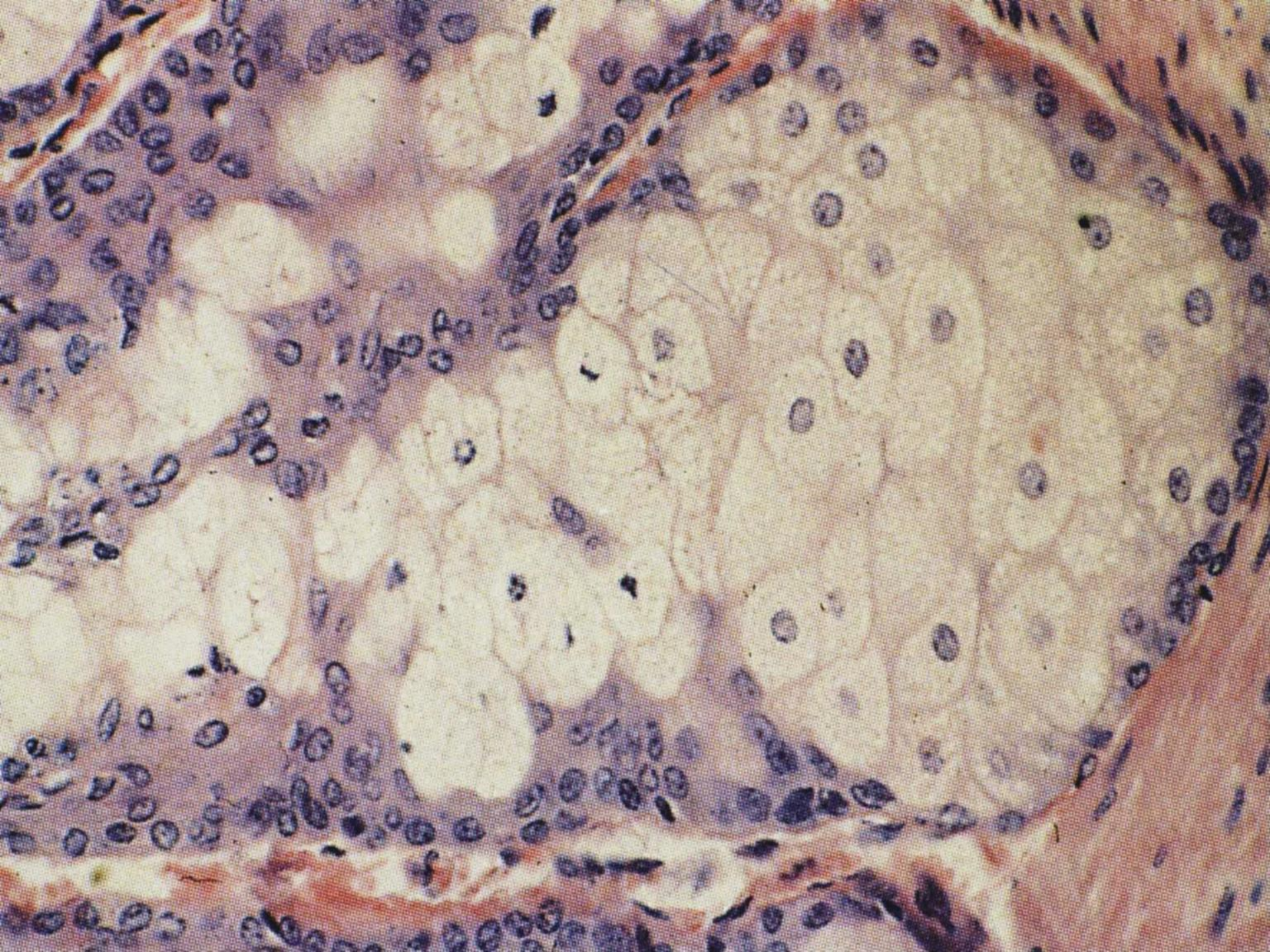


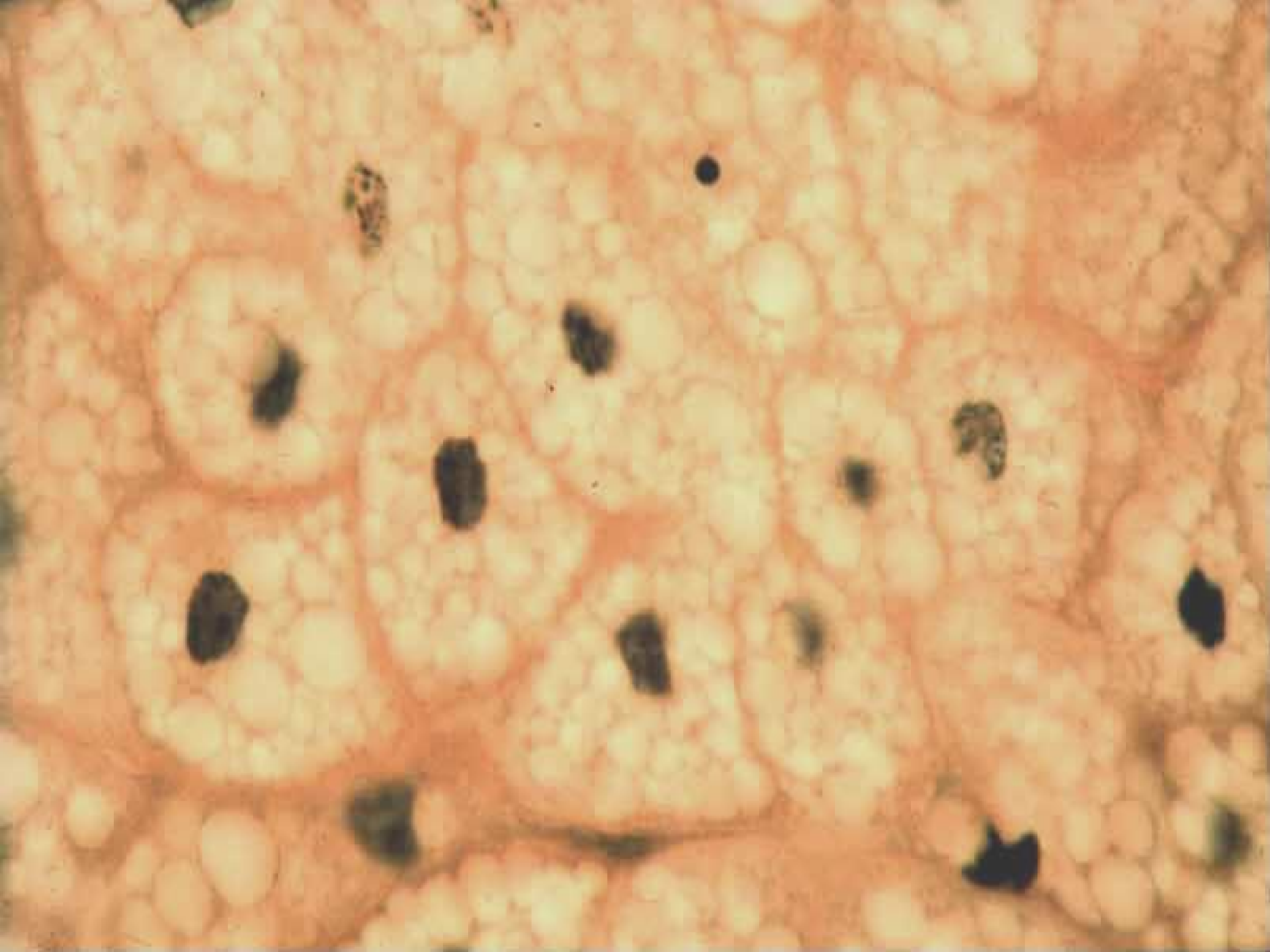
Mazové žlázy

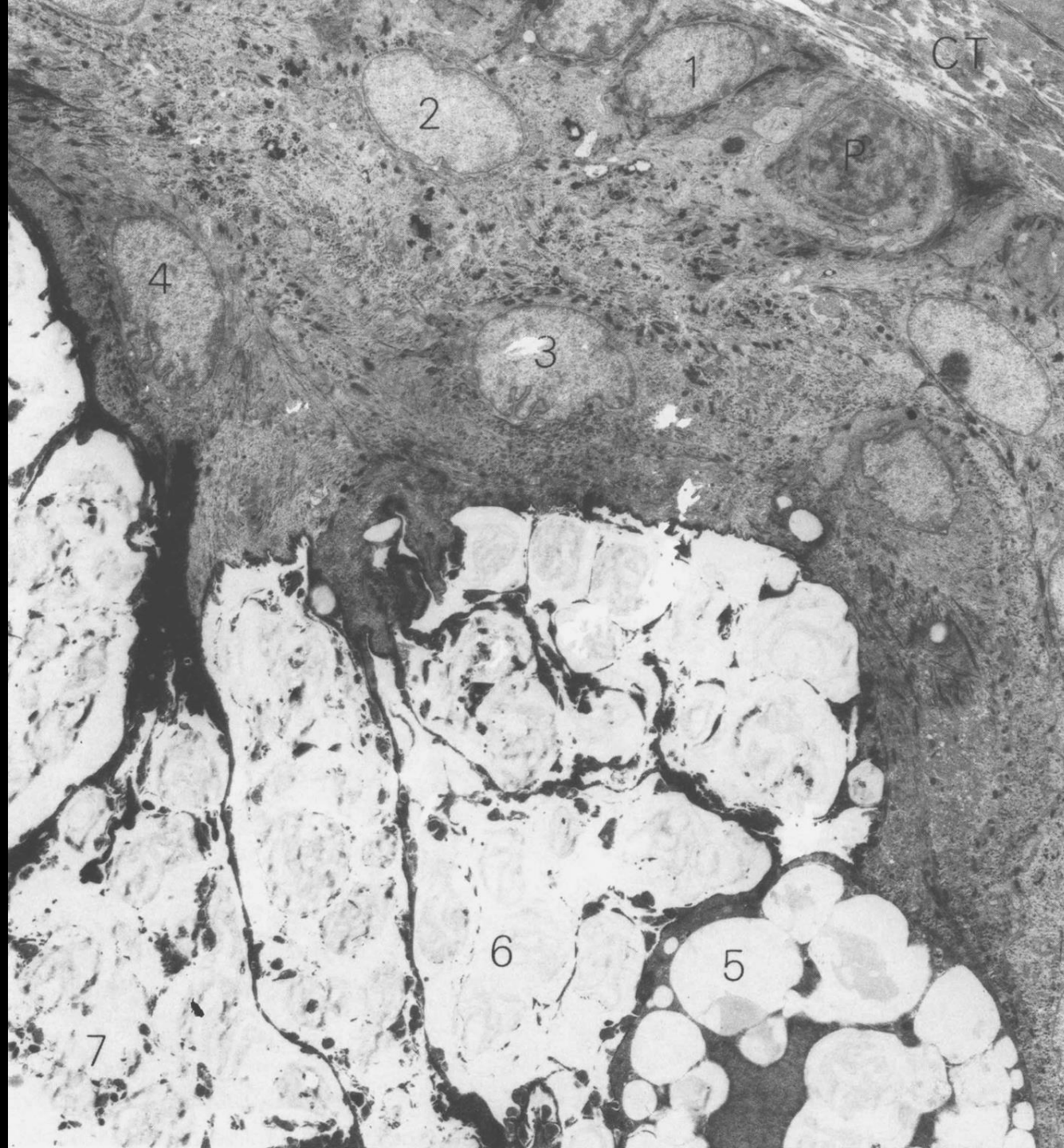
(Glandulae sebaceae)

- rozvětvené alveolární s vývodem do vlasového folikulu (výjimečně na povrch epidermis)
- holokrinní způsob sekrece
- po celém těle (100 na cm²)
- obličej, kštice (400-900 na cm²)
- chybí na dlaních a chodidlech
- tvoří maz (*sebum*)
 - směs triacylglycerolů, vosků, skvalenu, cholesterolu a jeho esterů



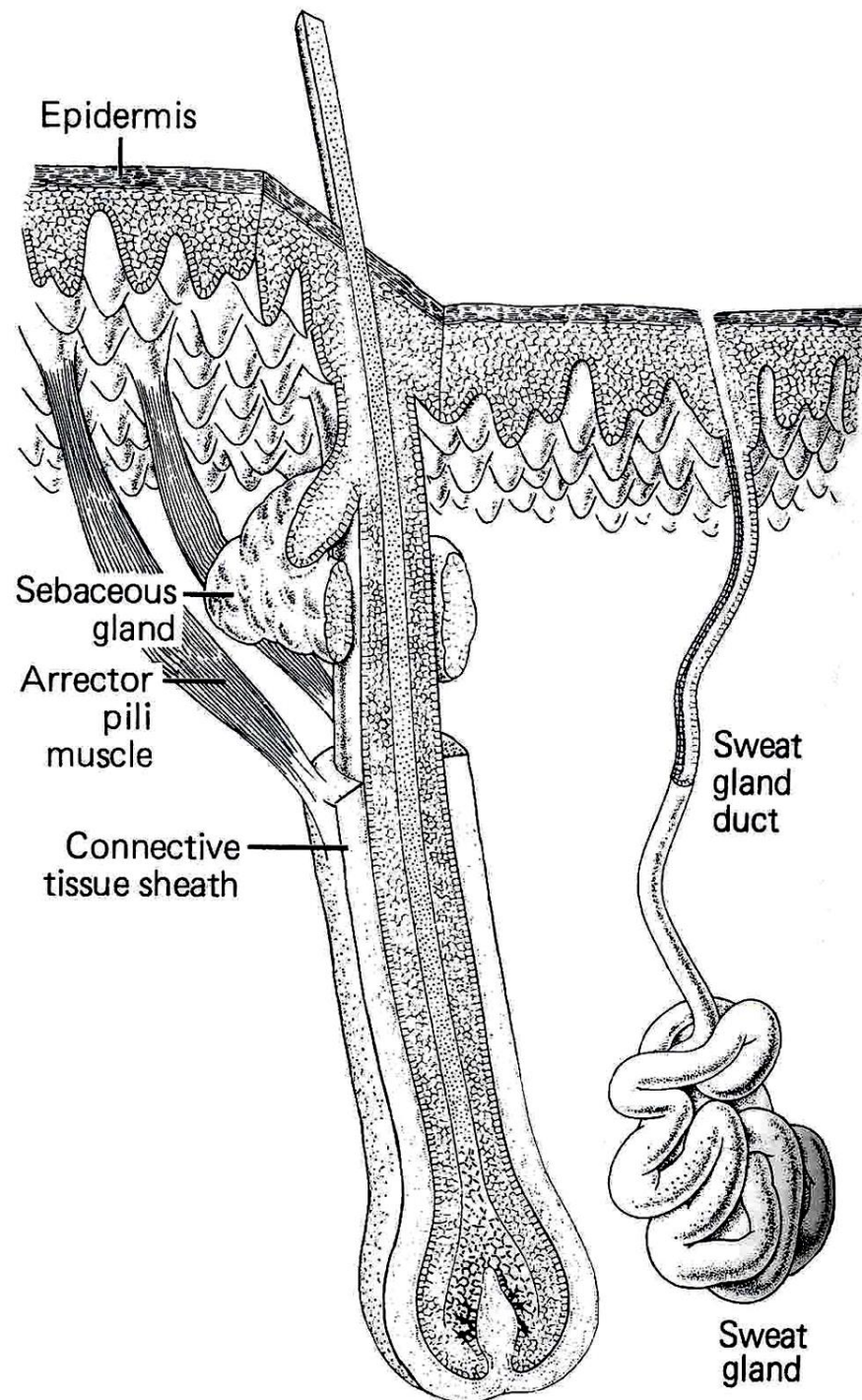


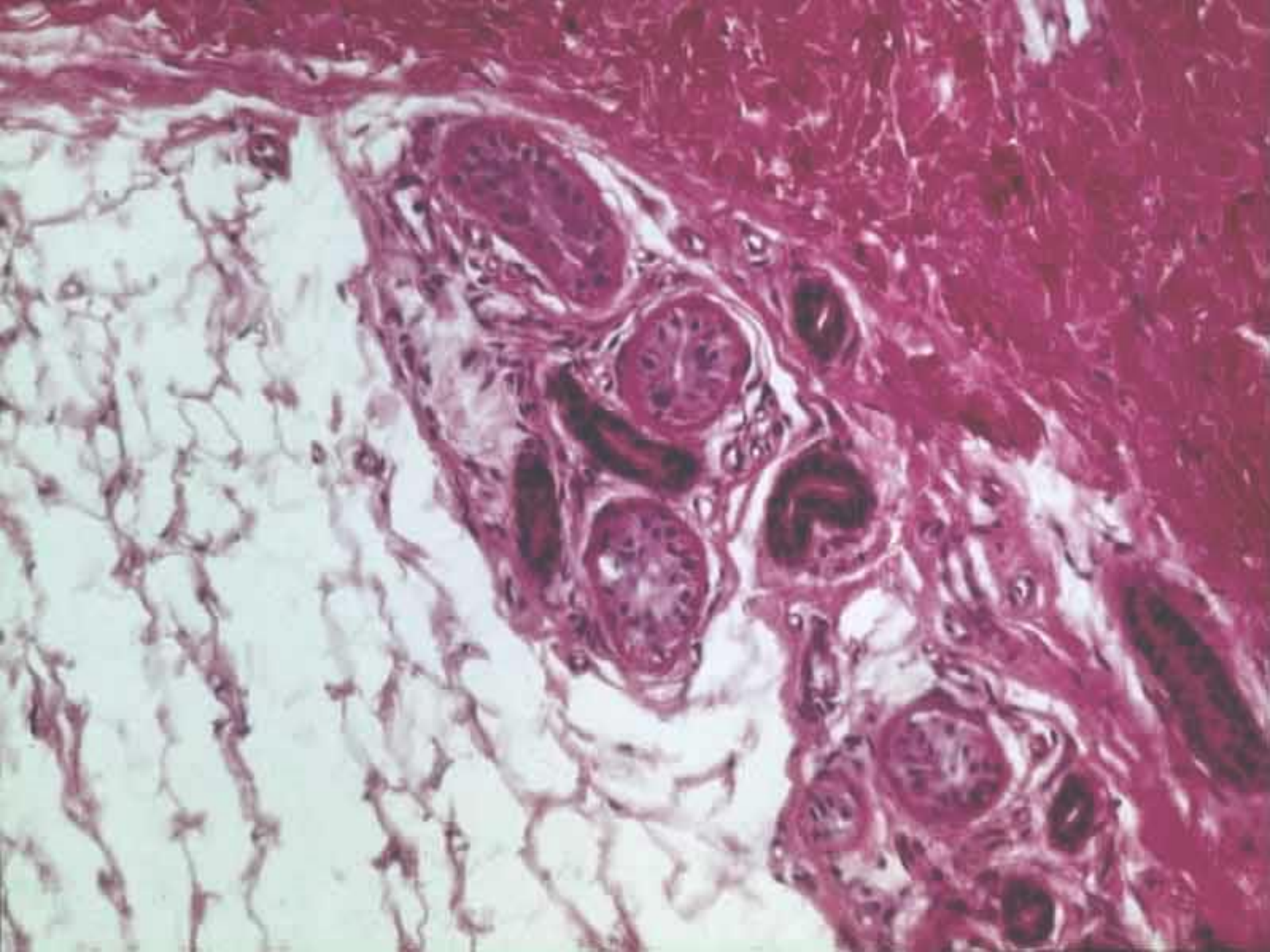


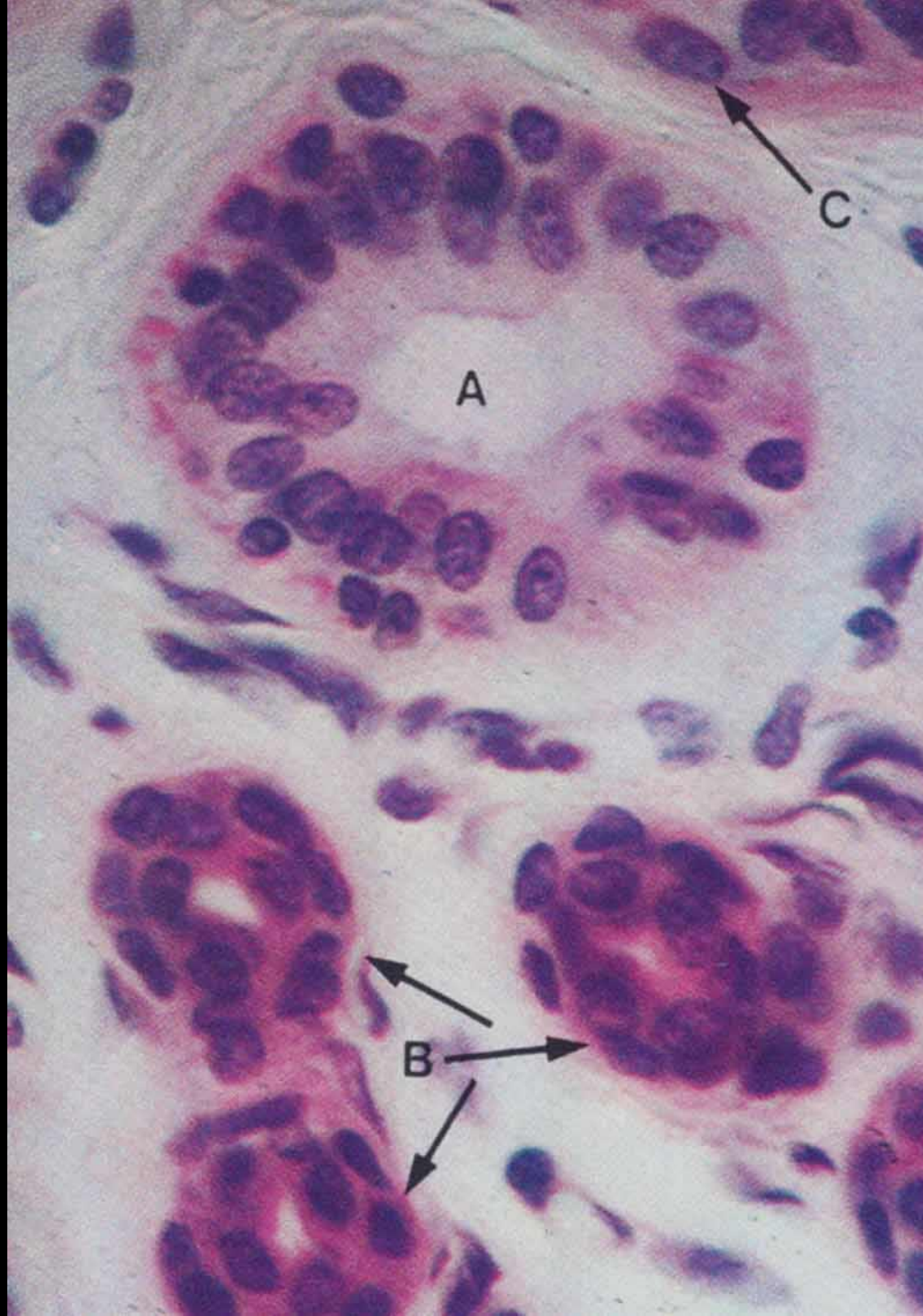


Vlastní (ekkrinní) potní žlázy (*Glandulae sudoriferae propriae / eccrinae*)

- jednoduché, tubulózní, stočené
- ústí mimo vlasové pochvy
- ekkrinní (merokrinní) sekrece
- všude, nejvíce na dlani, plosce a čele
- chybí na žaludu a vnitřní ploše předkožky
- pot (*sudor*)
 - voda, NaCl, močovina, amoniak, k. močová
- termoregulace
- sympatická cholinergní inervace!



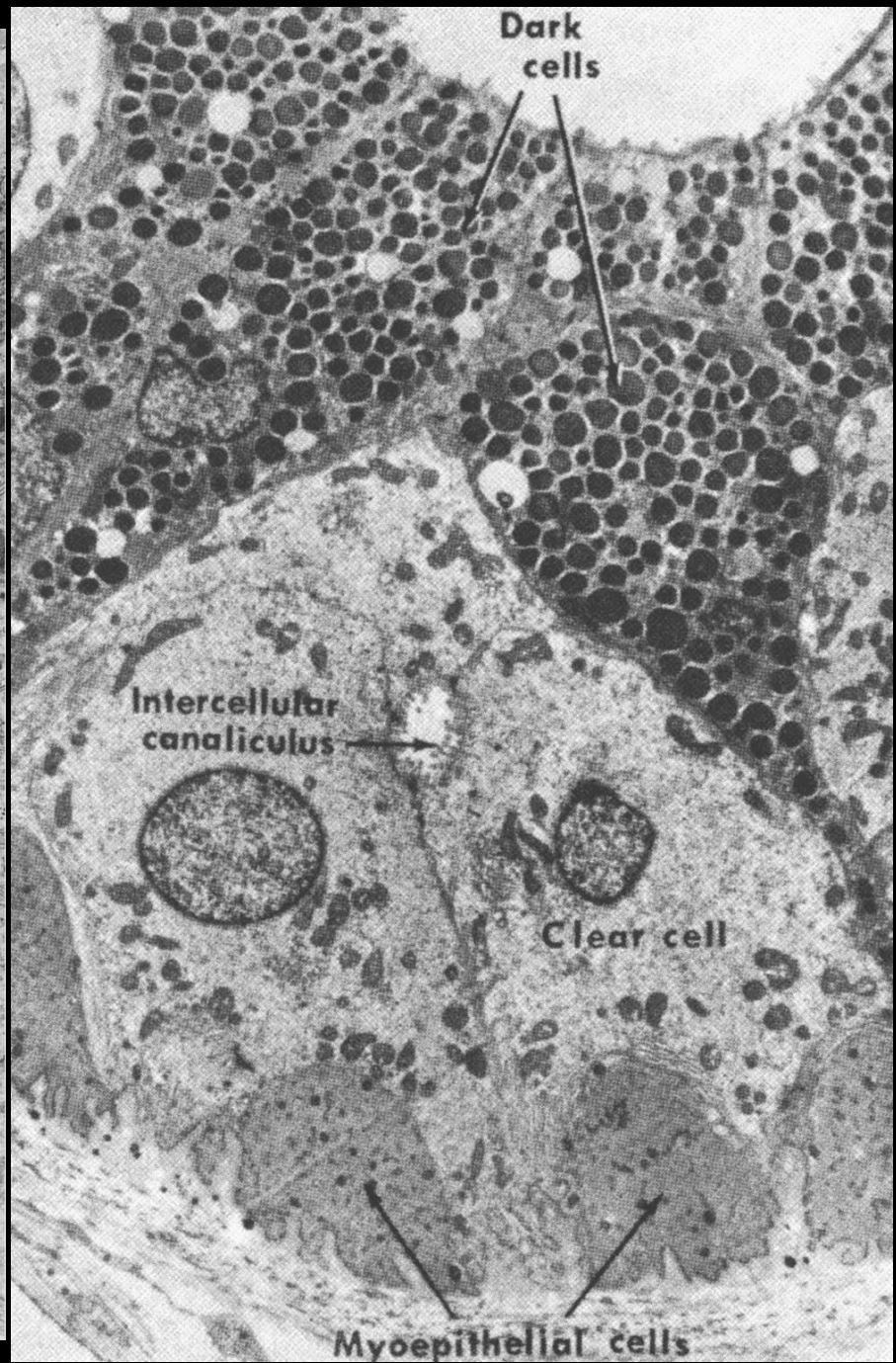
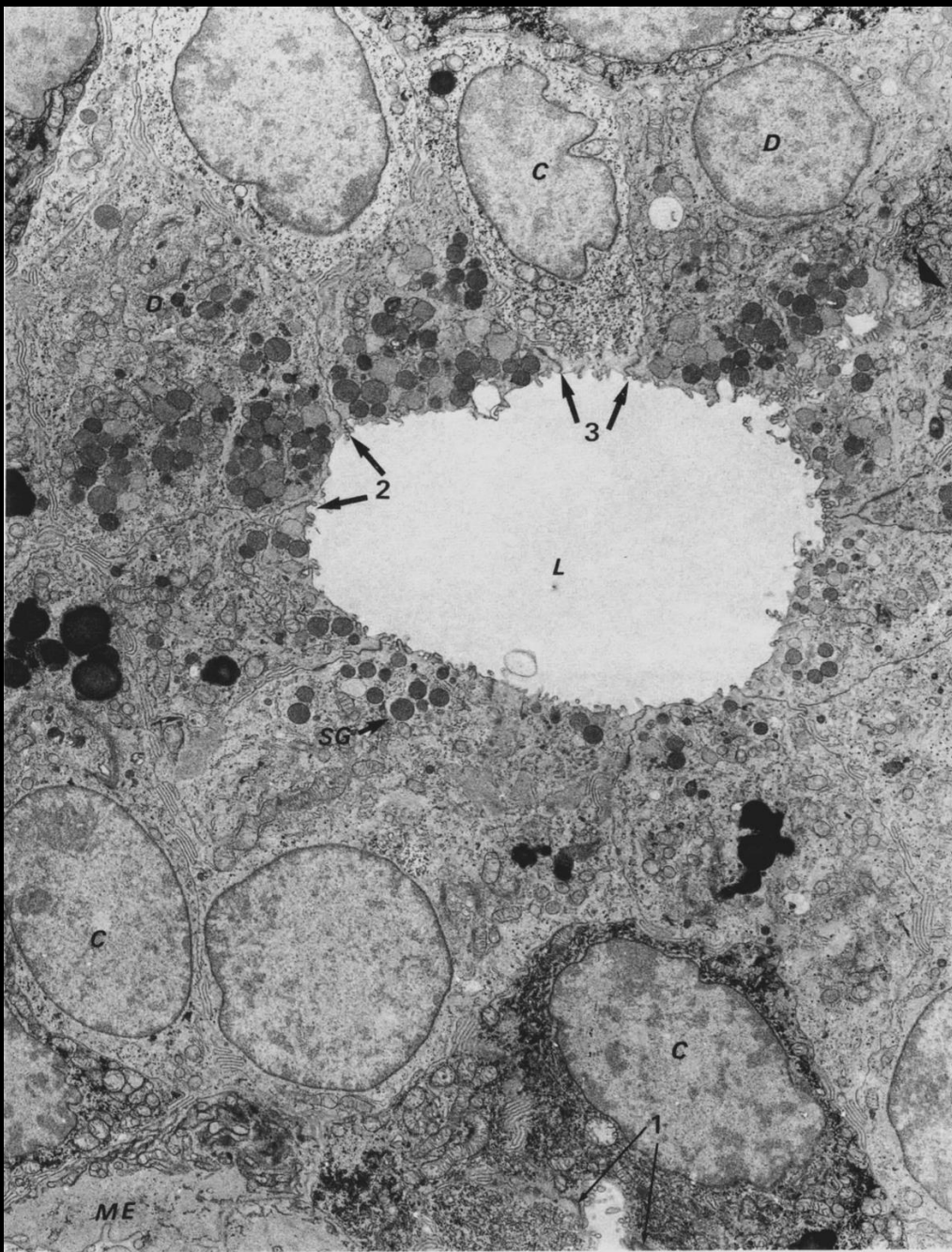


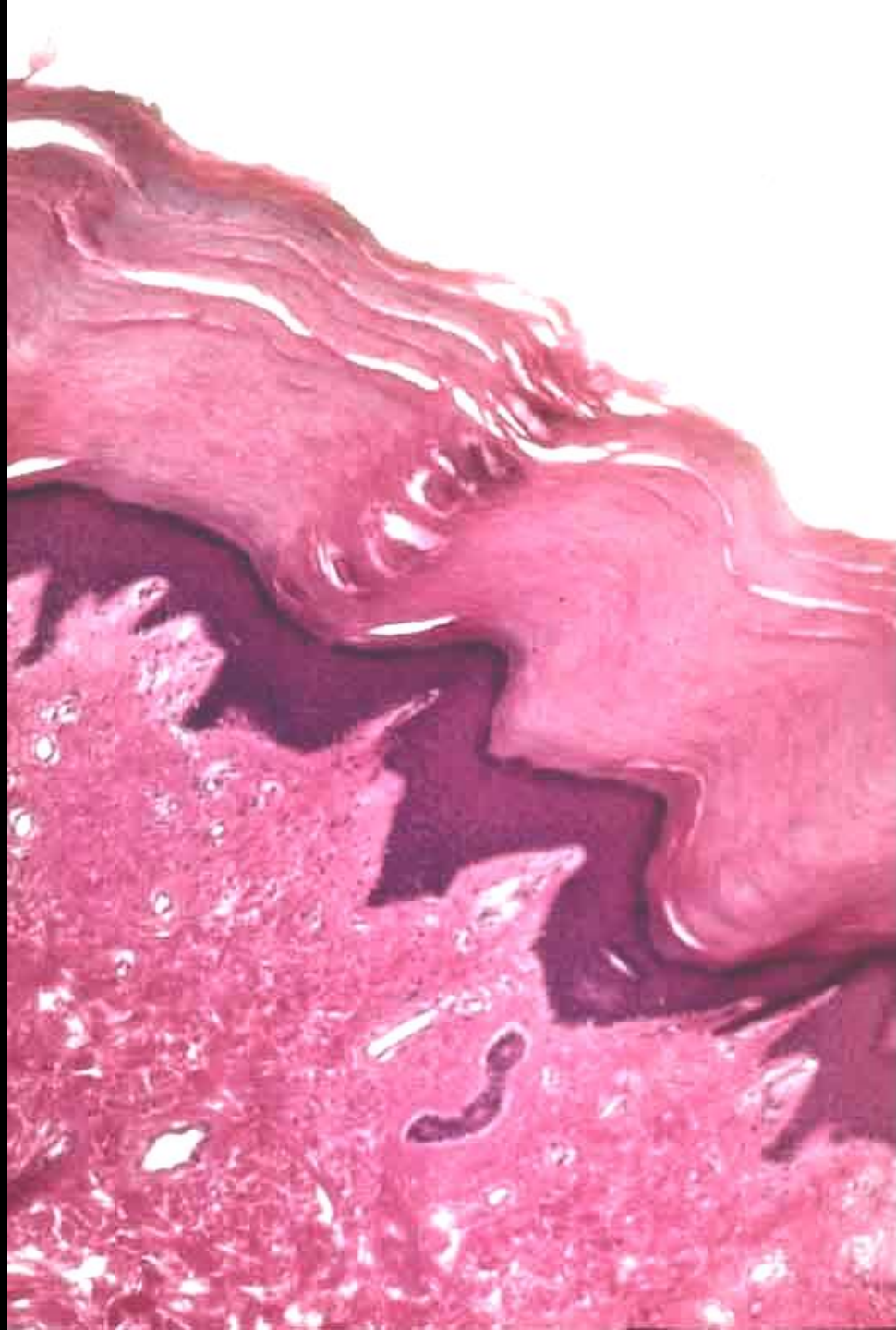


lumen

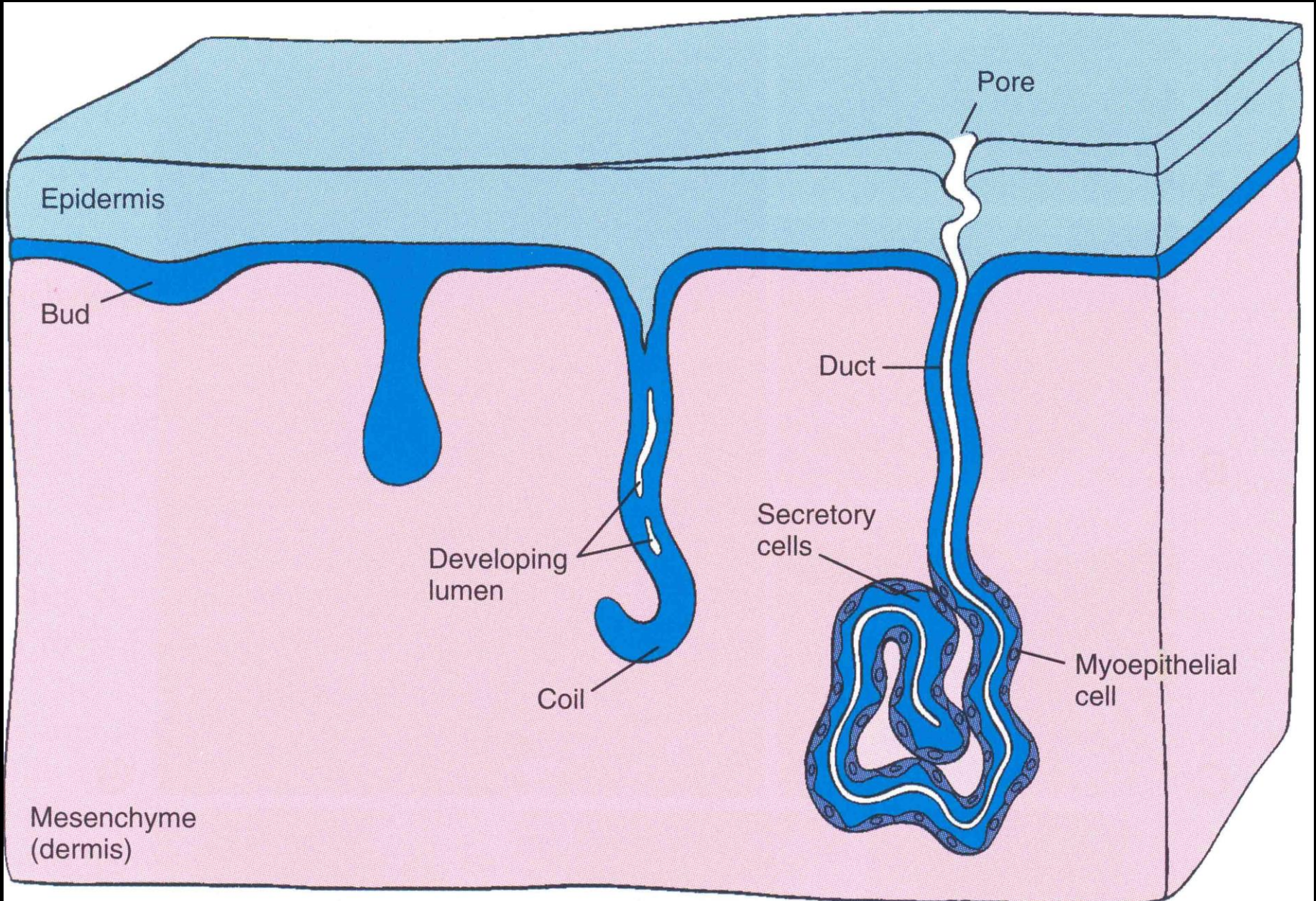


**světlá
buňka** **tmavá
buňka** **myoepitelová
buňka**





Vývoj potních žláz

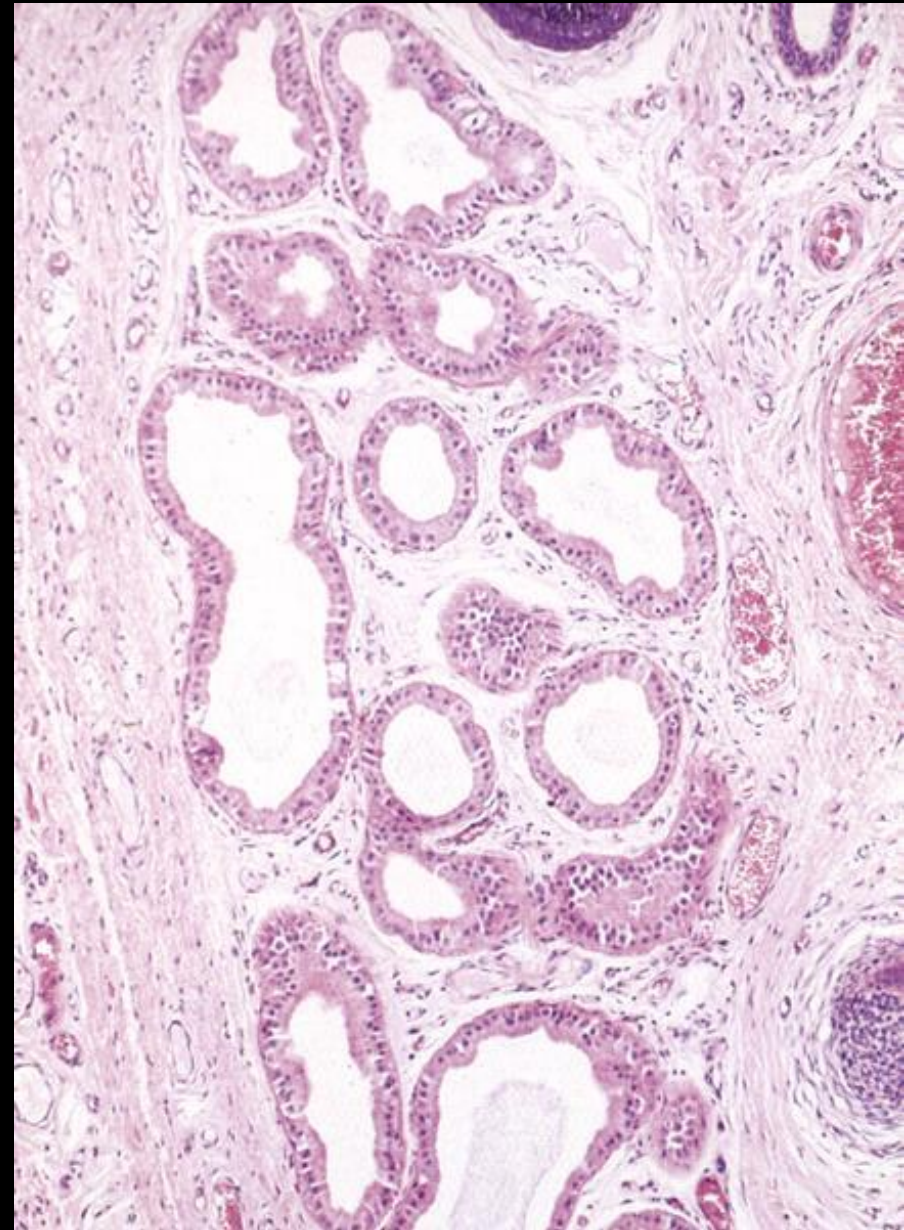


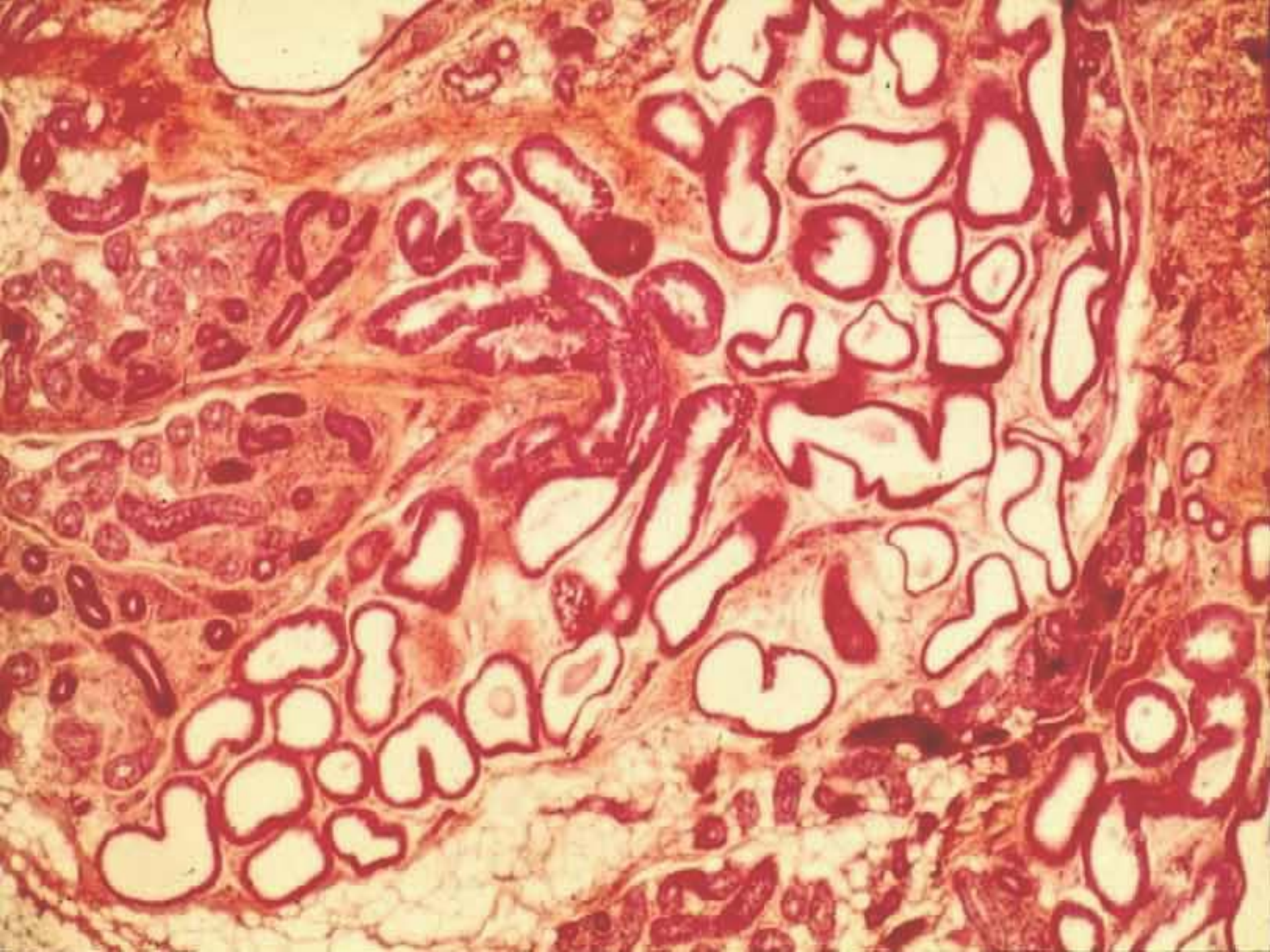
Aromatické (apokrinní)

potní žlázy

(*glandulae sudoriferae aromaticae / apocrinae*)

- rozvětvené, tubulózní, stočené
- ústí do vlasových folikulů
- ekrinní způsob sekrece !
- podpaží, ohanbí, malé stydké pysky
- aromatický pach – působení bakterií
- adrenergní inervace
 - gll. areolares *Montgomeryi*
 - gll. ciliares *Molli* – oční víčko
 - gll. ceruminosae – vnější zvukovod
 - gll. sudoriferae nasales
 - gll. circumanales



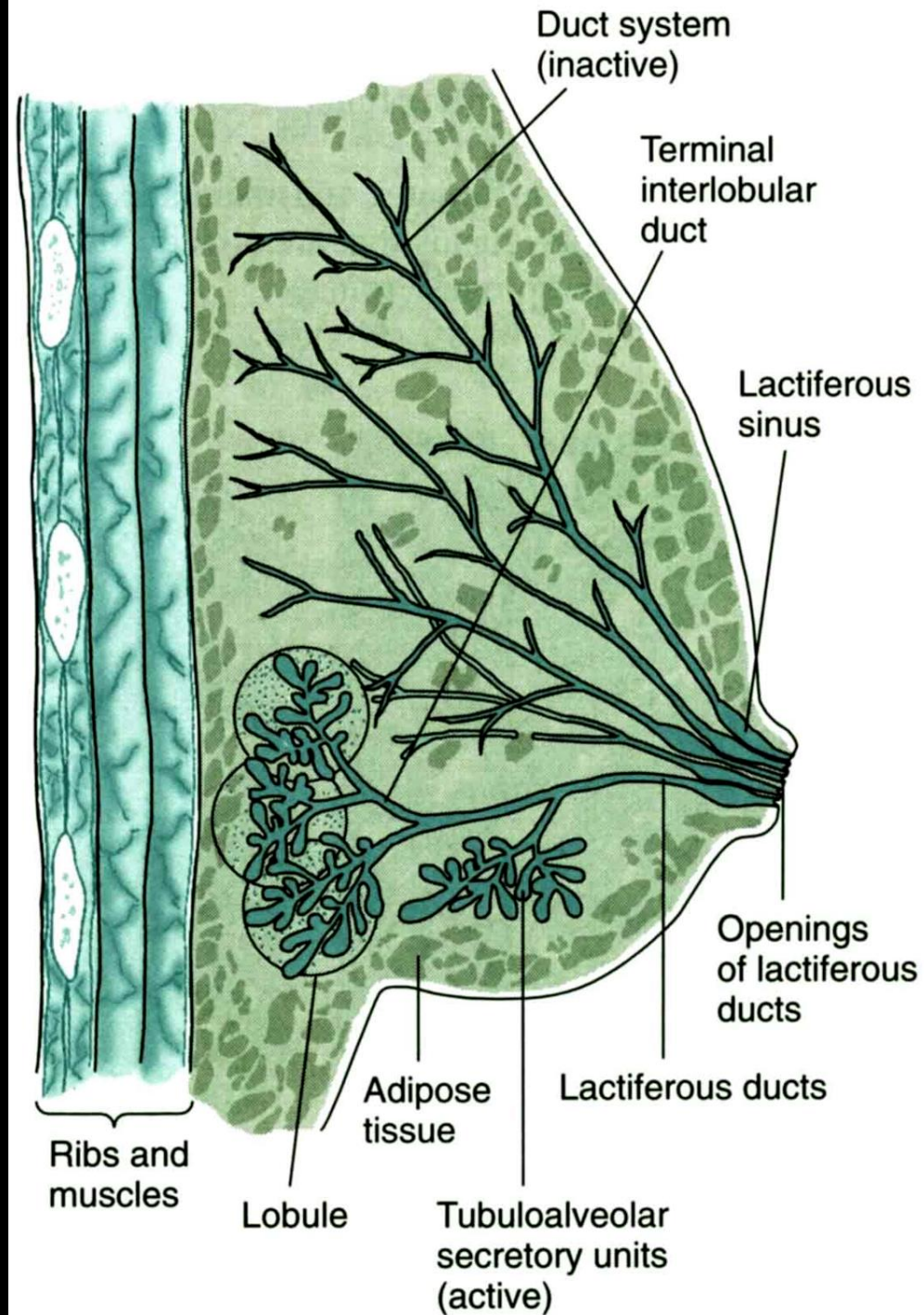




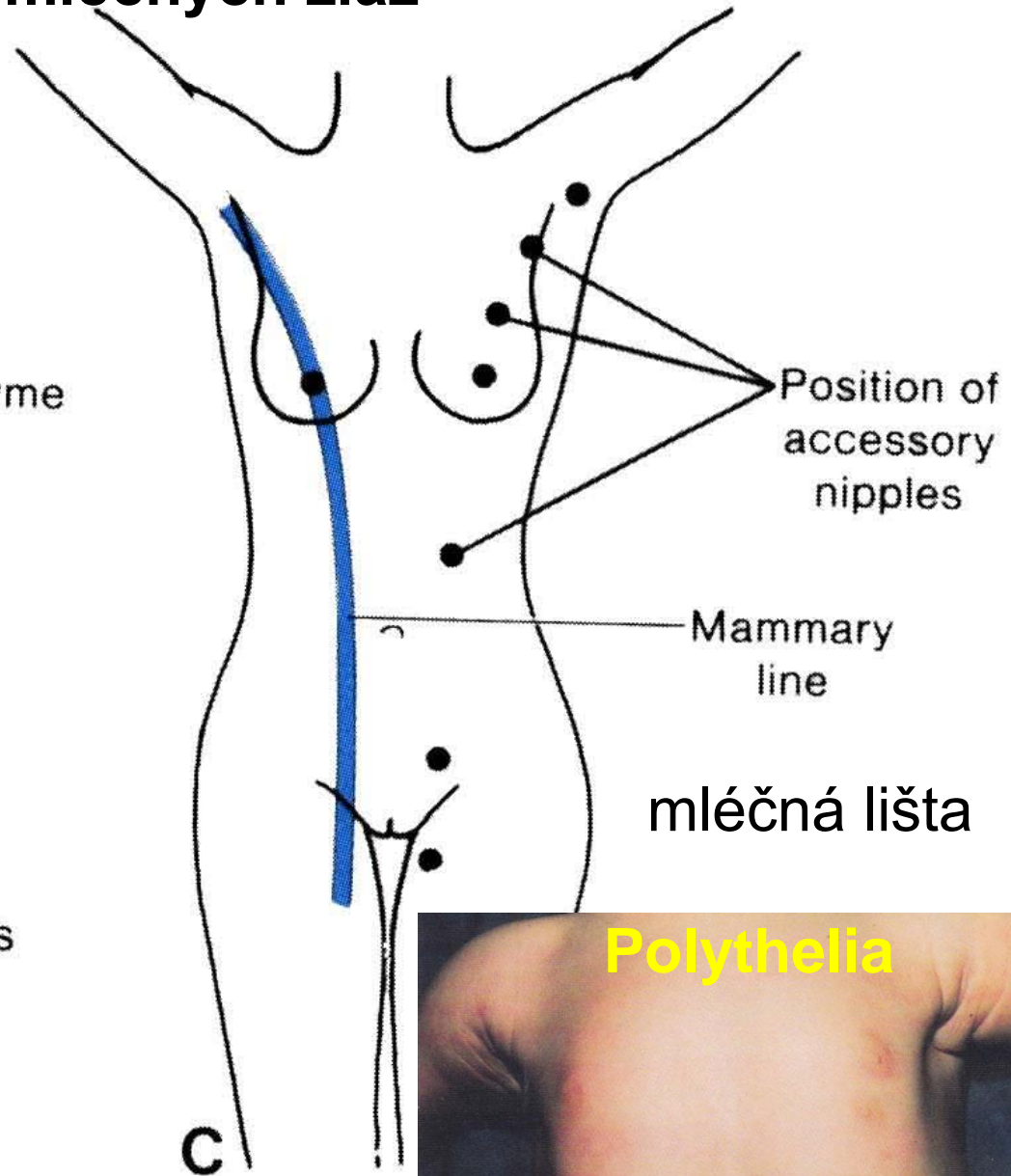
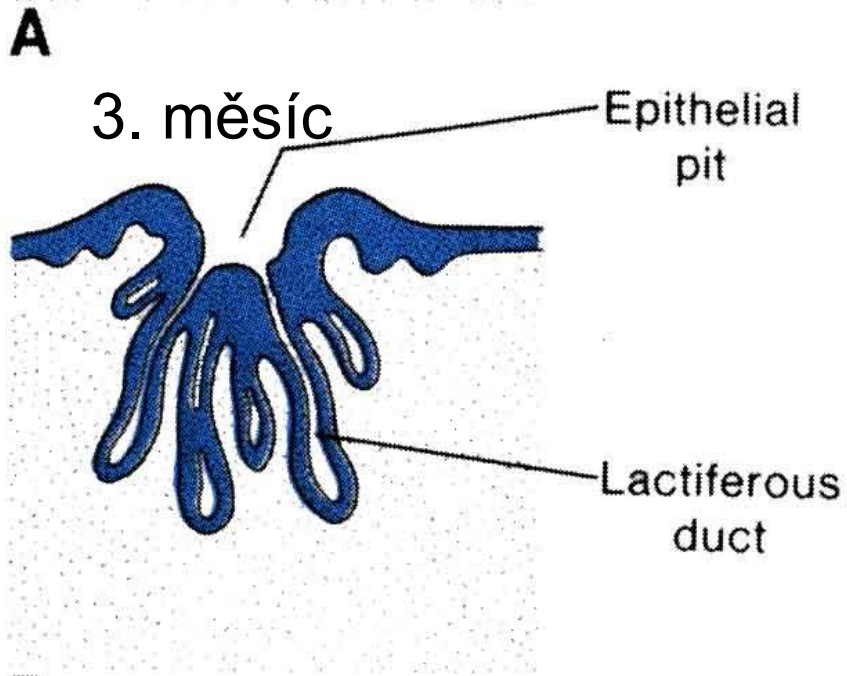
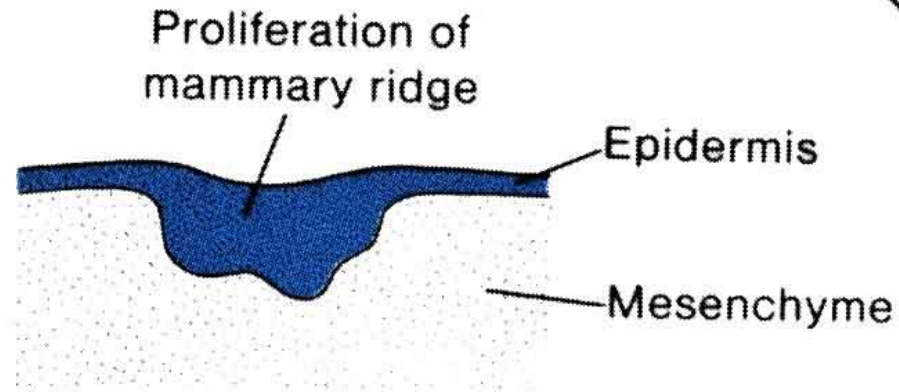
Mléčná žláza

(*Glandula mammaria*)

- prs = mamma
- rozsah: 3. – 6. mezižebří, parasternální až přední axilární čára, 11 x 12 cm, 150 g, v laktaci 300 – 800 g
- 15 – 20 složených tuboalveolárních žláz, každá z nich tvoří jeden lalok, každá má vlastní hlavní vývod – ductus lactiferus
- odděleny hustým kolagenním vazivem a tukovou tkání
- *ligg. suspensoria mammaria (Cooper)*



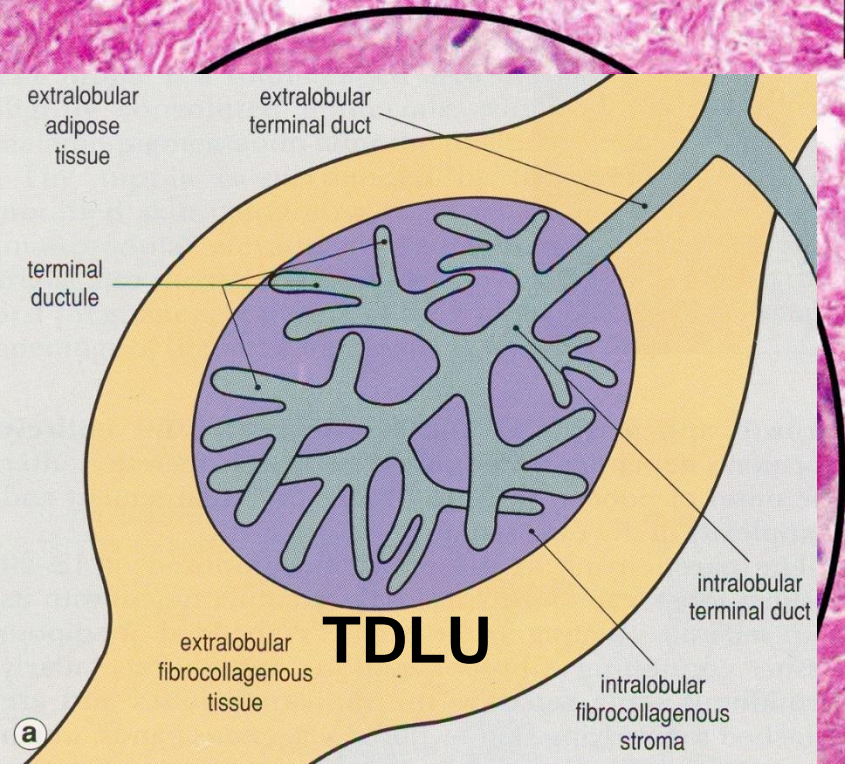
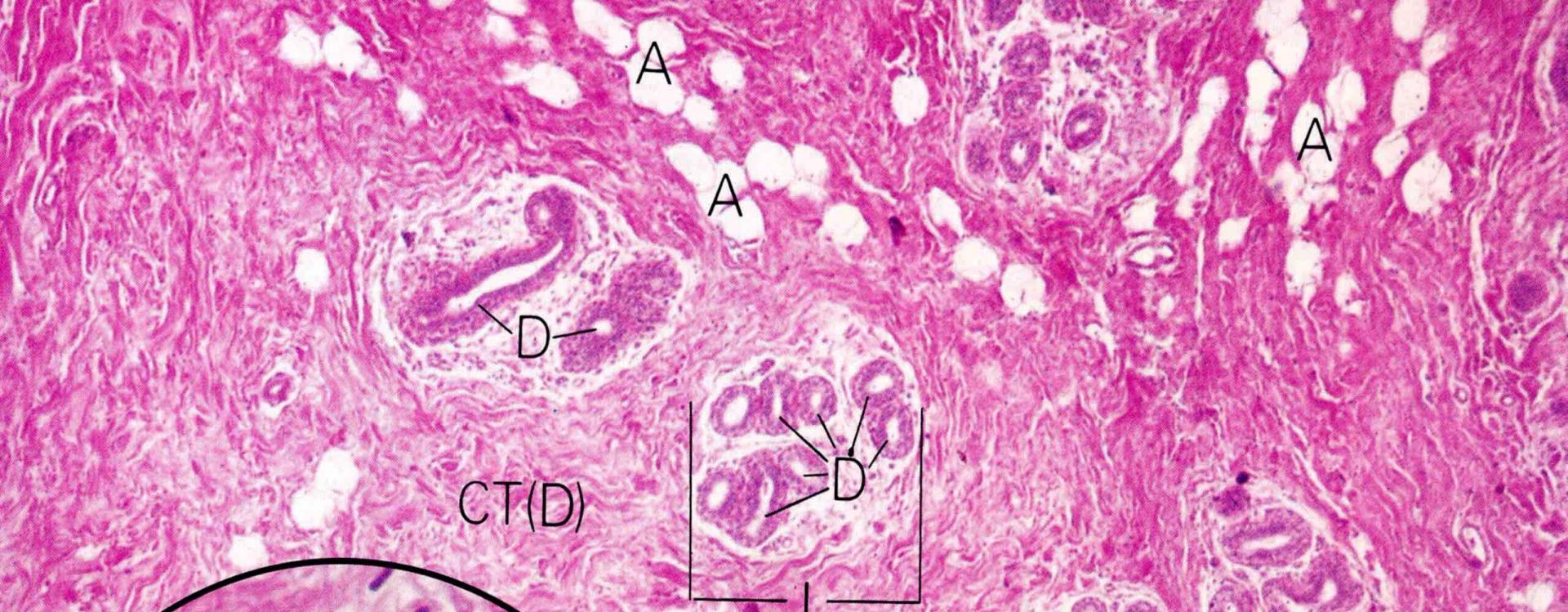
Vývoj mléčných žláz





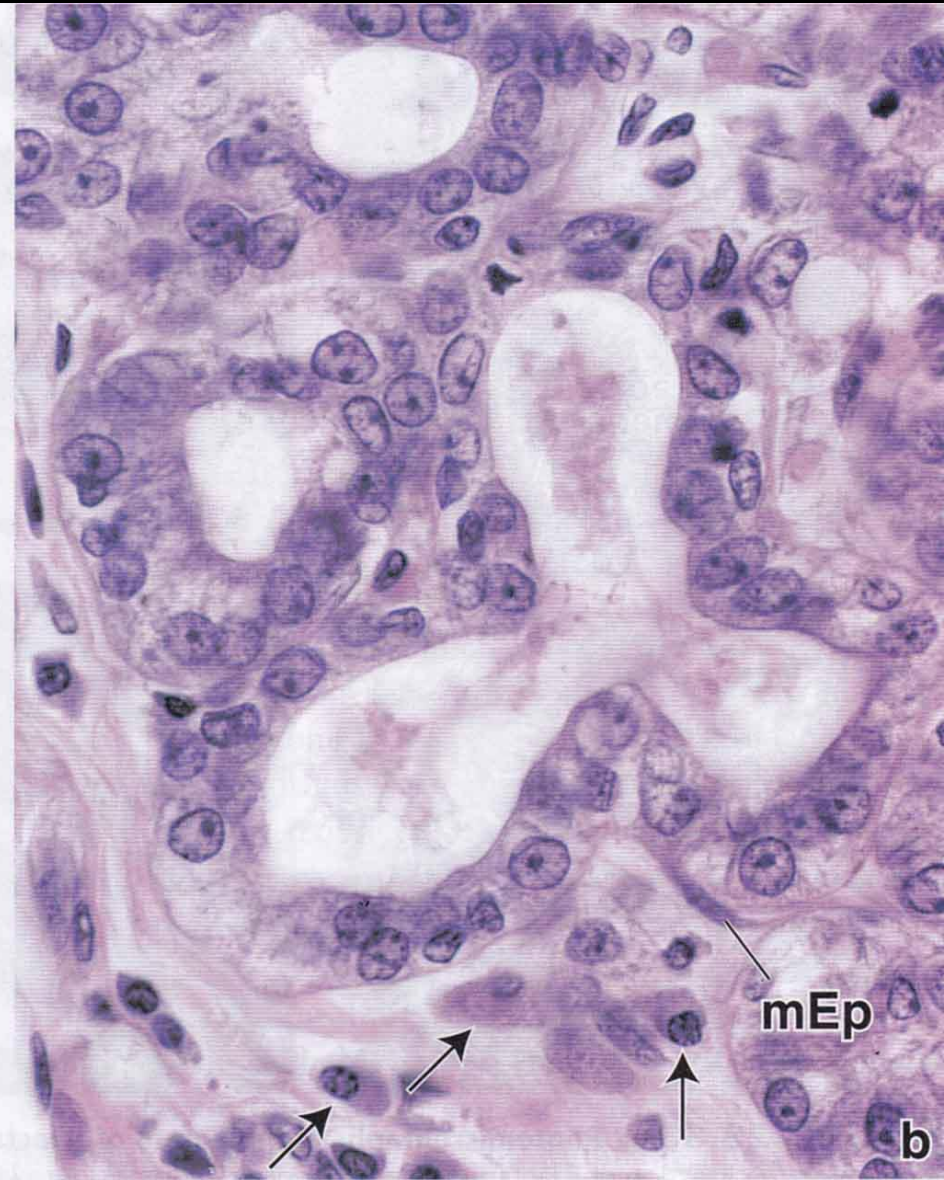
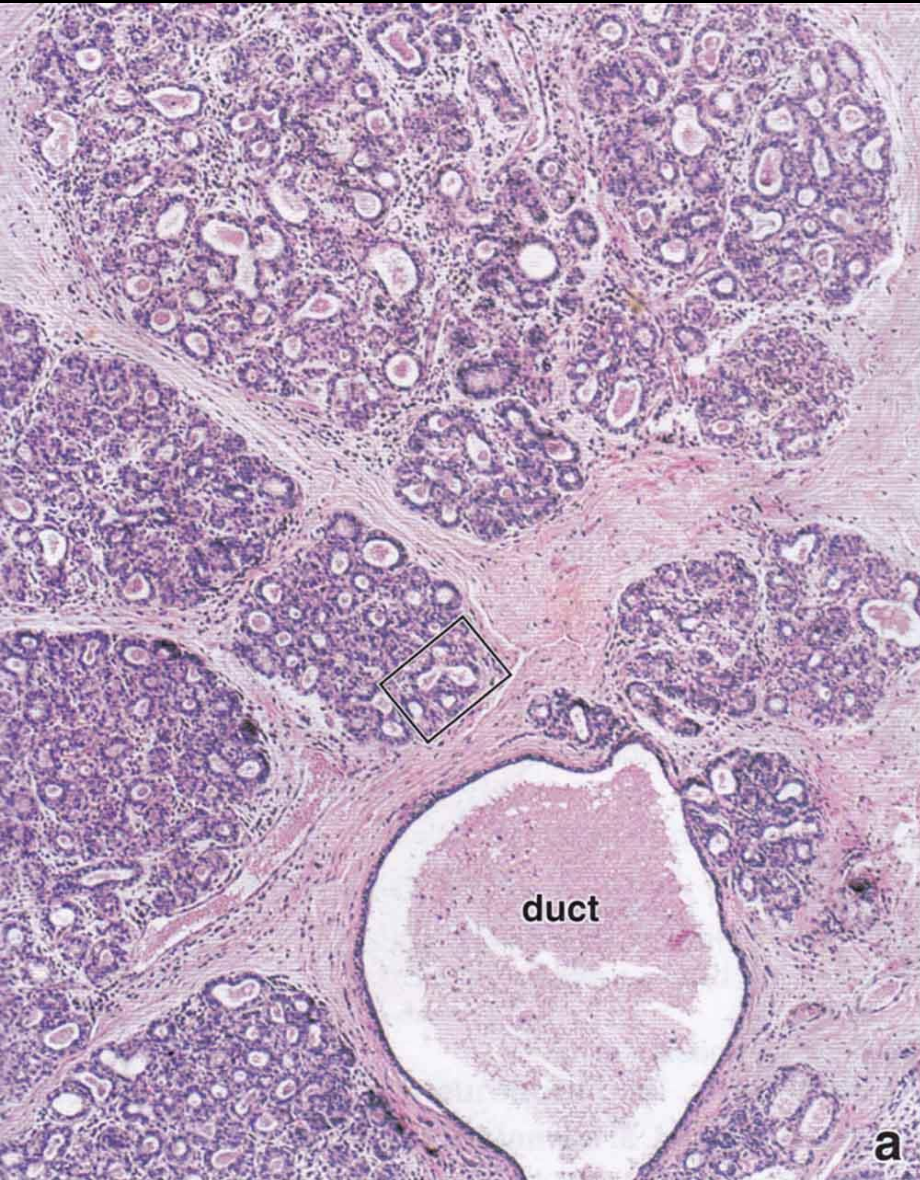
prepubertální mléčná žláza

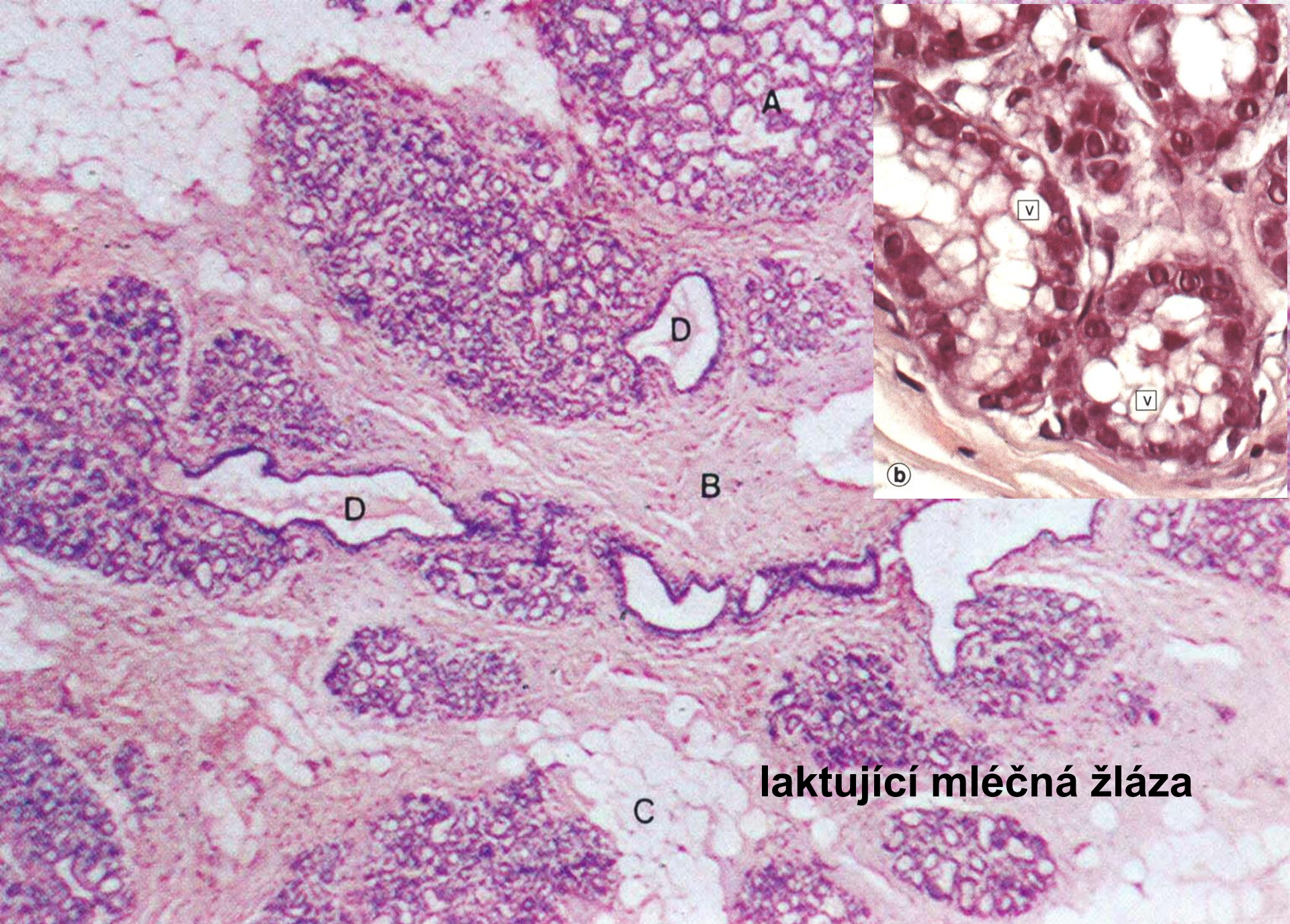
This is a histological micrograph of a prepubertal mammary gland. The image shows several cross-sections of ductal structures. Each duct is lined by a single layer of cuboidal epithelial cells, which are arranged in a circular pattern. The ducts are embedded within a dense, fibrous connective tissue stroma. The overall appearance is that of a developing gland with well-defined ductal architecture and minimal secretory activity.



dospělá nelaktující mléčná žláza

těhotenská mléčná žláza





laktující mléčná žláza

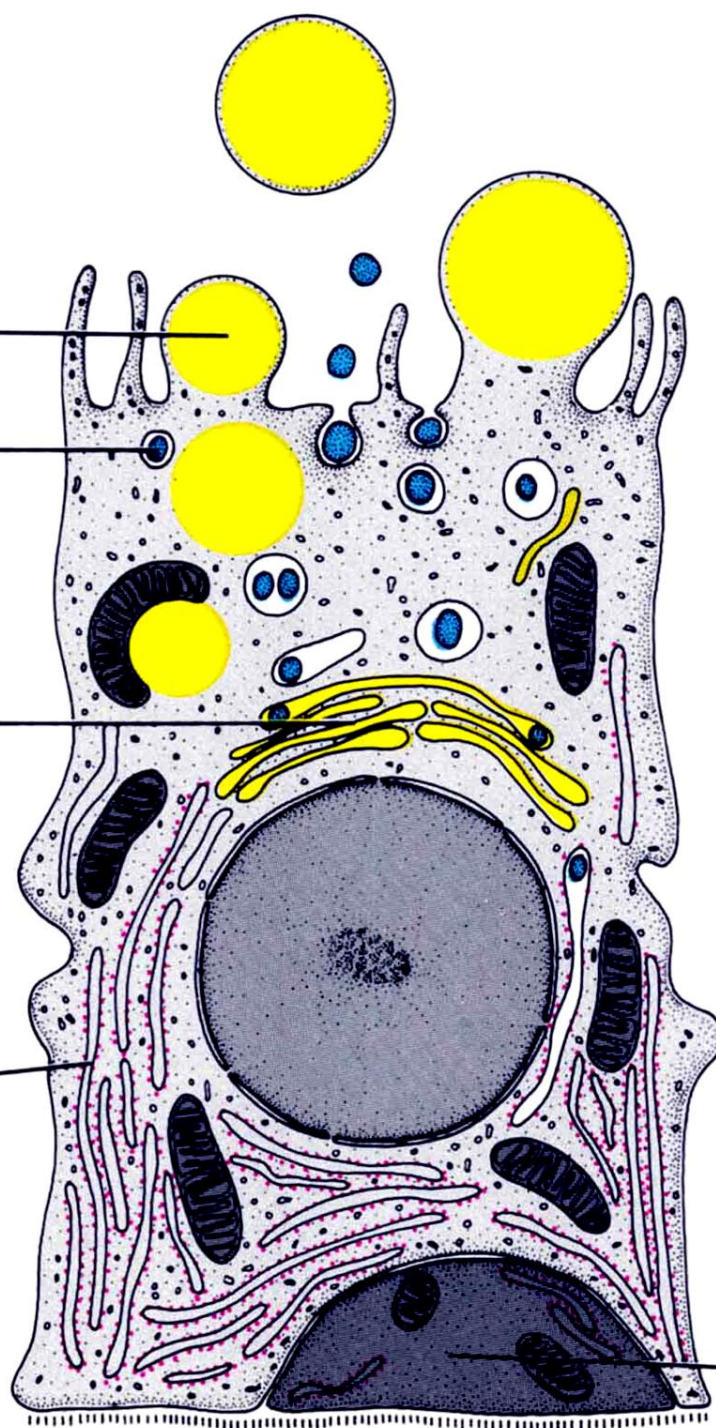
Lipid

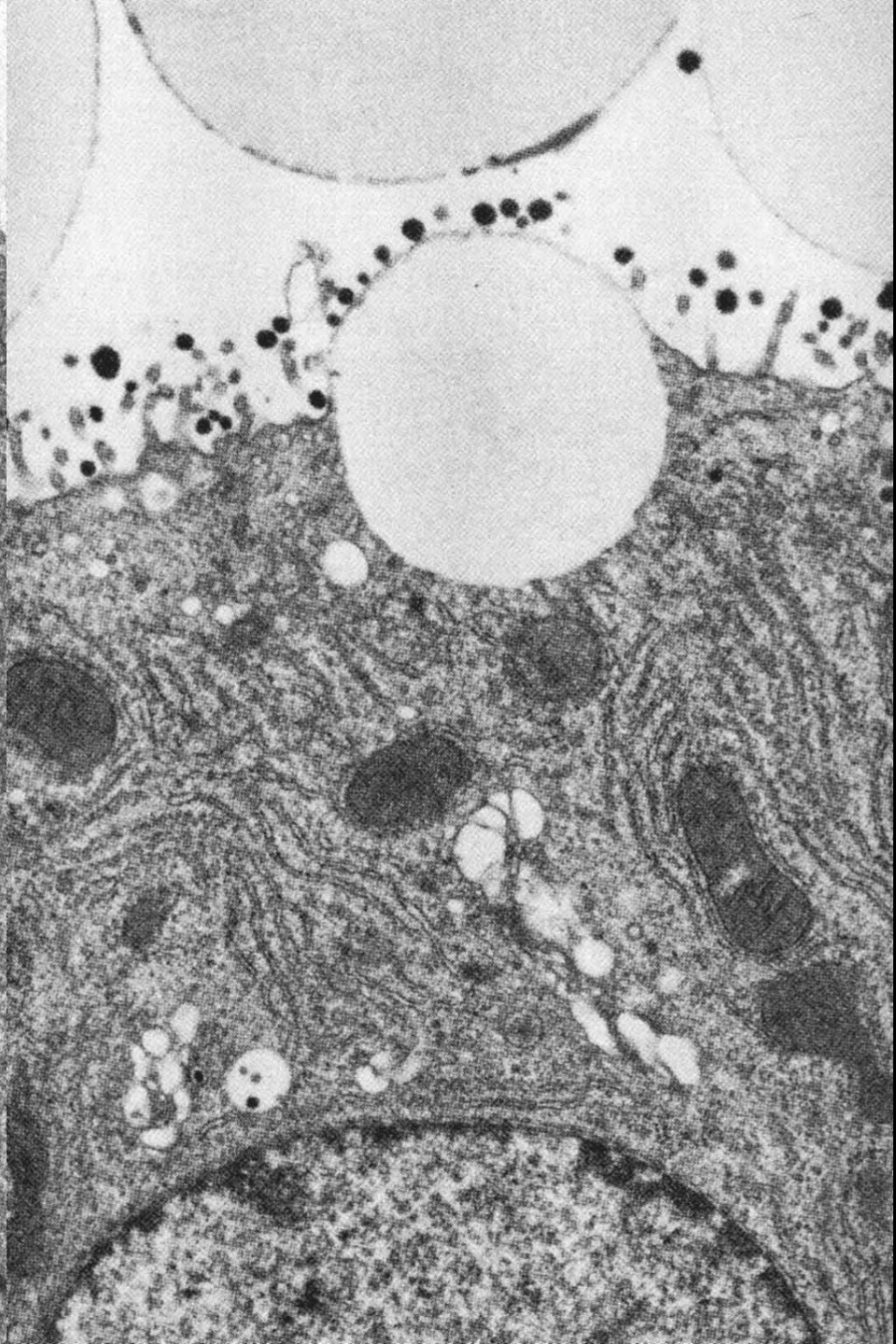
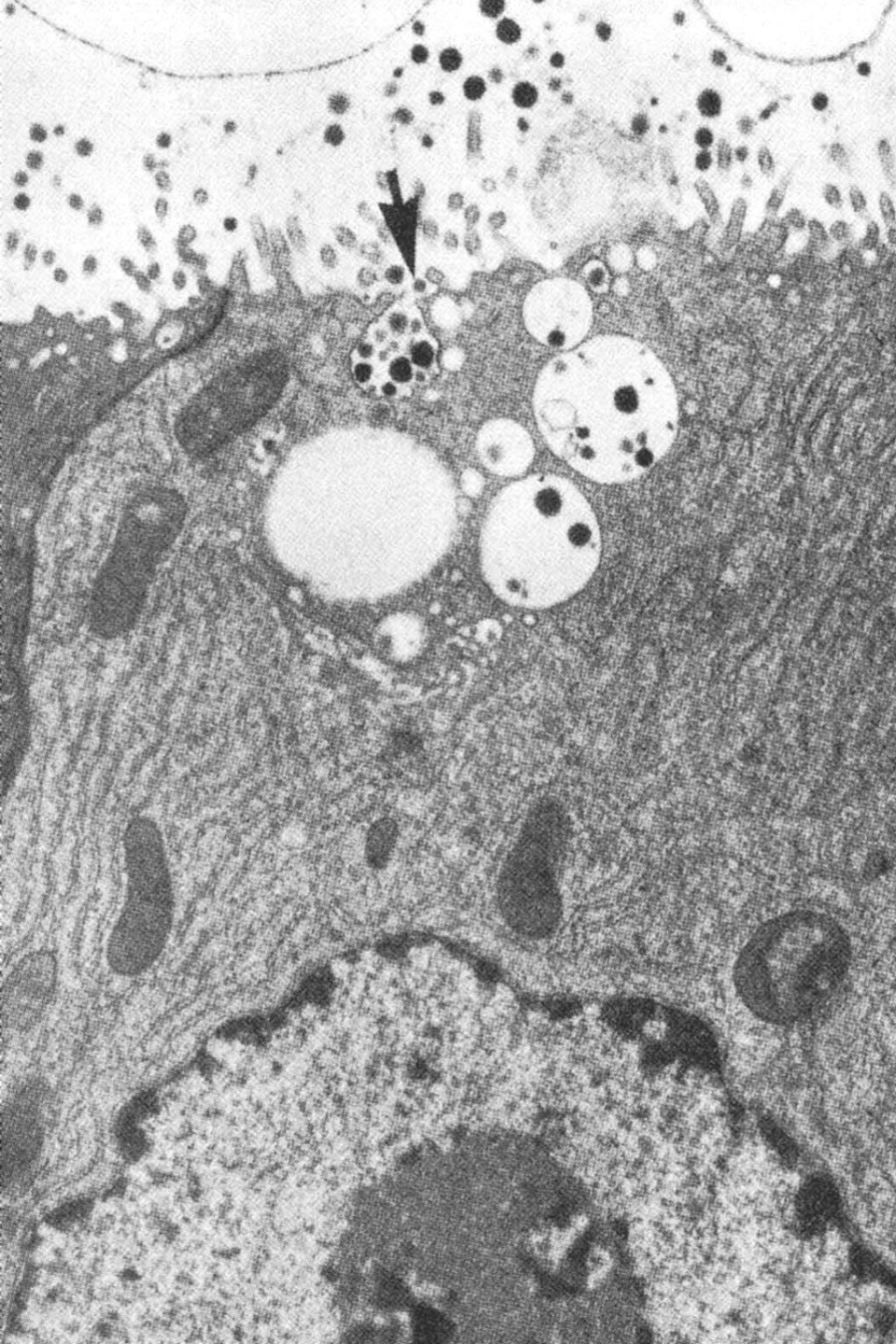
Protein

Golgi complex

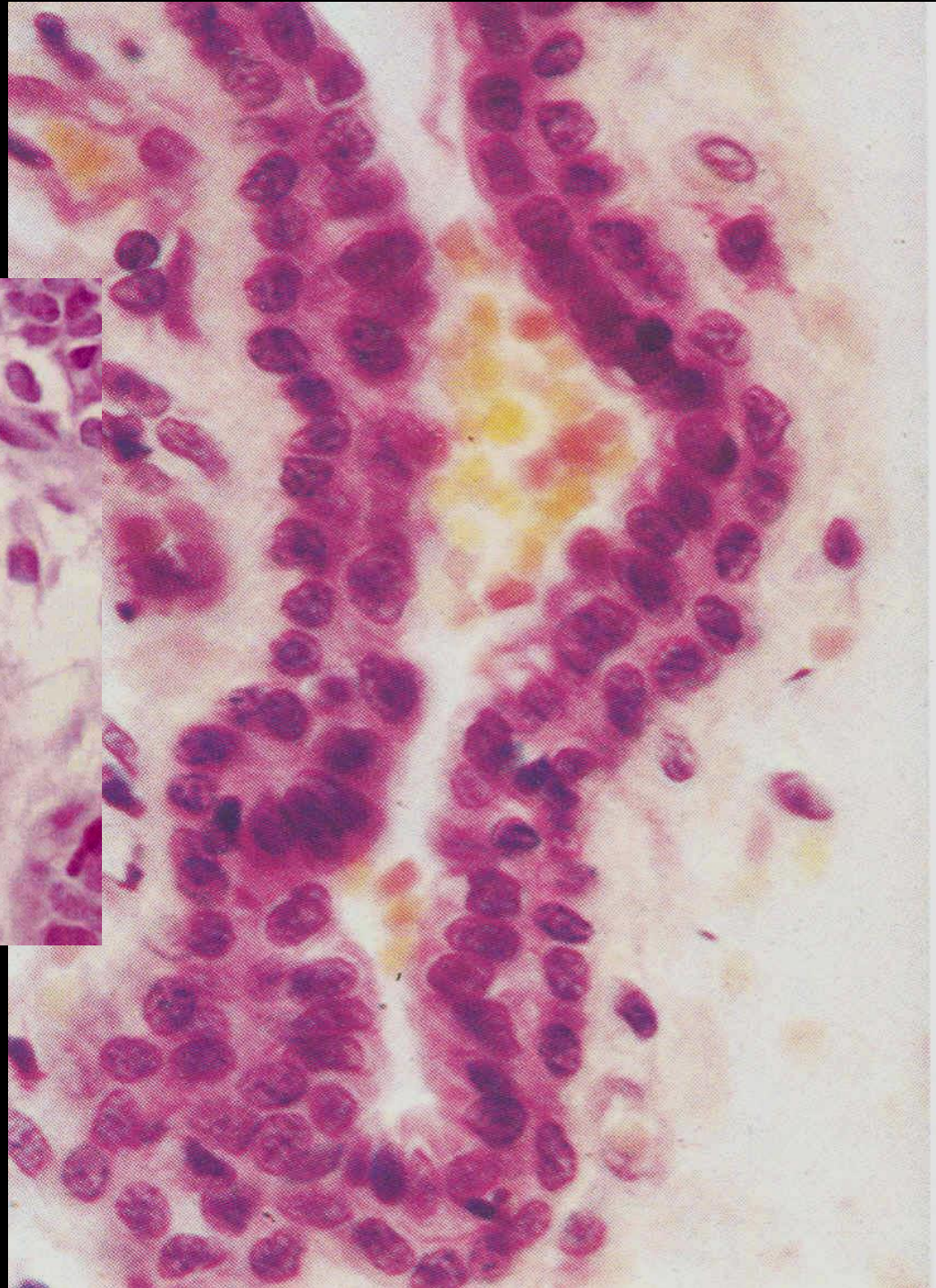
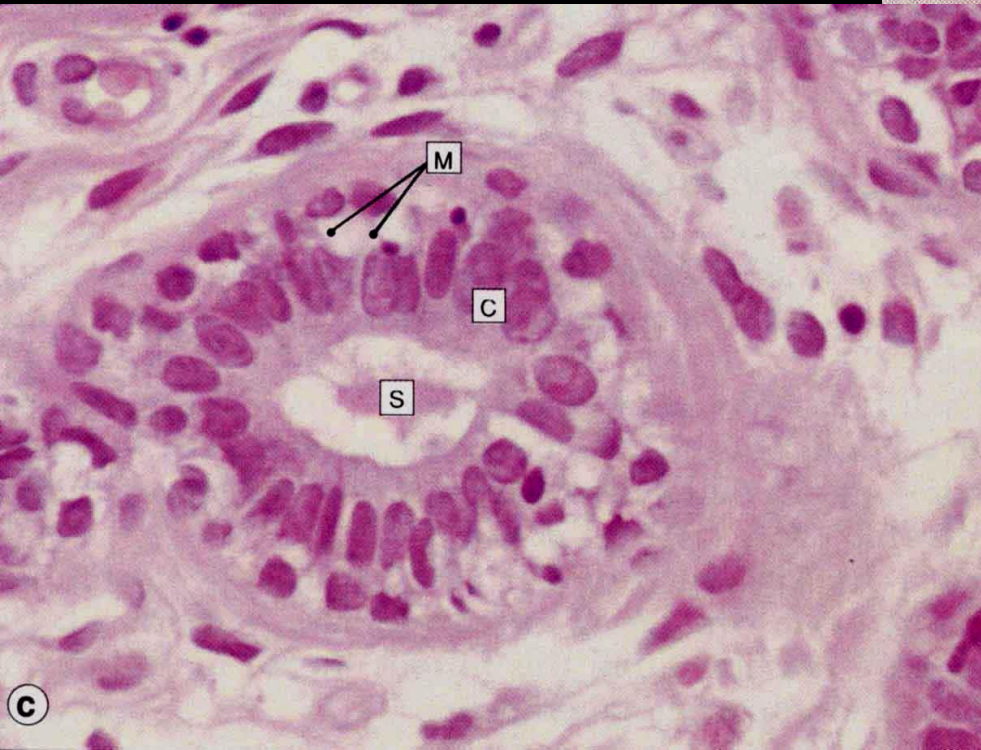
Granular endoplasmic reticulum

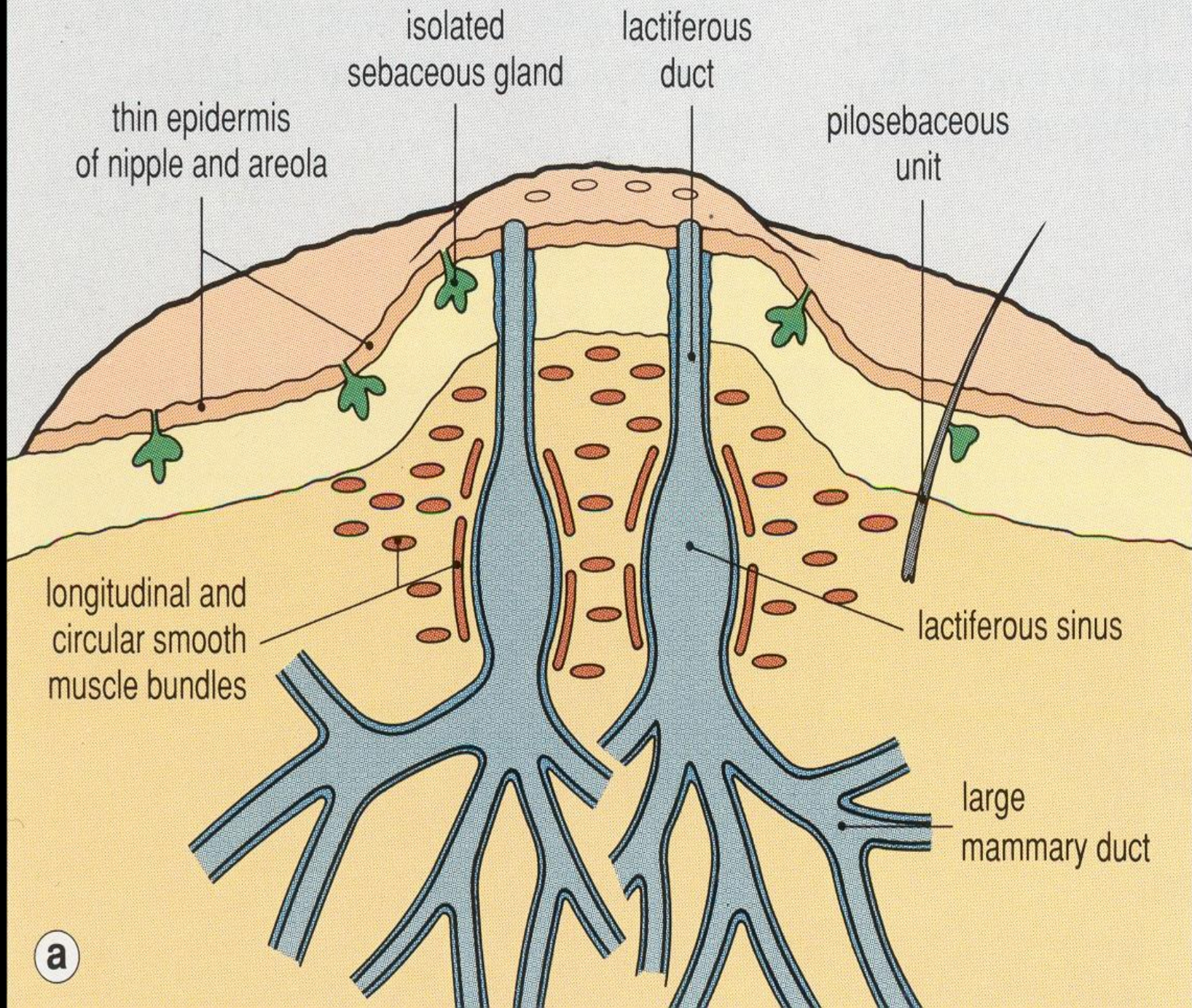
Process of a myoepithelial cell





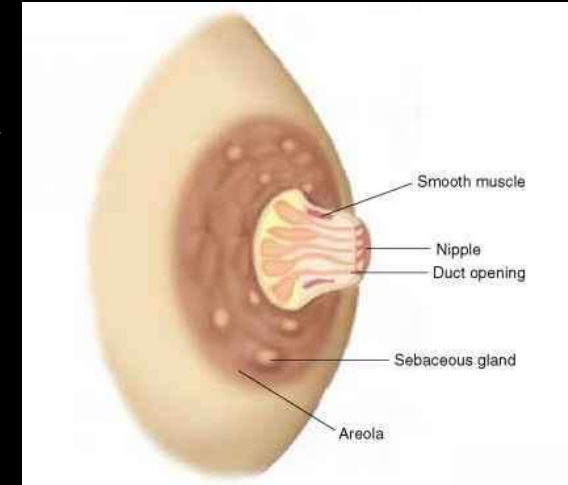
Ductus lactiferus





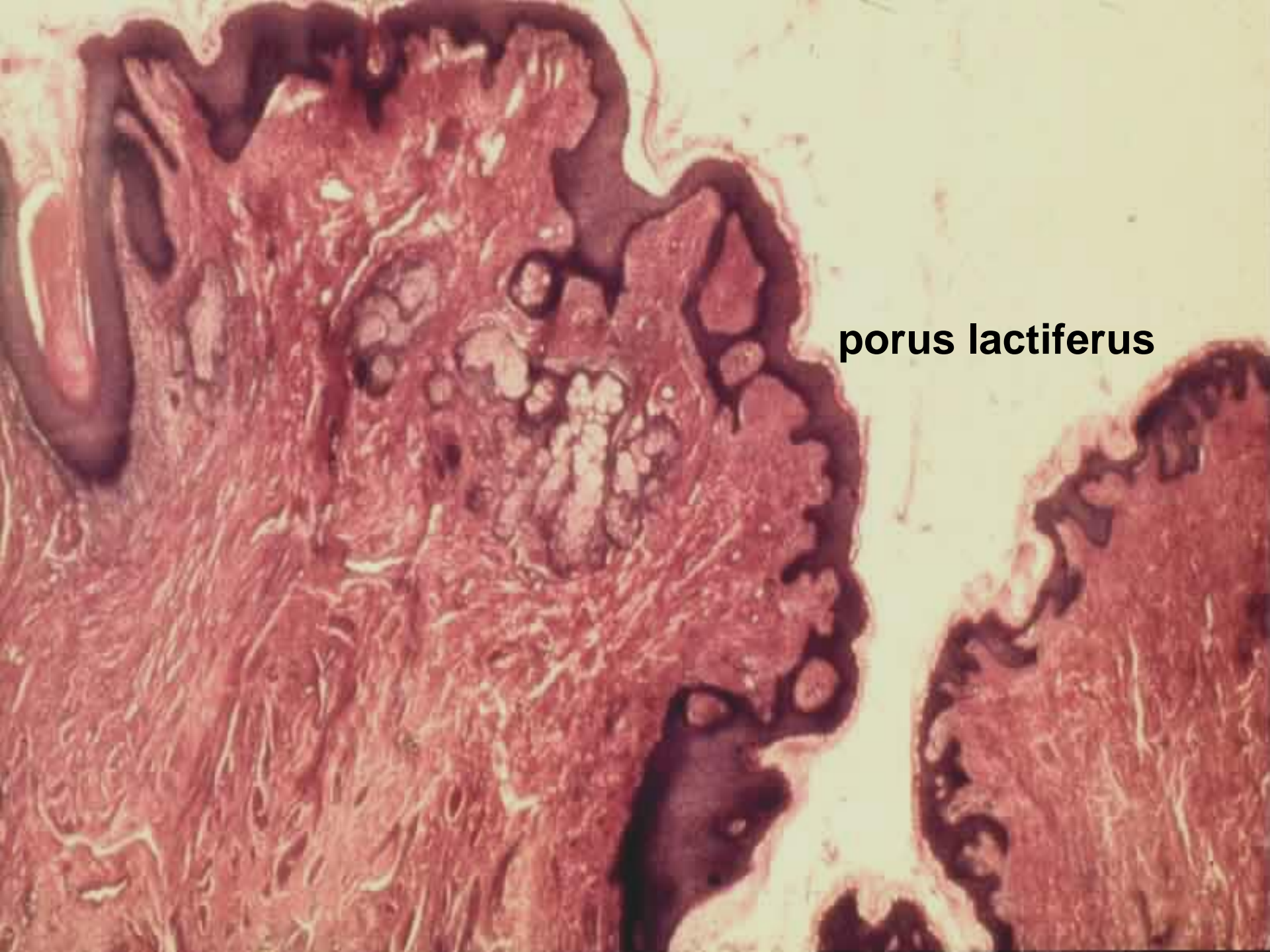
a

- dvorec (*areola mammae*)
 - glandulae areolares *Montgomeryi*
 - tubercula areolae
 - *hladká svalovina – paprsčitě*
 - *pigmentace*



- prsní bradavka (*papilla mammaria*)
 - area cribriformis papillae
 - konce mlékovodů (*pori lactiferi*)
 - mazové žlázy
 - *hladká svalovina – šroubovitě (m. sphincter papillae)*





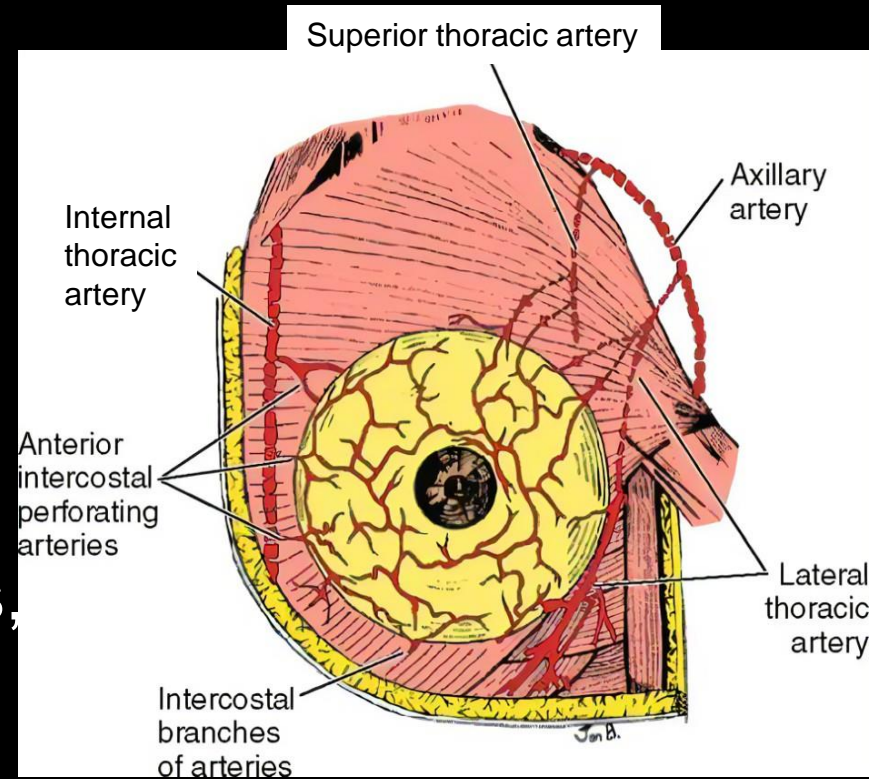
porus lactiferus

Mléčná žláza – tepenné zásobení

a. thoracica interna → aa.
intercostales anteriores (I.-
V./VI.) → rr. perforantes

a. axillaris → a. thoracica
superior
(a. thoracica lat.,
r. pectoralis a. thoracoacromialis,
a. subscapularis)

aorta thoracica → aa.
intercostales posteriores (II.-V.)
→ rr. perforantes (II.
nejsilnější)



Mléčná žláza – žilní odtok

- plexus venosus *Halleri* – pod dvorcem
 - v. axillaris
 - v. thoracica interna
 - vv. intercostales posteriores

Mléčná žláza – nervy

nn. intercostales IV.- VI.
rami ant. + lat.

senzitivní pleteň kolem bradavky (T4)

- nejčastější nádor u žen
postihuje 9 % ženské
populace

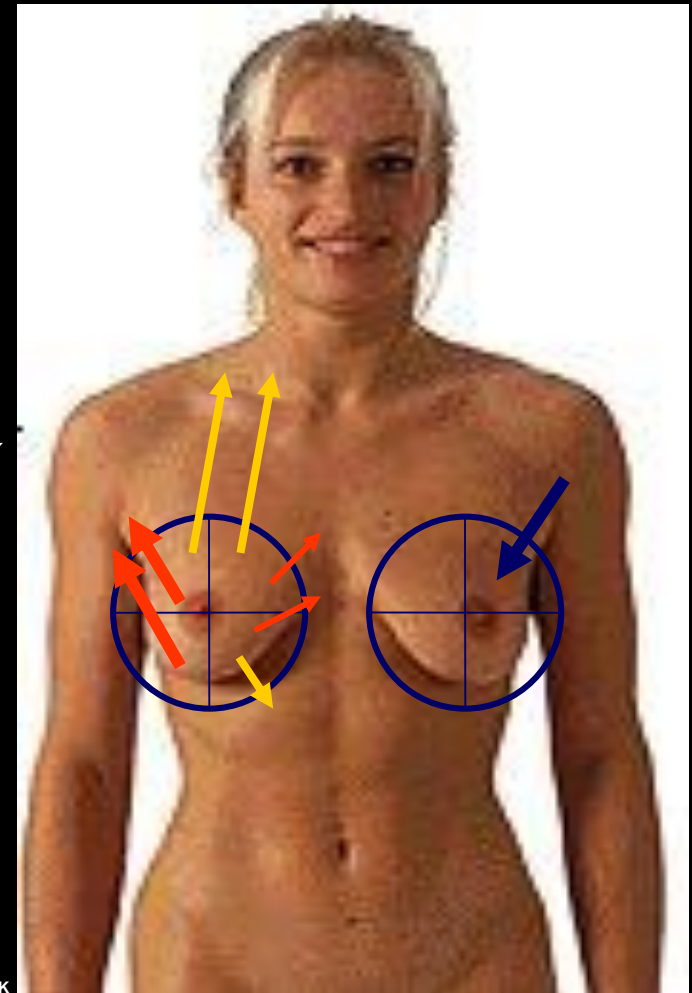
- klinické známky – zduření,
vtažení kůže/bradavky,
ulcerace

- vyšetření – pohmat,
ultrazvuk, mamografie, mízní
uzliny

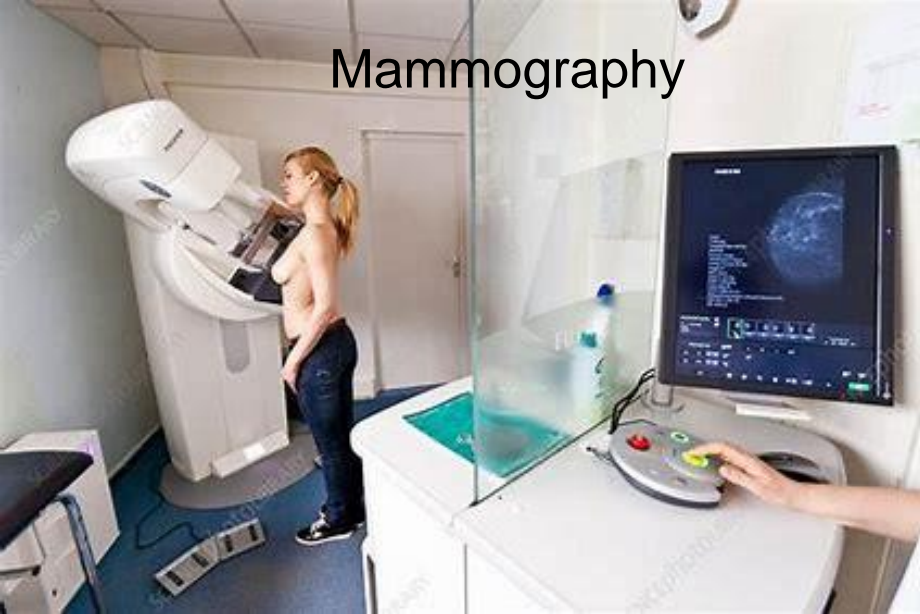
- exstirpace

- mastektomie (parciální,
totální)

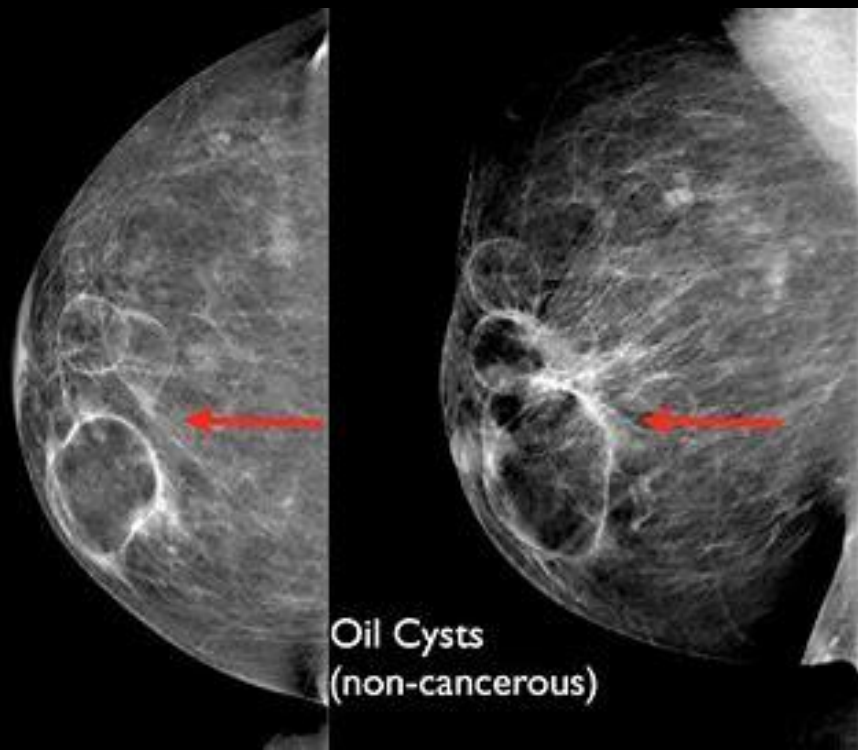
Karcinom mléčné žlázy



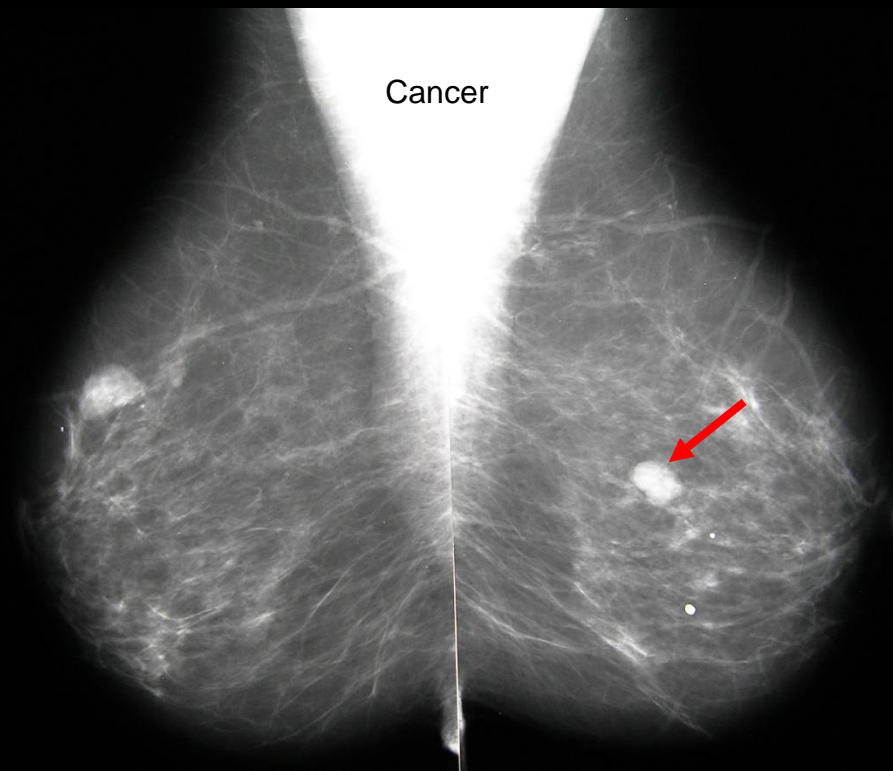
Mammography



Normal finding



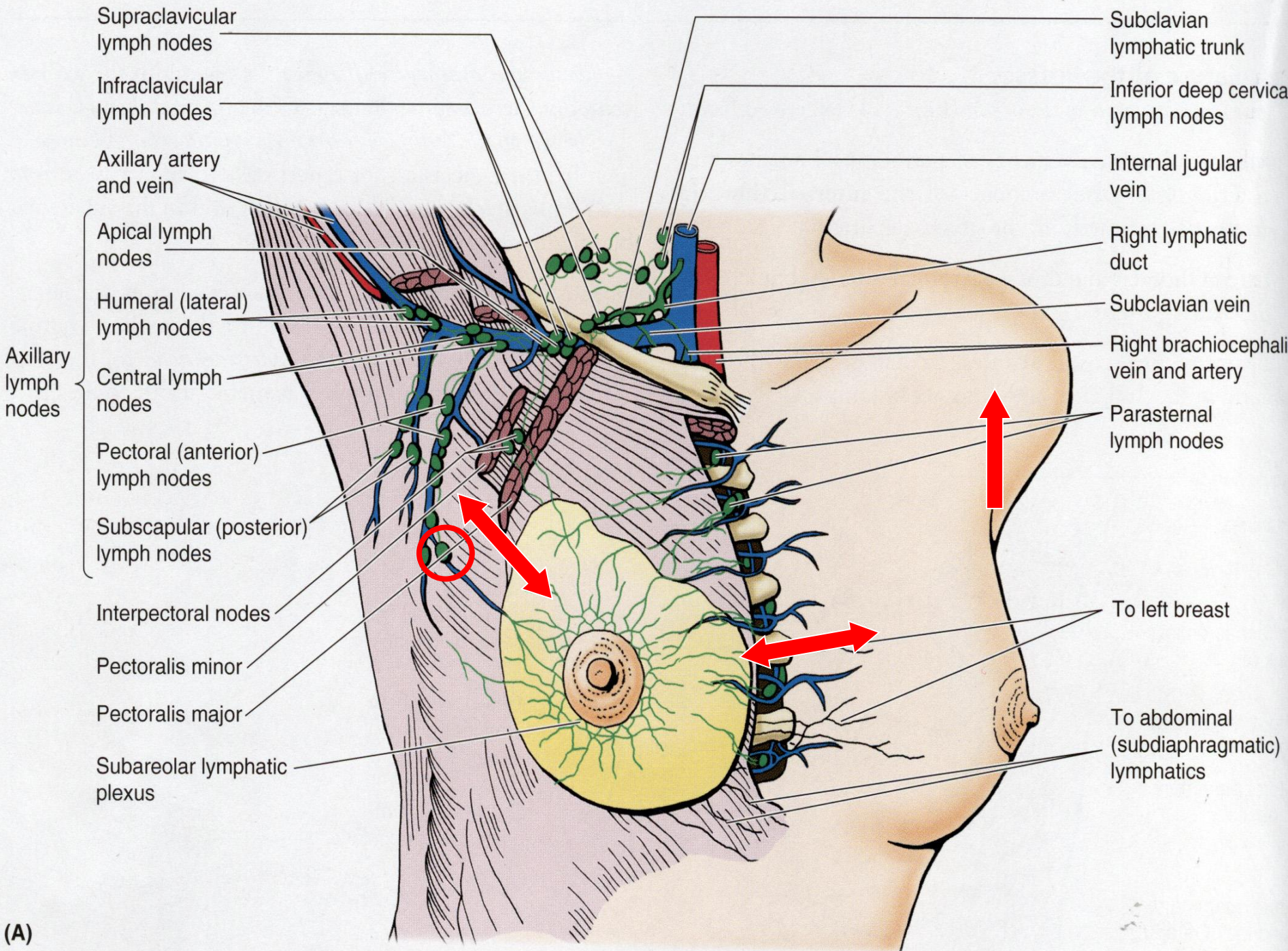
Cancer



Mléčná žláza – mízní odtok

4 kvadranty

- nodi I. axillares
 - Sorgiusova – první (nejkaudálnější) ze skupiny nodi I. pectorales, na 2./3. zubu m. serratus ant.
- nodi I. parasternales
 - nodi. mediastinales ant.
 - nodi epigastri sup. + inf.
- nodi I. supraclaviculares
- kontralaterálně do druhé žlázy a axilly
plexus subareolaris Sappeyi



(A)