

# Grundgewebe und Histologie der Gefäße

Emese Pálfi

Semmelweis Universität

Anatomisches, Histologisches und Embryologisches Institut

# Grundgewebe

**Gewebe:** eine Ansammlung von differenzierten Zellen. Zellen eines Gewebes besitzen ähnliche Funktionen und erfüllen gemeinsam die Aufgabe des Gewebes.

Die verschiedene Geweben können durch die Verbindung, den histologischen Aufbau und die physiologische Funktion unterschieden werden.

Epithelgewebe

Oberflächenepithel

Resorptionsepithel

Drüsenepithel

Sinnesepithel

Pigmentepithel

Binde- und Stützgewebe

Muskelgewebe

Nervengewebe

# Epithelgewebe

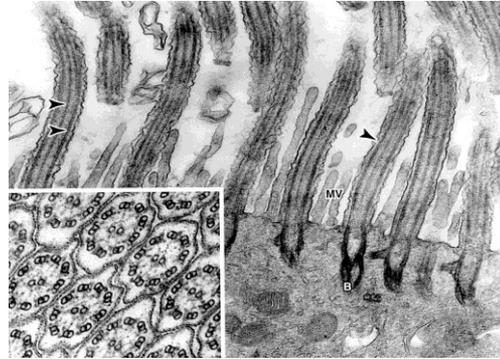
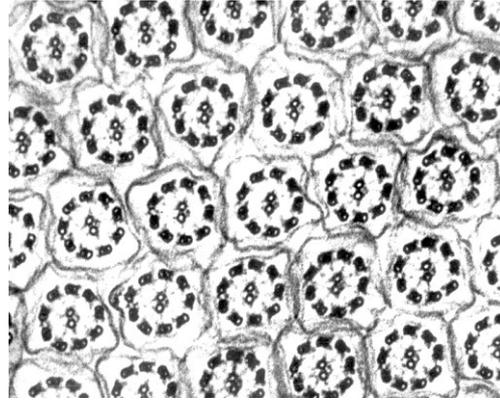
- Eng gepackte Zellen mit minimaler Menge von Extrazellulärsubstanz
- Verankerung an der Basalmembran
- Kräftige Zellkontakte
- Polare Bauweise (apikaler Pol, basaler Pol) und Funktionsweise
- Oberflächendifferenzierungen

**Ursprünglich:** ekto-, ento- und mesodermales Epithelgewebe

**Funktionell:** Deck-, Drüsen-, Resorptions-, Pigment- und Sinnesepithel

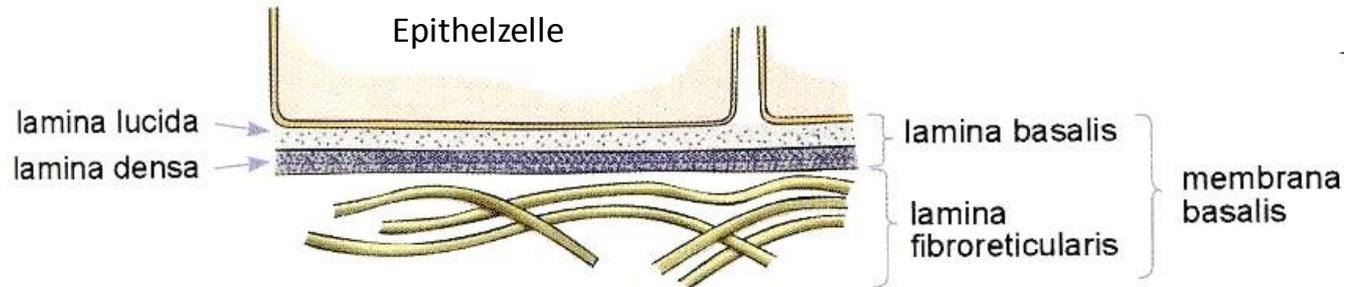
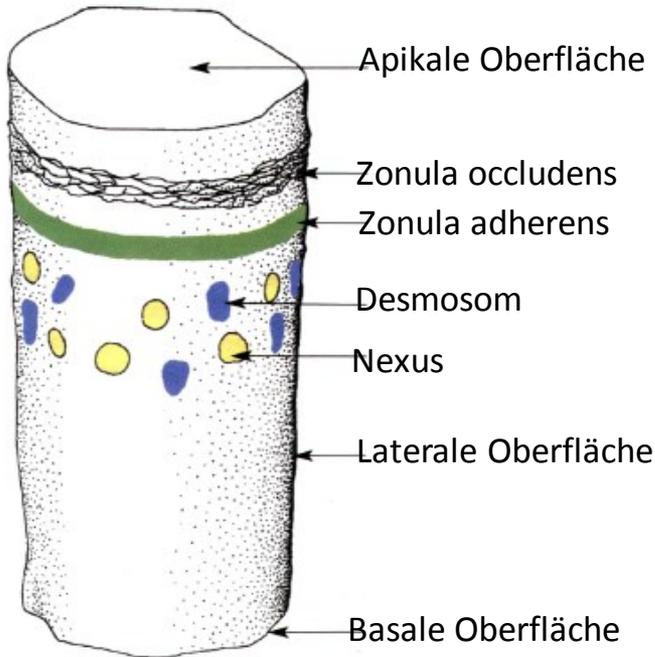
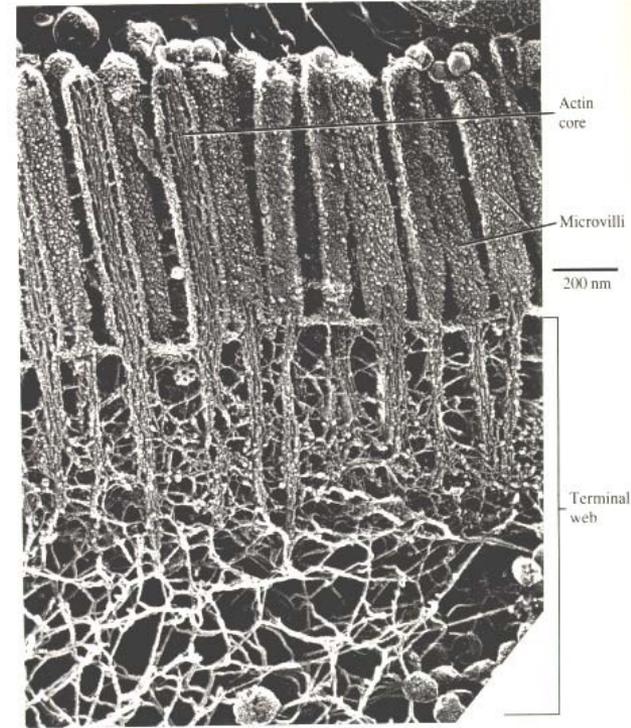
# Kinocilien

- Aktive Bewegung
- 9x2+2

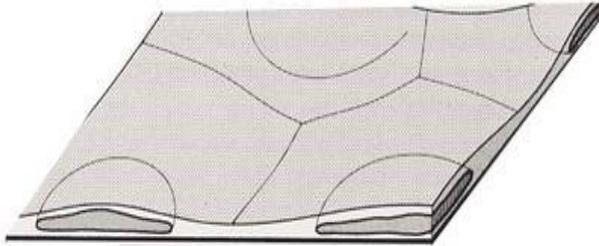


# Stereocilien

- Oberflächevergrößerung
- Aktin filament



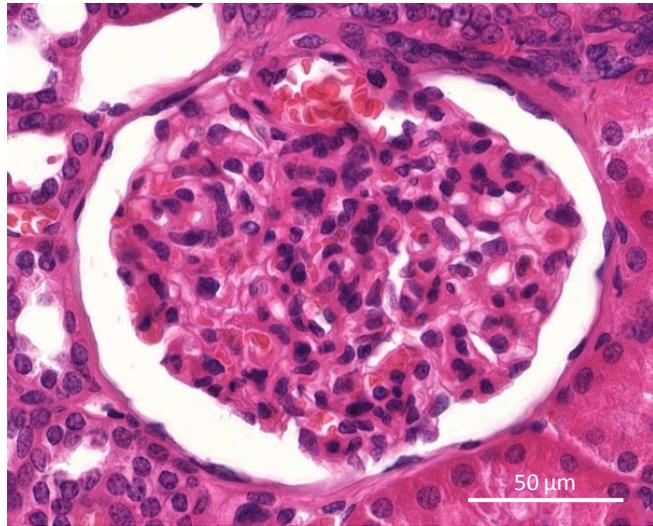
# Einschichtiges Plattenepithel



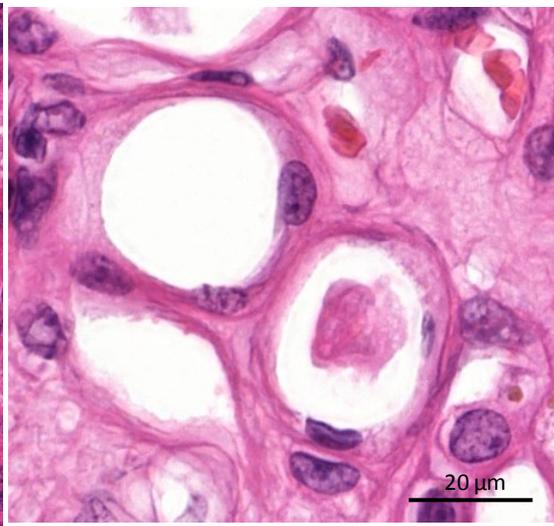
Abgeflachte Zellkerne wölben sich ins Lumen vor  
Zytoplasma erscheint linienartig

- Bowman-Kapsel, äussere Lamelle (1)
- Intermediär Tubulus (2)
- Alveolarepithel in den Lungen (3)
- Hintere Fläche der Hornhaut (Cornea) (4)
- Innere Fläche vom Trommelfell und von den Bogengängen (5)
- Mesothel (6)
- Endothel (2)
- Epithel von der Gehirnhaut
- Rete testis

1.

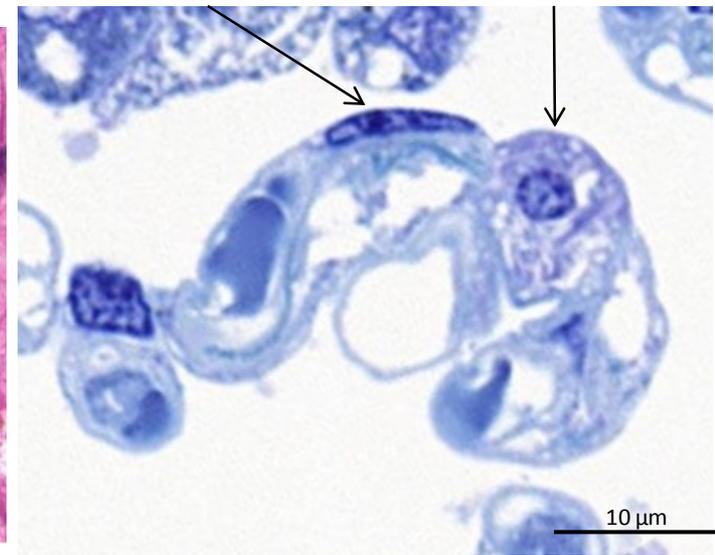


2.

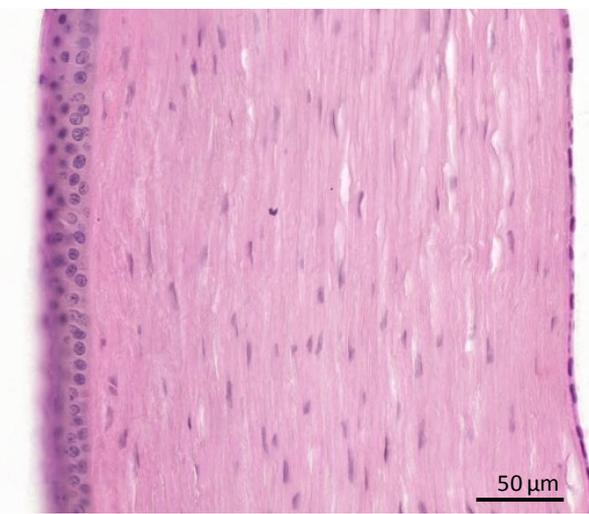


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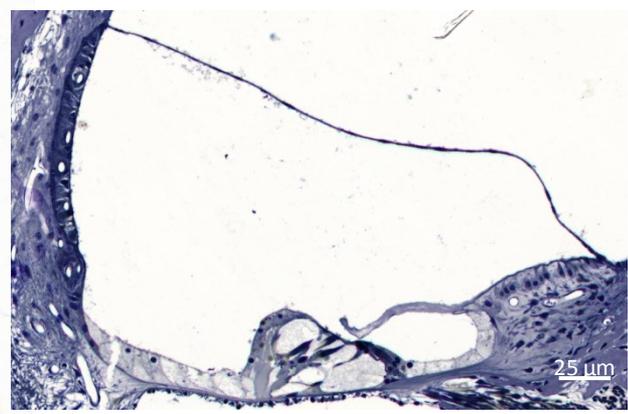
Pneumozyt Typ I. Pneumozyt Typ II.



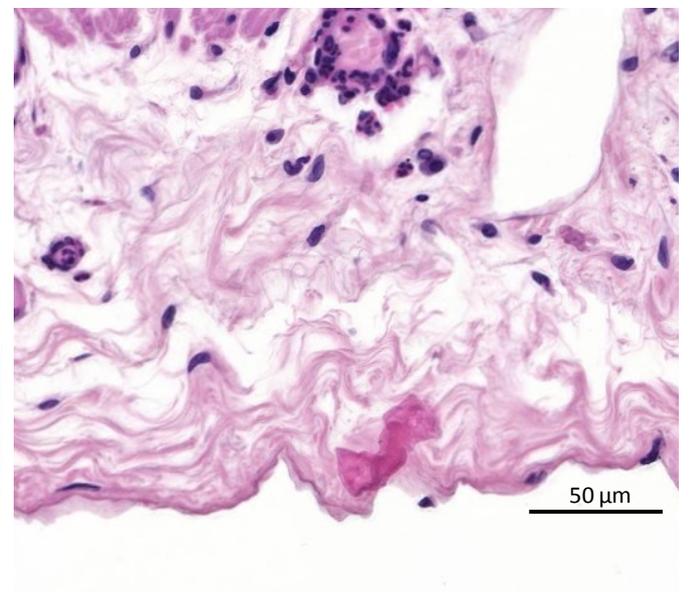
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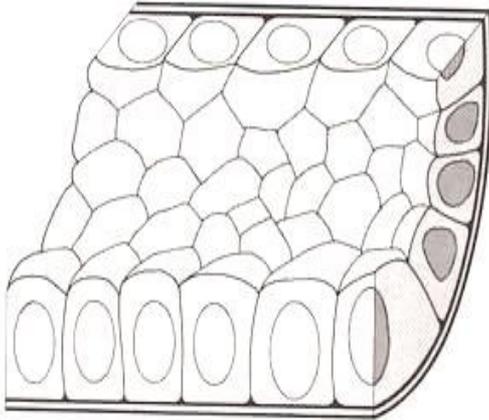
5.



6.



# Einschichtiges kubisches/isoprismatisches Epithel

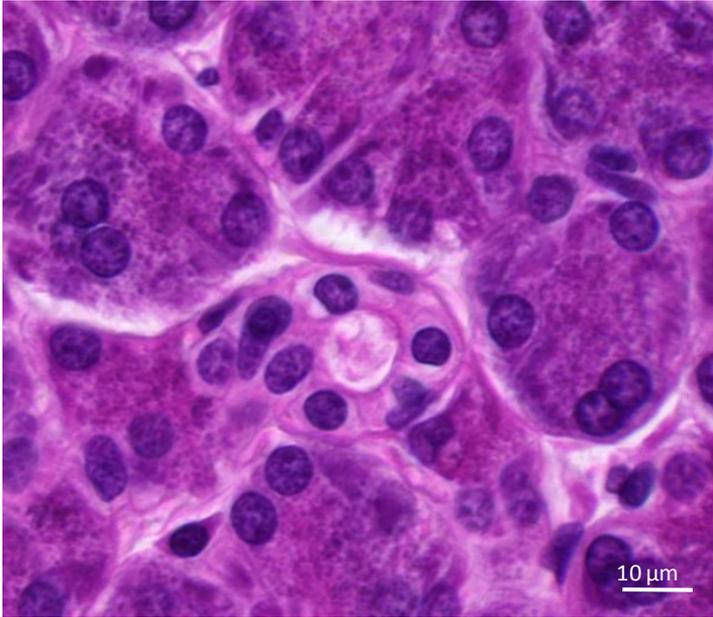


Die Höhe und die Breite der Zelle sind ca. gleich  
Zellkerne:

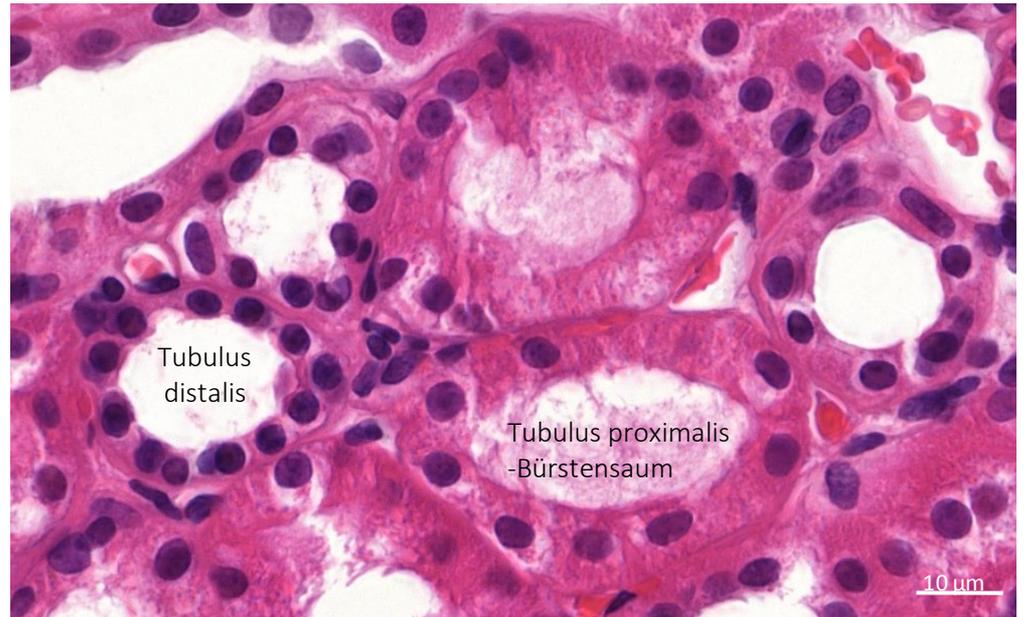
- rund
- in der Mitte der Zelle

- Drüsenendstücke, Duct. intercalaris (1)
- Nierentubuli (2)
- Oberfläche des Ovars (3)
- Amnionepithel (4)
- Duct. biliaris, Hering-Kanäle (5)
- Cytotrophoblast, Syncytiotrophoblast (6)
- Oberfläche vom Plexus choroideus

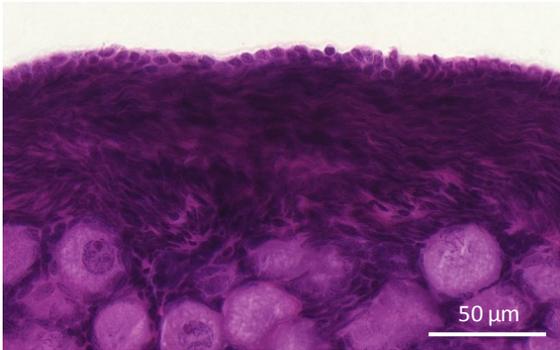
1.



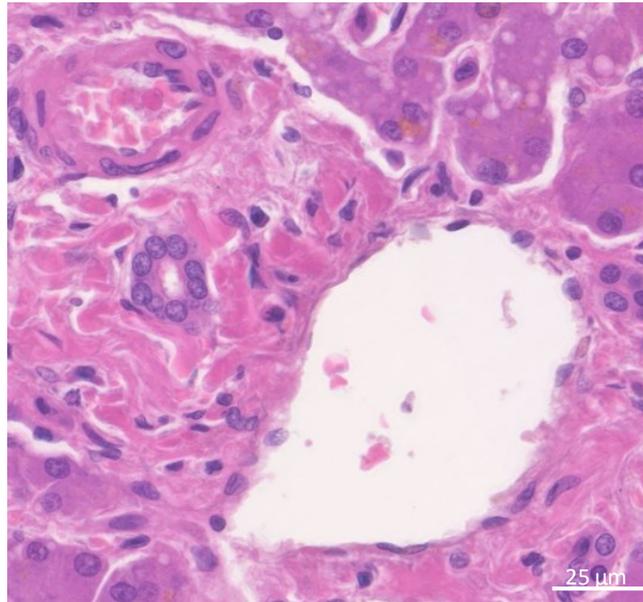
2.



3.



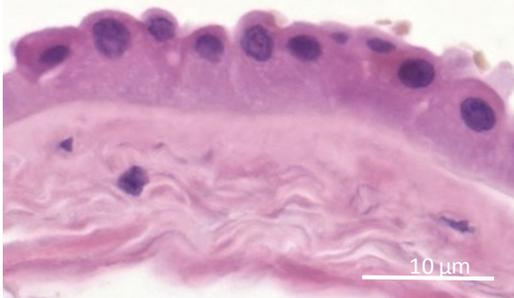
5.



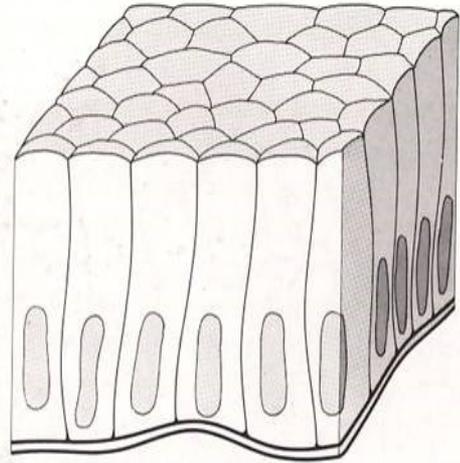
6.



4.



# Einschichtiges hochprismatisches Epithel



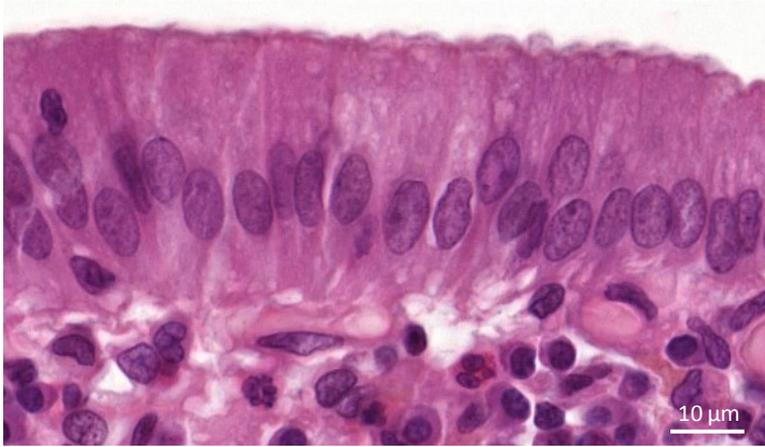
Die Höhe übersteigt die Breite

Zellkerne:

- senkrecht stehend
- elliptisch
- an der Basis der Zellen

- Kutikulares hE – Darm, Gallenblase (1)
- Flimmerepithel– Eileiter (2)
- Spezielles sekretorisches hE– Magen (3)
- Duct. salivaris (4)
- kleine Bronchi

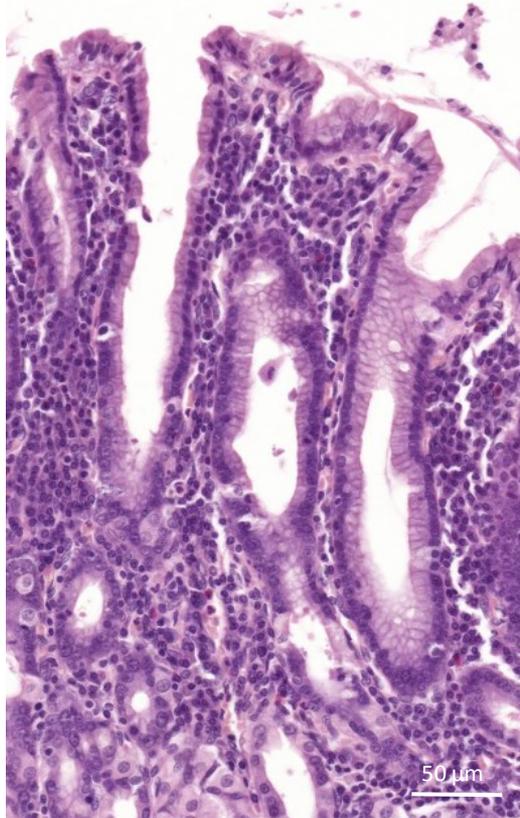
1.



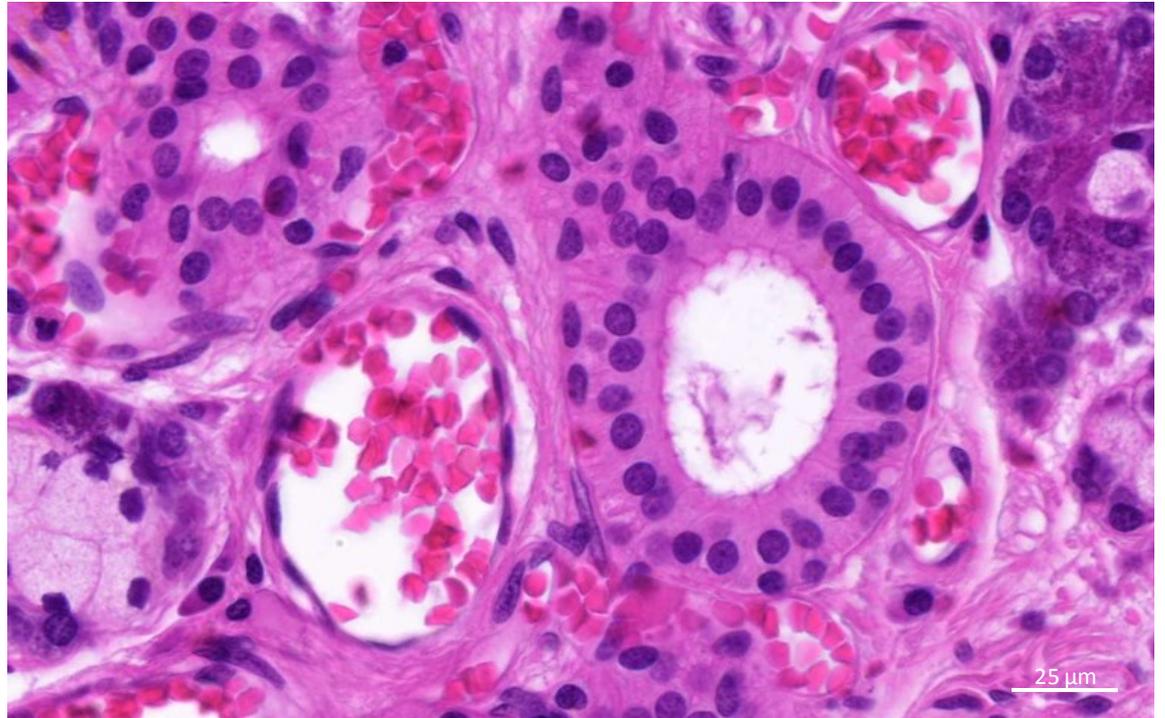
2.



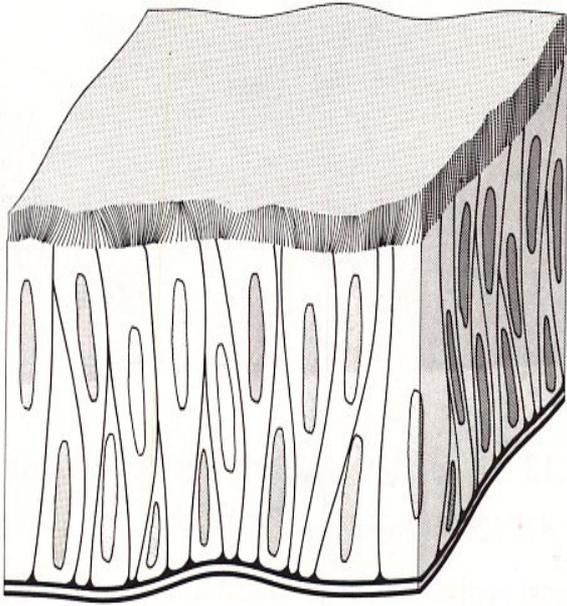
3.



4.



# Mehrreihiges hochprismatisches Epithel



JEDE ZELLE STEHT MIT DER BASALMEMBRAN IN VERBINDUNG  
Nicht alle erreichen die Oberfläche  
Zellkerne liegen in verschiedenen Höhen  
Basale Zellen = Ersatzzellen

Mehrreihiges hochprismatisches Epithel mit Kinozilien

- Luftröhre (1)
- Eustachsche Röhre (Ohrtrompete)
- Paukenhöhle
- Tränenschläuche, Tränenkanal

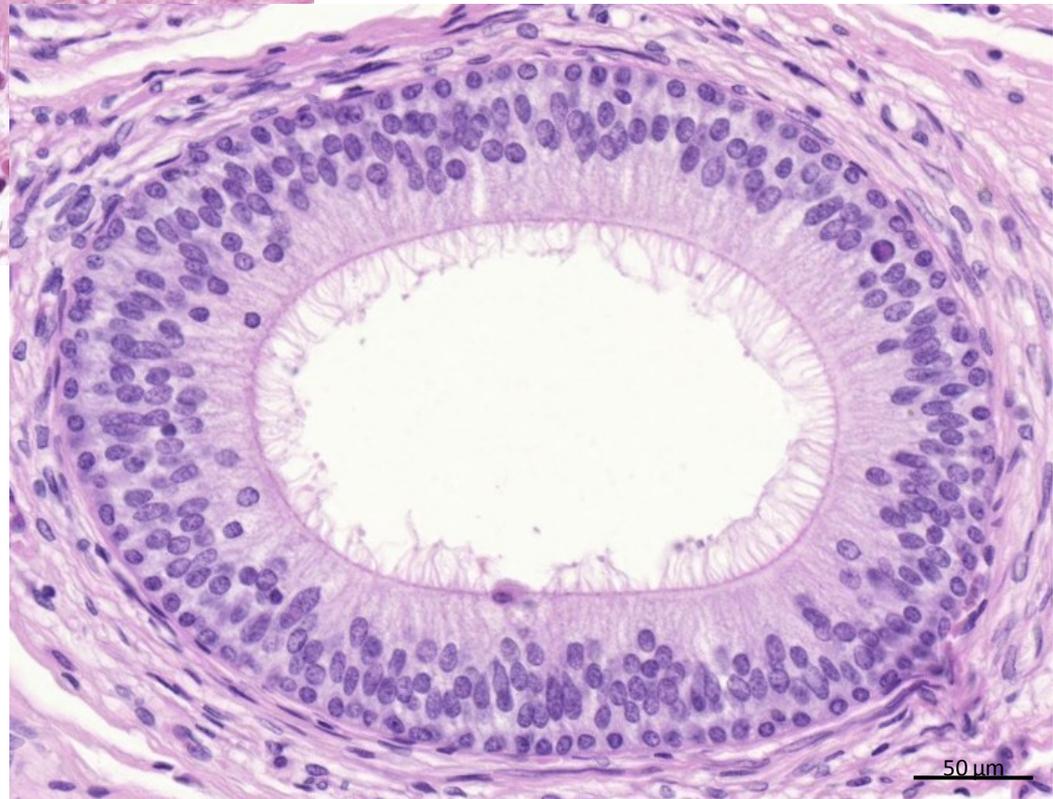
Mehrreihiges hochprismatisches Epithel mit Stereozilien

- Männliche Geschlechtsgänge (2)

1.

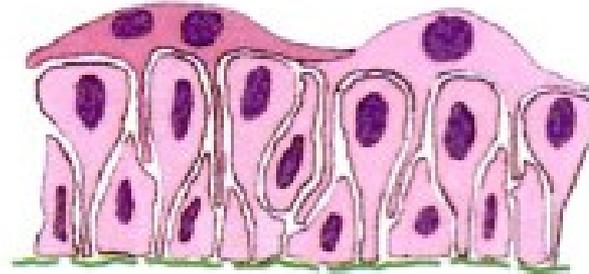


2.



# Urothelium

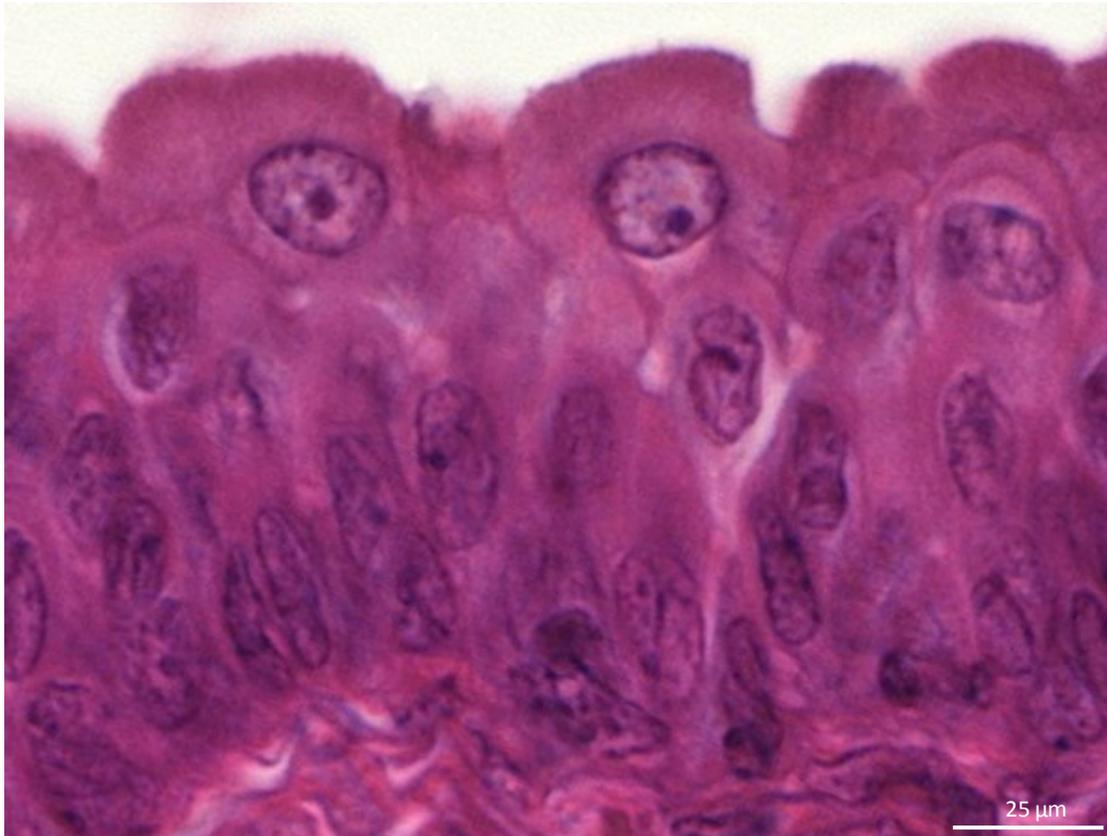
- Sinus renalis
- Ureter
- Vesica urinaria
- Anfang von Urethra



Schirmzellen

Biernenzellen

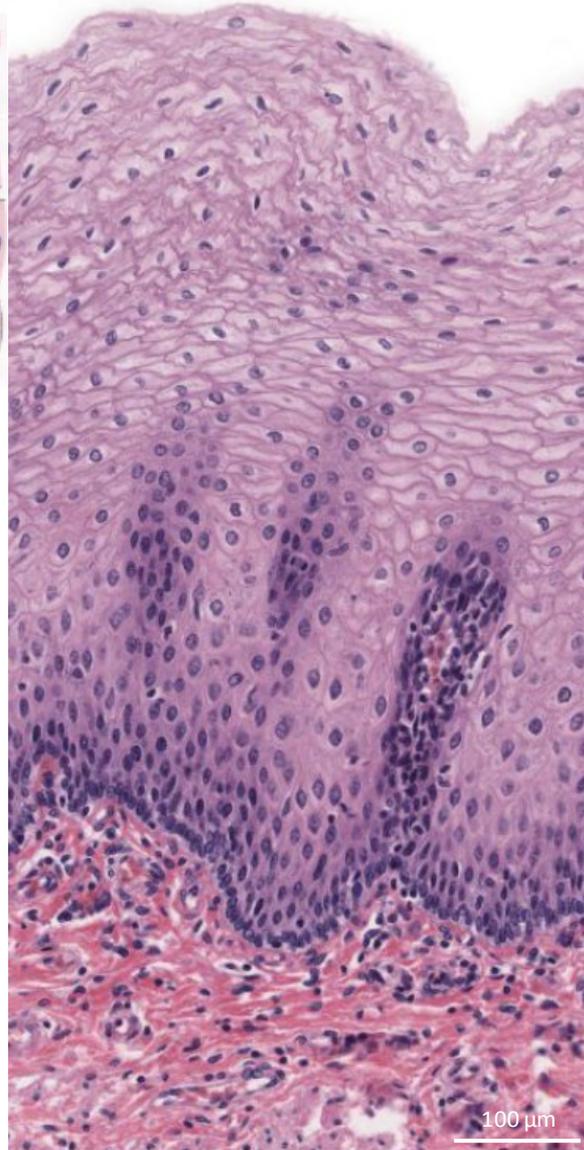
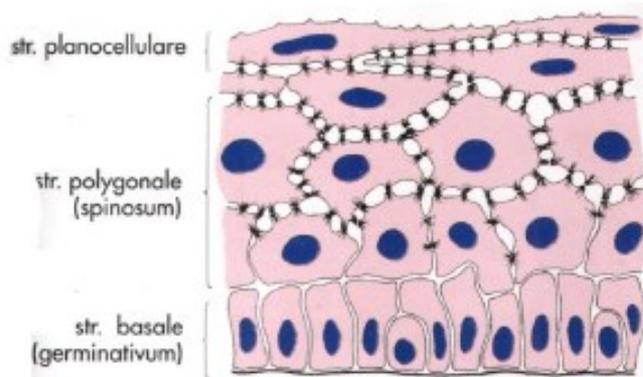
Iso-/hochprismatische Zellen



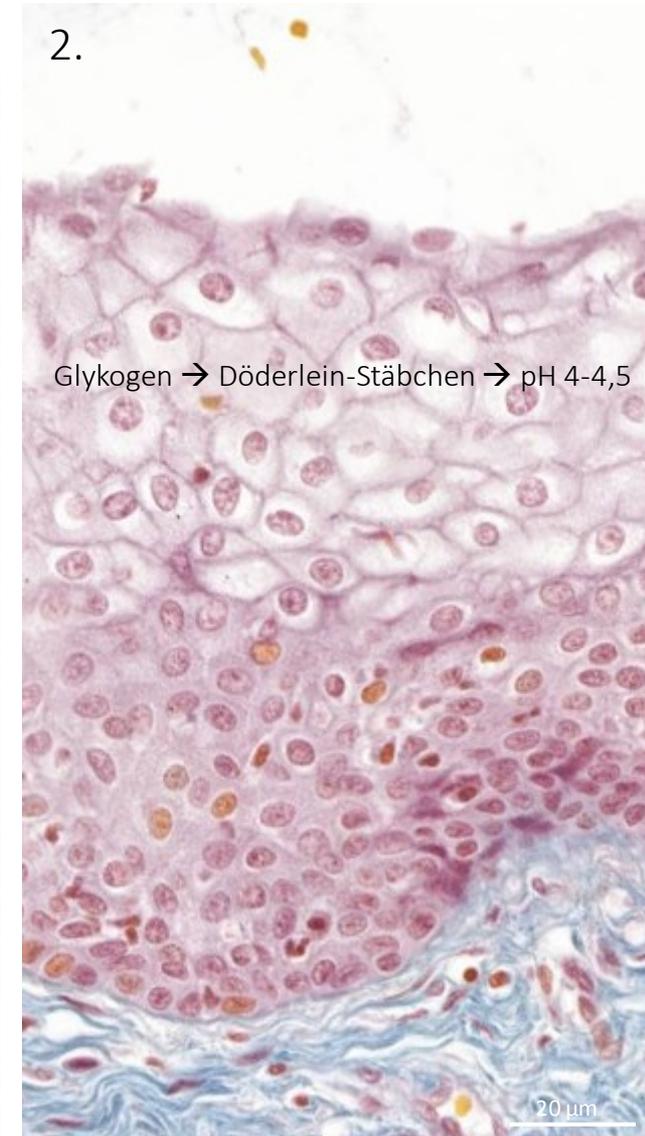
25 µm

# Mehrröhiges unverhorhtes Plattenepithel

1.

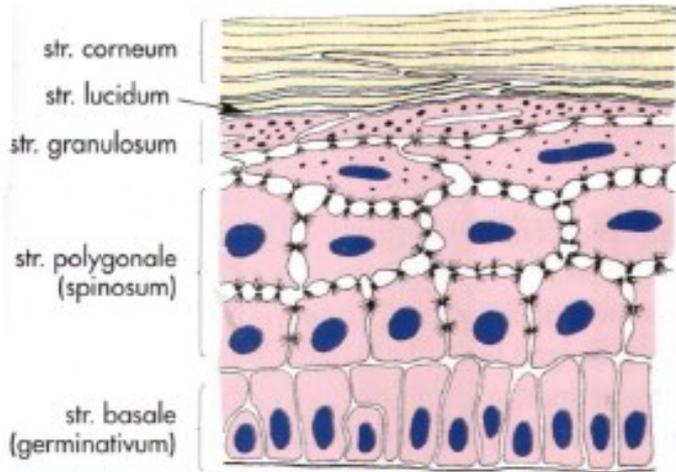


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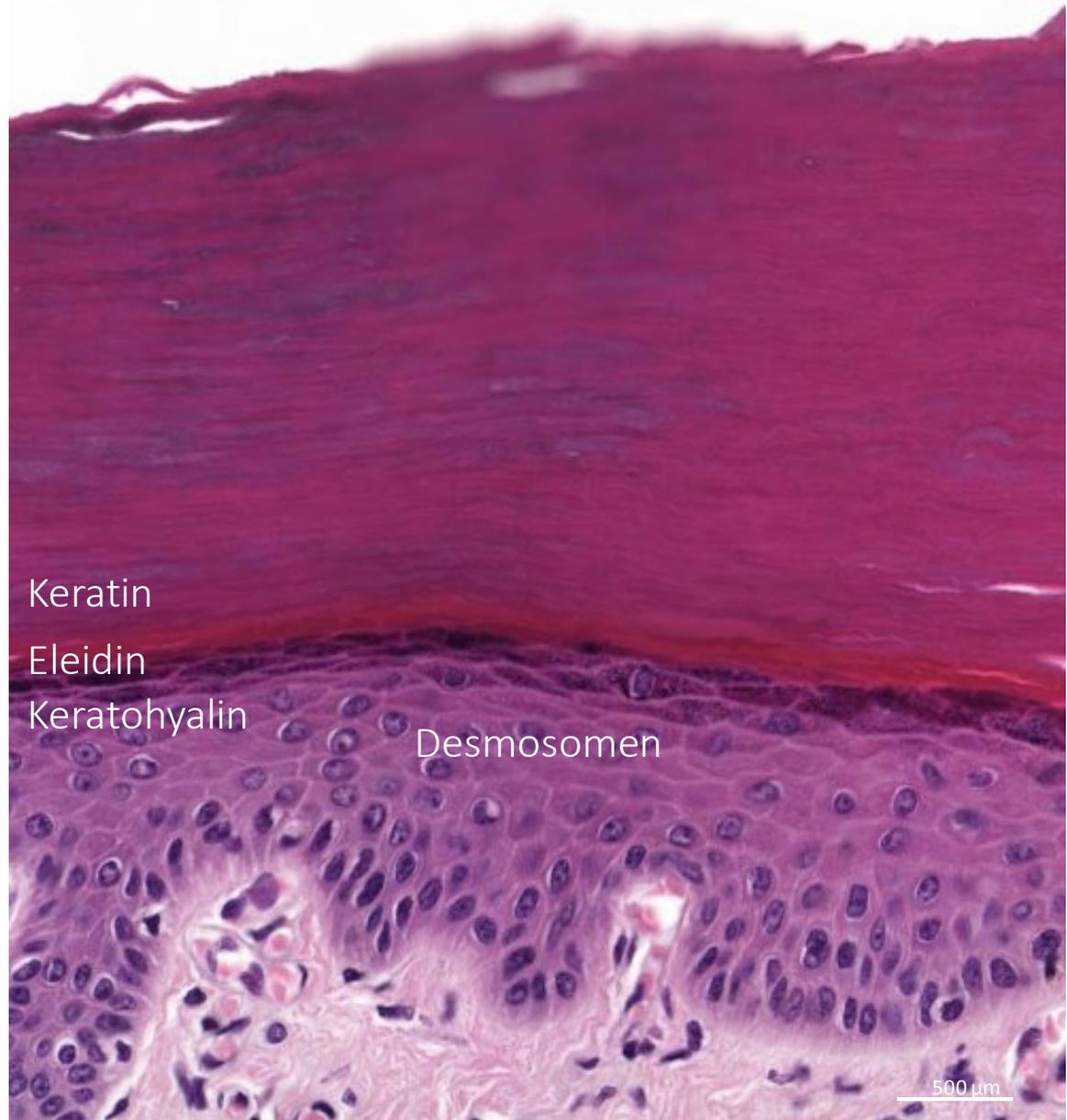


- Mundhöhle
- Untere 2/3 von Pharynx
- Speiseröhre (1)
- Scheide (2)
- Cornea
- Vestibulum nasi
- Fossa navicularis

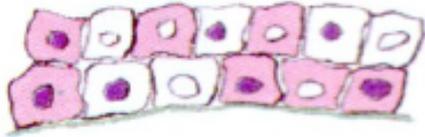
# Mehrröhiges verhorntes Plattenepithel



- Haut



# Mehrsichtiges kubisches Epithel

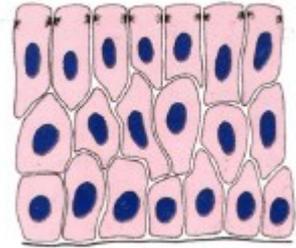


- Drüsenausführungsgänge

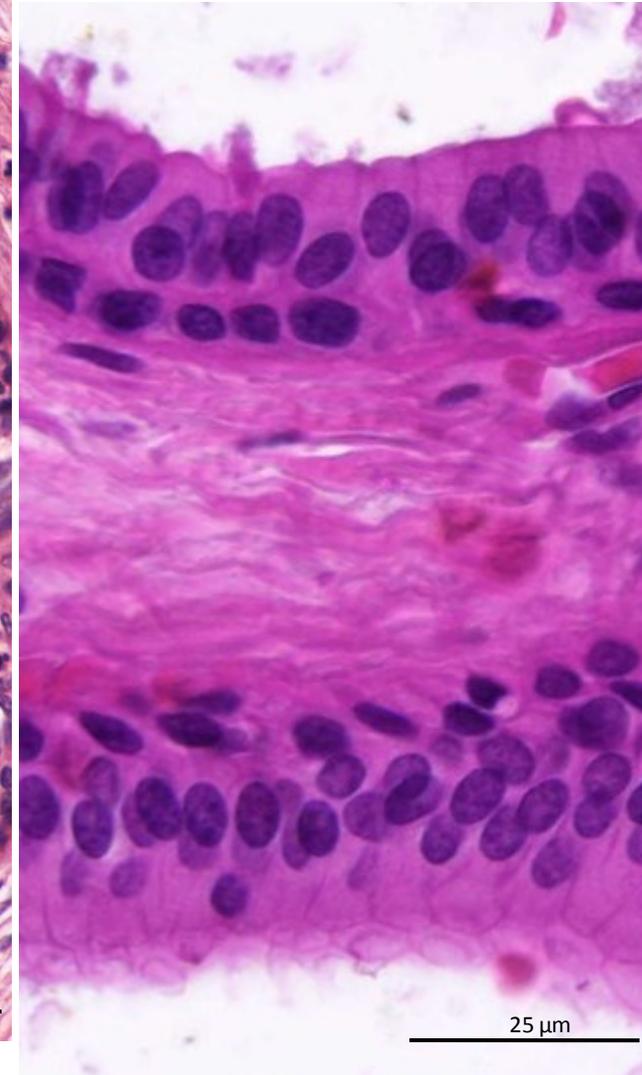
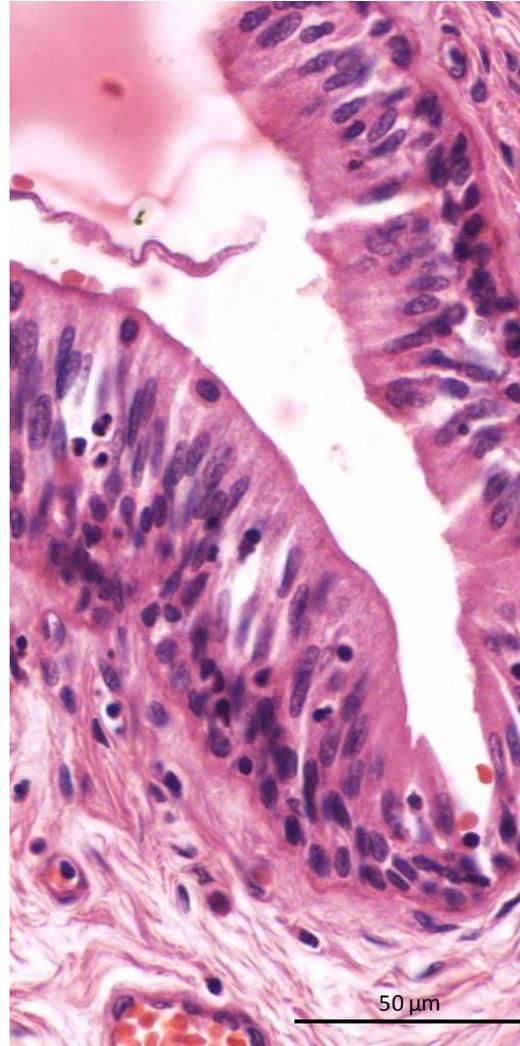


# Mehrsichtiges hochprismatisches Epithel

1.



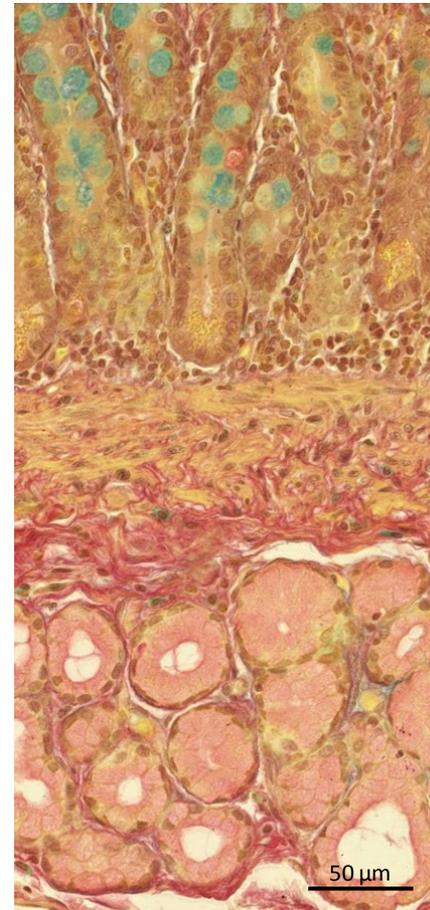
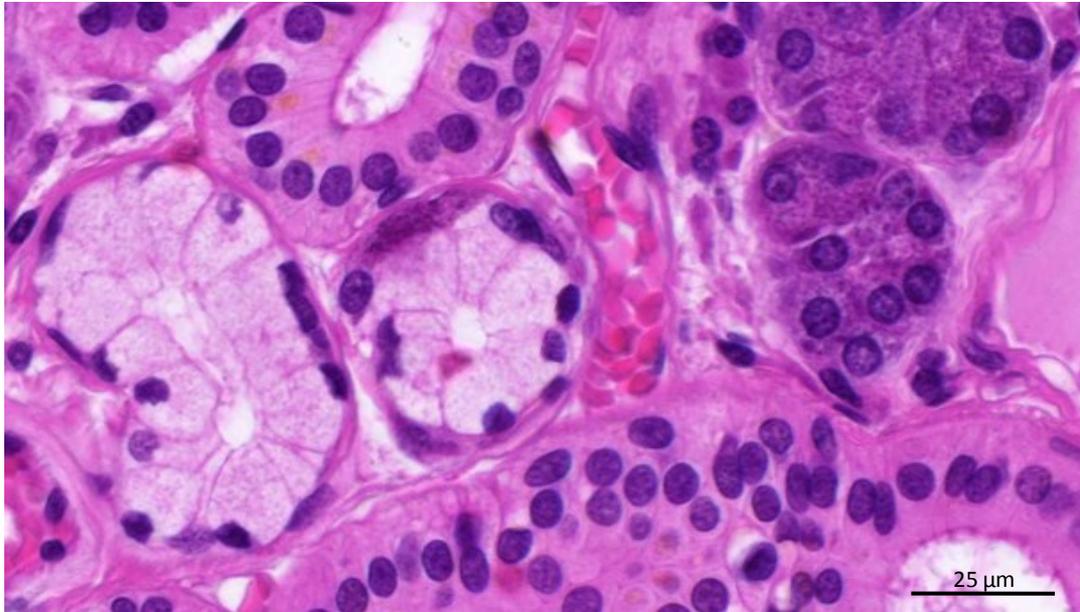
2.



- Männliches Harnrohr (1)
- Drüsenausführungsgänge (2)
- Fornix conjunctivae

# Drüsenepithel

1. Exo- oder endoepitheliale Drüse
2. Ein- (Dünn- und Dickdarm, Luftröhre, weibliche Geschlechtsgang) oder mehrzellige (männlichen Harn-röhre, Nasenschleimhaut) Drüse
3. Säckchenförmig (alveolär), beerenförmig (azinös), rörchenförmig (tubulär)
4. Einfach (nonramificatus), verzweigt (ramificatus), zusammengesetzt (composita)
5. Serös, mucös

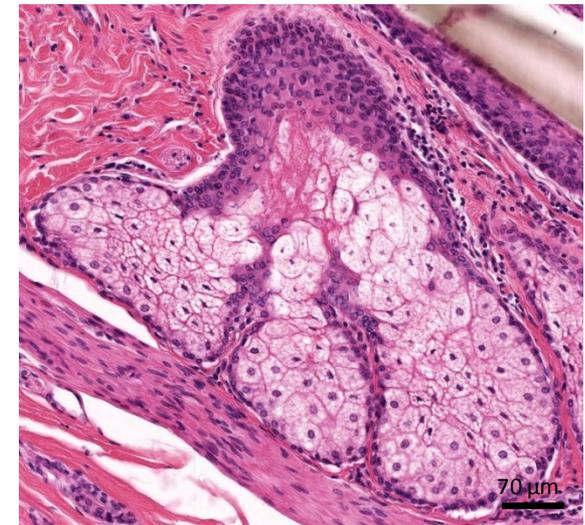
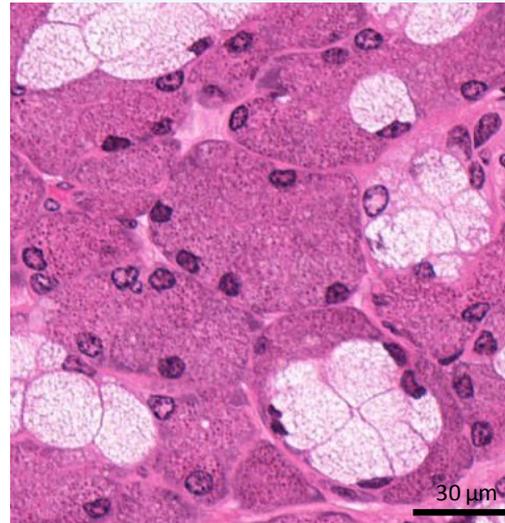
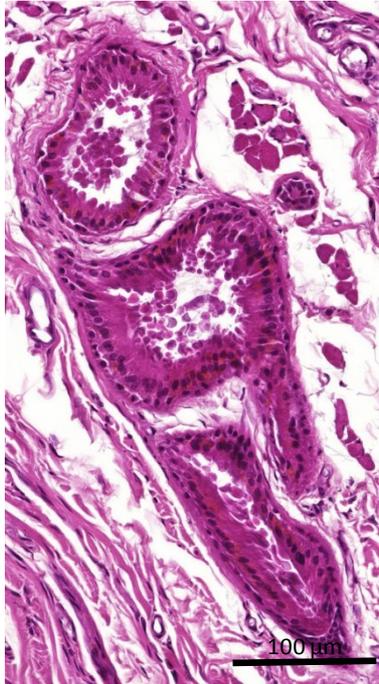
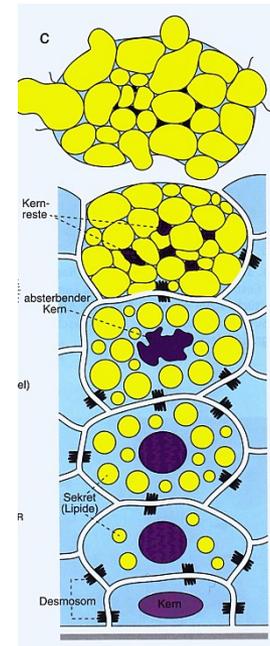
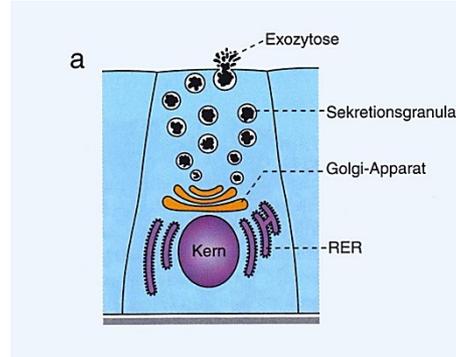
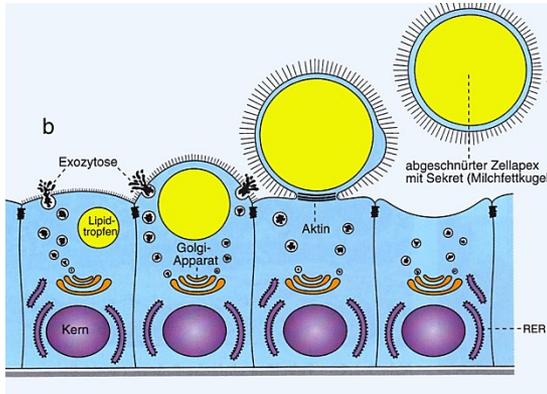


Sauere Mukosubstanzen  
(Proteoglykane,  
Glykoproteine)

Neutrale, alkalische  
Mukosubstanzen  
(Glykoproteine,  $\text{HCO}_3^-$ )

Alcianblau-H-Pikrosiriusrot

## 6. Sekretionsmodus: apokrine, merokrine, holokrin



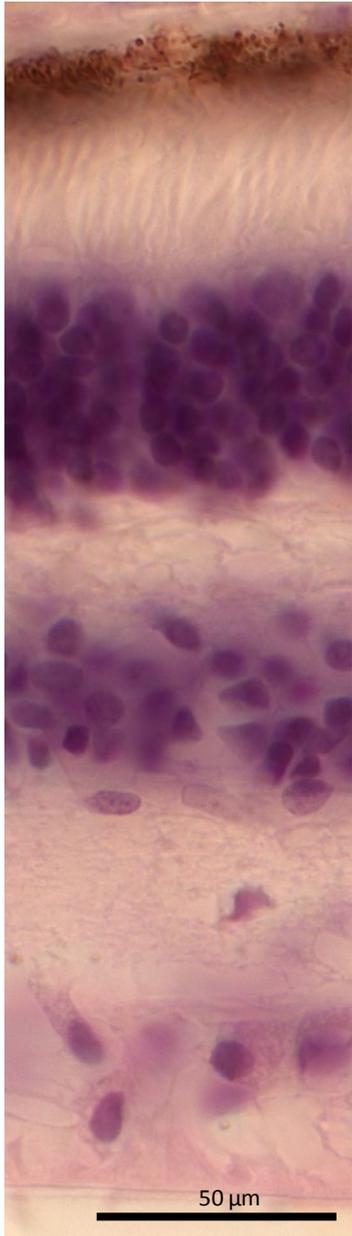
Moll-Drüsen  
Duftdrüsen  
laktierende Brustdrüse  
Epithelzellen im Ductus deferens

Speicheldrüsen  
Schweißdrüsen  
Pancreas  
Hauptzellen in Magen  
Gl. lacrimalis  
Prostata (pseudoapokrin)

Talgdrüsen  
Zeiss-Drüsen  
Meibom-Drüsen

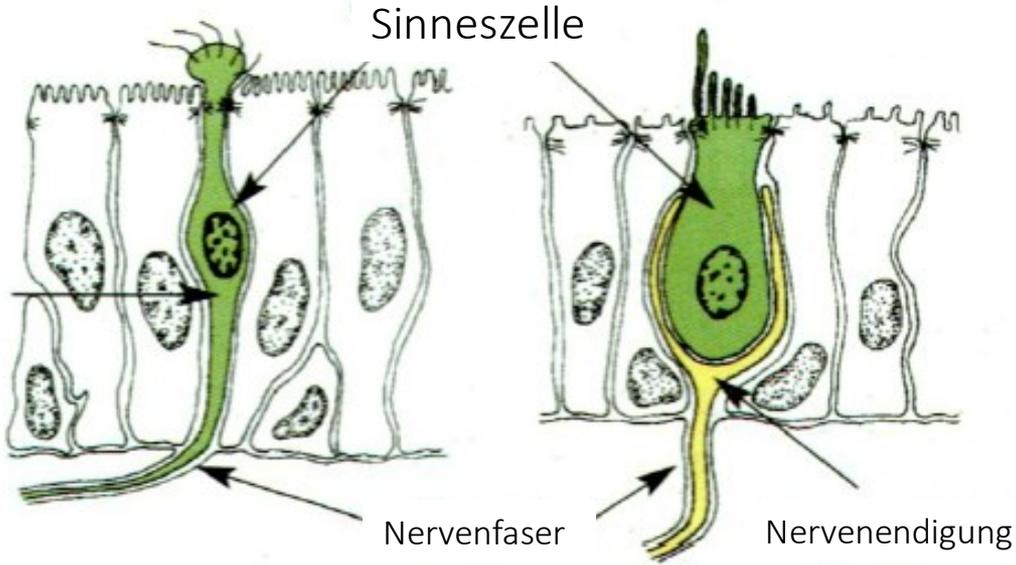
# Pigmentepithel

- Stratum pigmentosum retinae



# Sinnesepithel

1.



**Primär**

Olfaktorisches Epithelium

**Sekundär**

Geschmacksknospen (1)

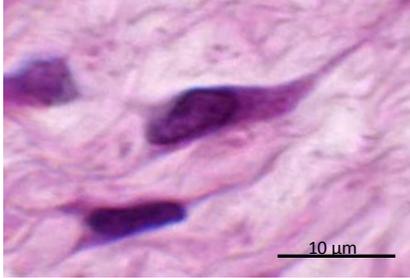
Haarzellen



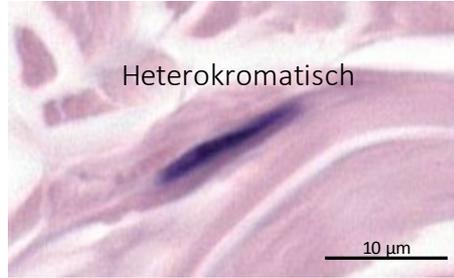
# Bindegewebe

- Fixe und mobile Zellen

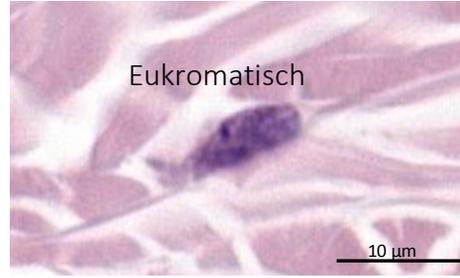
Mesenchymzellen



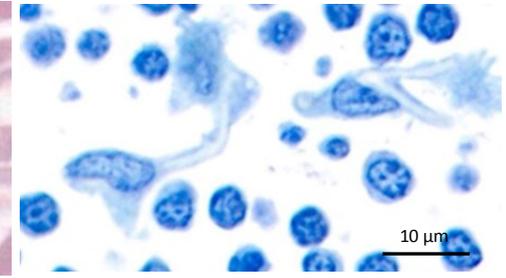
Fibrozyten



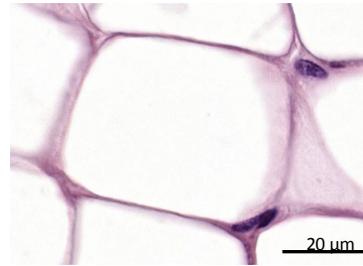
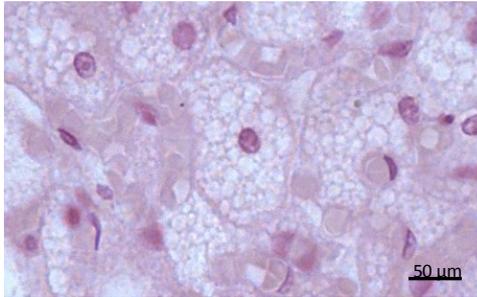
Fibroblasten



Reticulumzellen

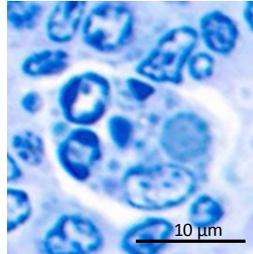


Fettzellen/Adipozyten



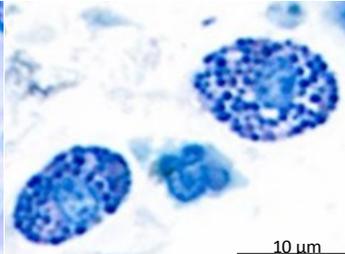
Pigmentzellen/Melanozyten

Macrophagen

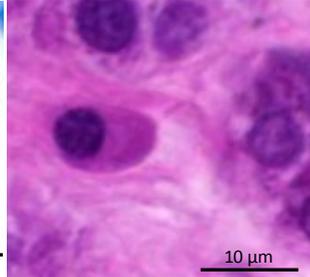


Alveolare macrophagen  
Kupffer-Zellen  
Mesoglia Zellen  
Langerhans-Zellen  
Osteoklasten  
Chondroblasten

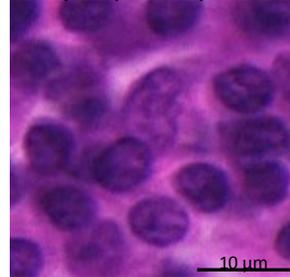
Mastzellen



Plasmazellen

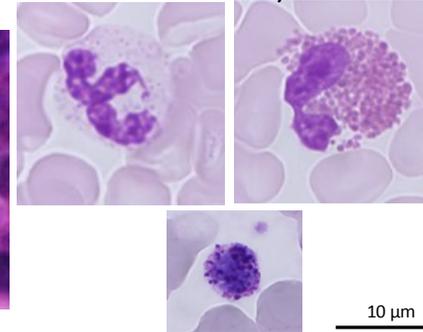


Lymphozyten

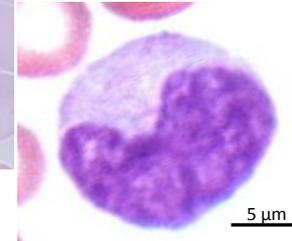


Immuncytochemie  
T Lymphozyten – CD3  
B Lymphozyten – CD20

Granulozyten

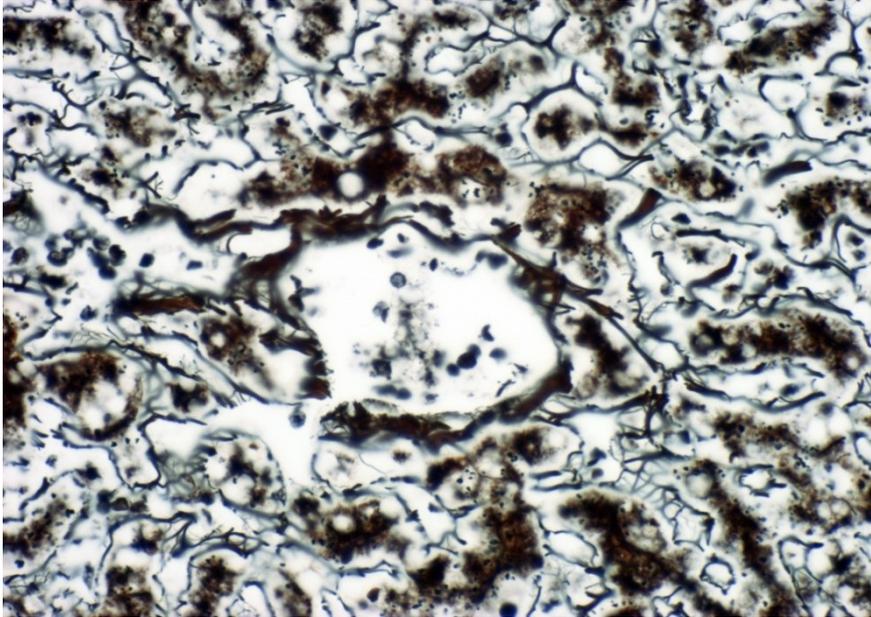


Monozyten

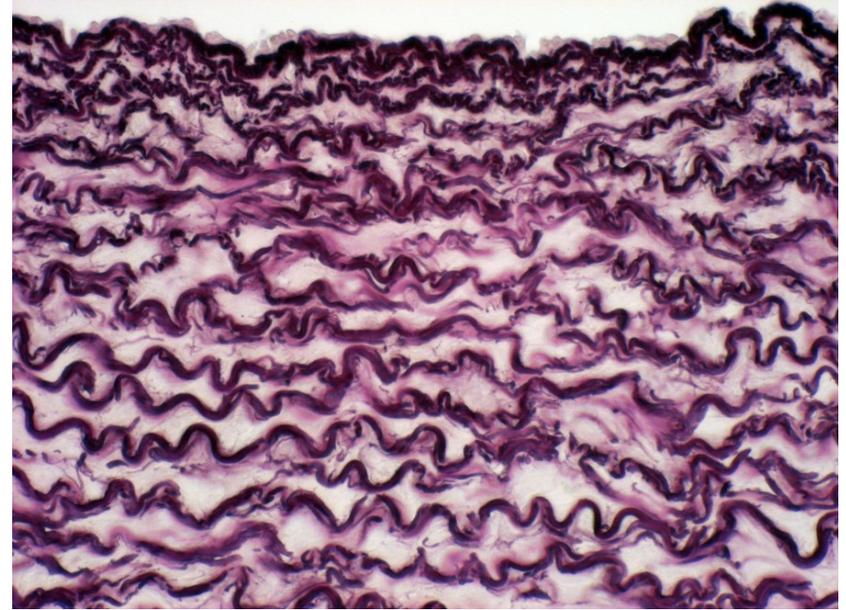


Histiozyten

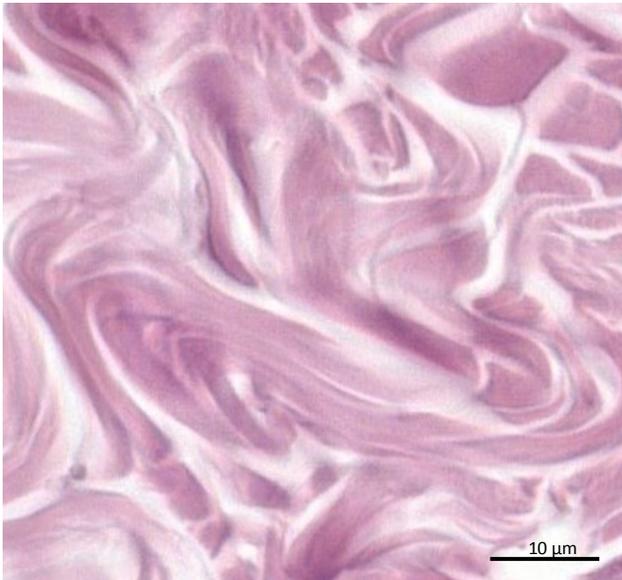
- Interzellulärsbstanz (retikuläre, elastische, kollagen Fasern)



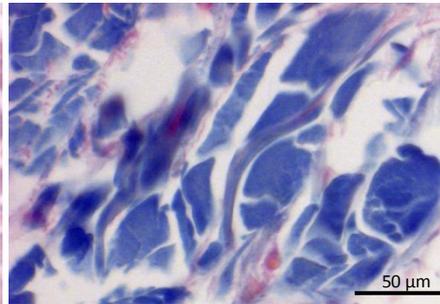
50 µm



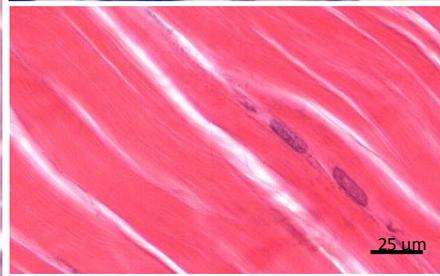
50 µm



10 µm



50 µm



25 µm

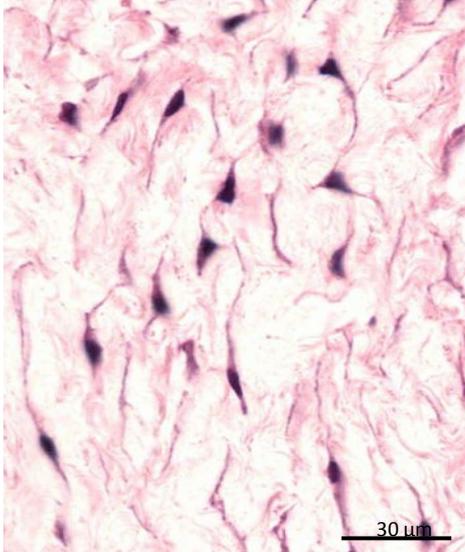
Färbungen:

Retikuläre Fasern → Silberimprägnierung

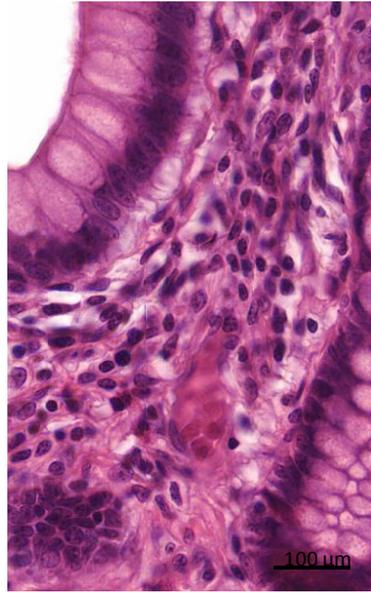
Elastische Fasern → RF, Orcein

- Grundsubstanz (Proteoglykane, Glykoproteine)

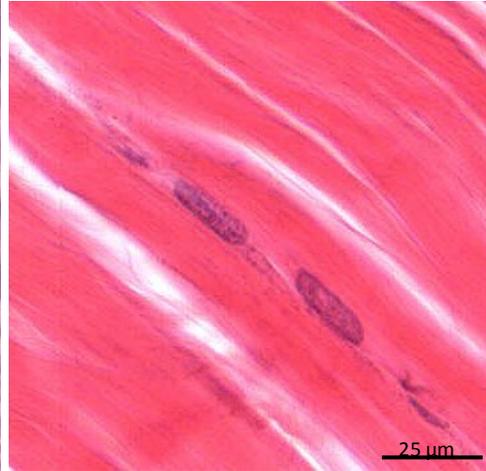
Embryonales Bgw



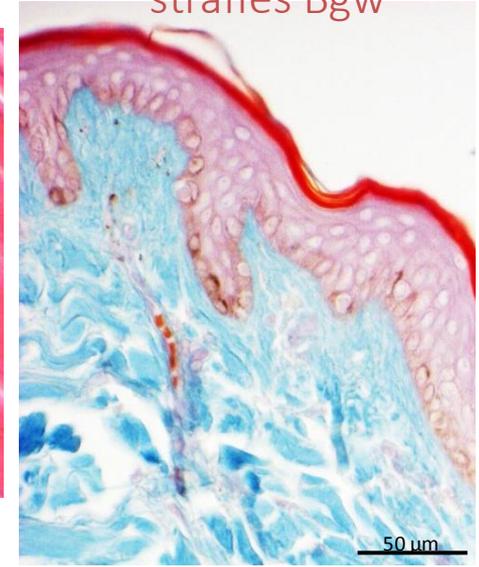
Lockeres Bgw



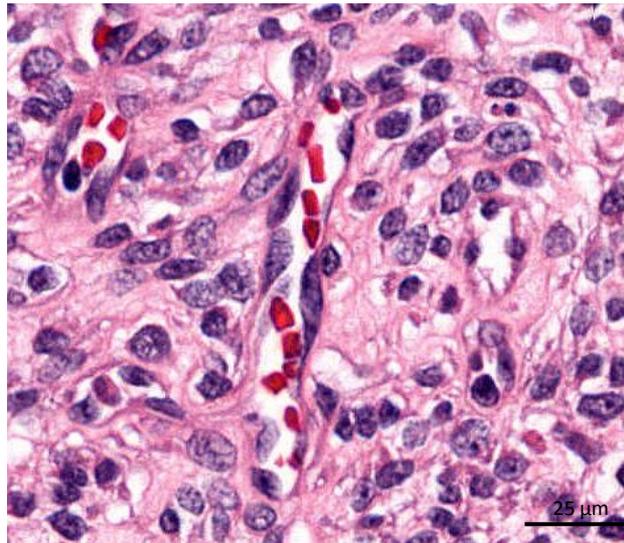
Parallelfaseriges  
straffes Bgw



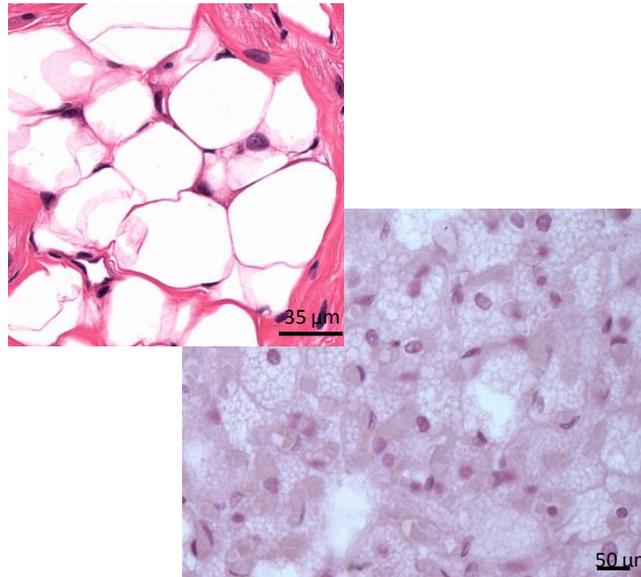
Geflechtartiges  
straffes Bgw



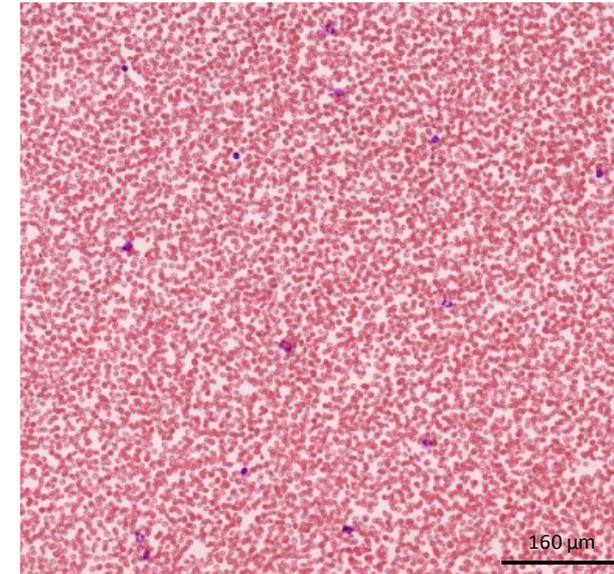
Spinozelluläres Bgw



Fettgewebe

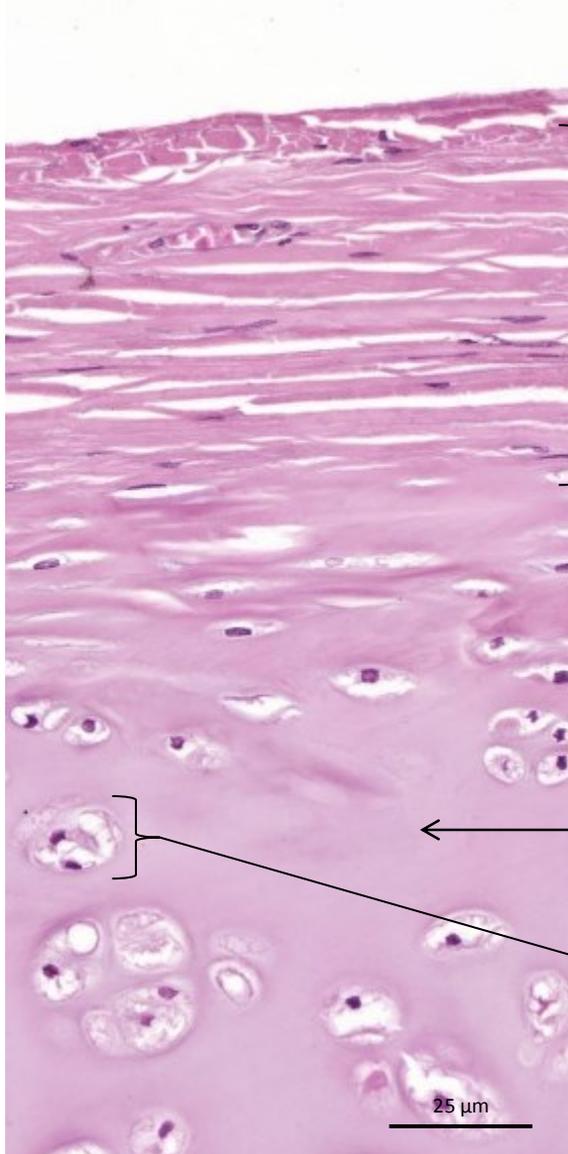


Blut



# Stützgewebe

## Knorpelgewebe



Str. fibrosum

Str. chondroblasticum

Interterritorielle matrix

Chondron

25 µm

Knorpelhof=  
territoriale Matrix

Knorpelkapsel

Chondrozyt

Lakune

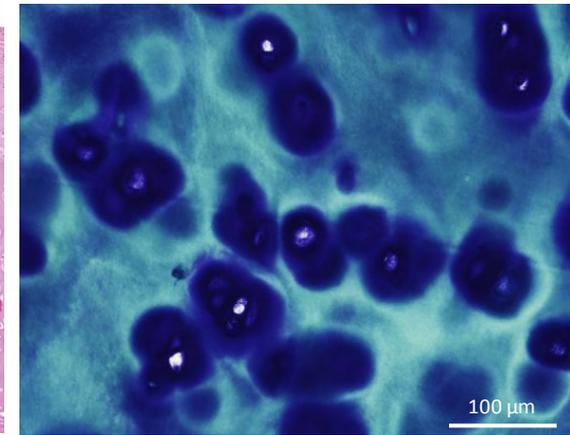
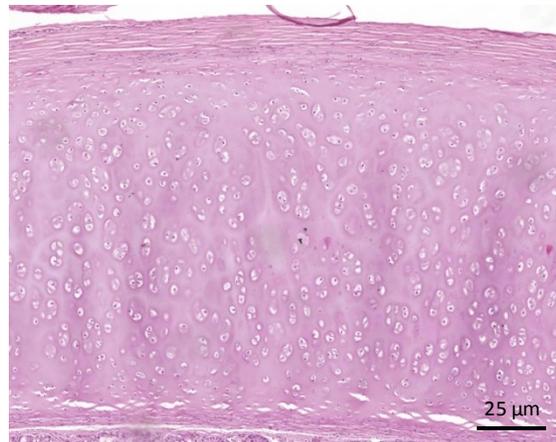


10 µm

## Hyaliner Knorpel

- Luftröhre (1)
- Bronchien
- Rippenknorpel
- Nasenknorpel
- Gelenke
  
- Perichondrium

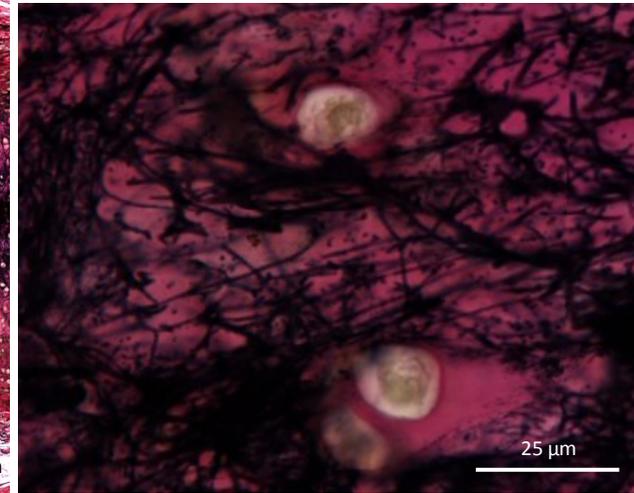
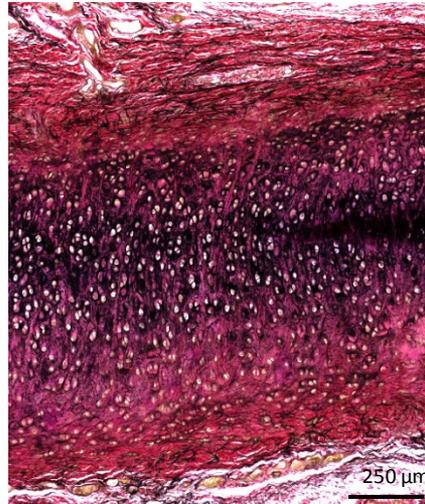
1.



## Elastischer Knorpel

- Ohrmuschel
- Epiglottis (2)
- Tuba auditiva
- Kleine Knorpeln vom Larynx
  
- Perichondrium
- Elastische Fasern

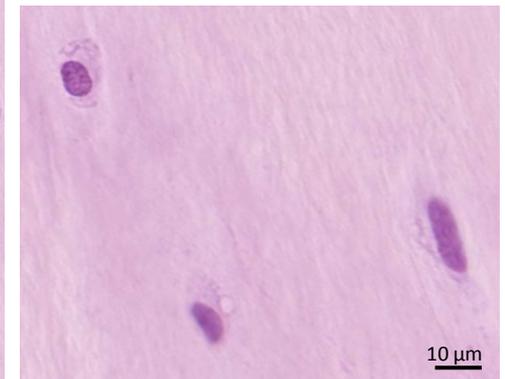
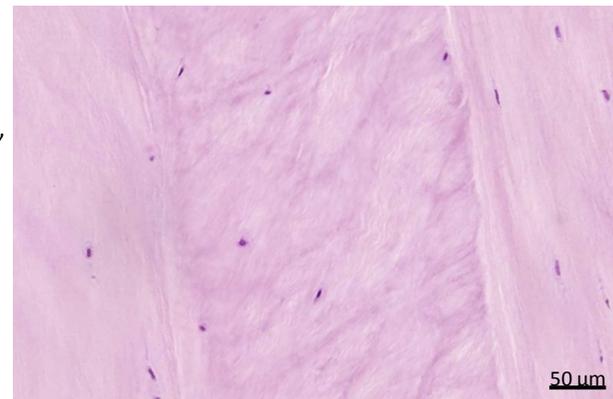
2.



## Faserknorpel

- Anulus fibrosus von Disc. intervertebralis
- Symphysis pubica
- Disc. Articularis
- Menisci (3)
- Gelenkflächen: Art. temporomandibularis, Art. sternoclavicularis, Art. acromioclavicularis, Art. sacroiliaca
- Gelenkklippen
  
- Ø Perichondrium
- Kollagen Typ I.
- Fibro-Chondrozyten

3.

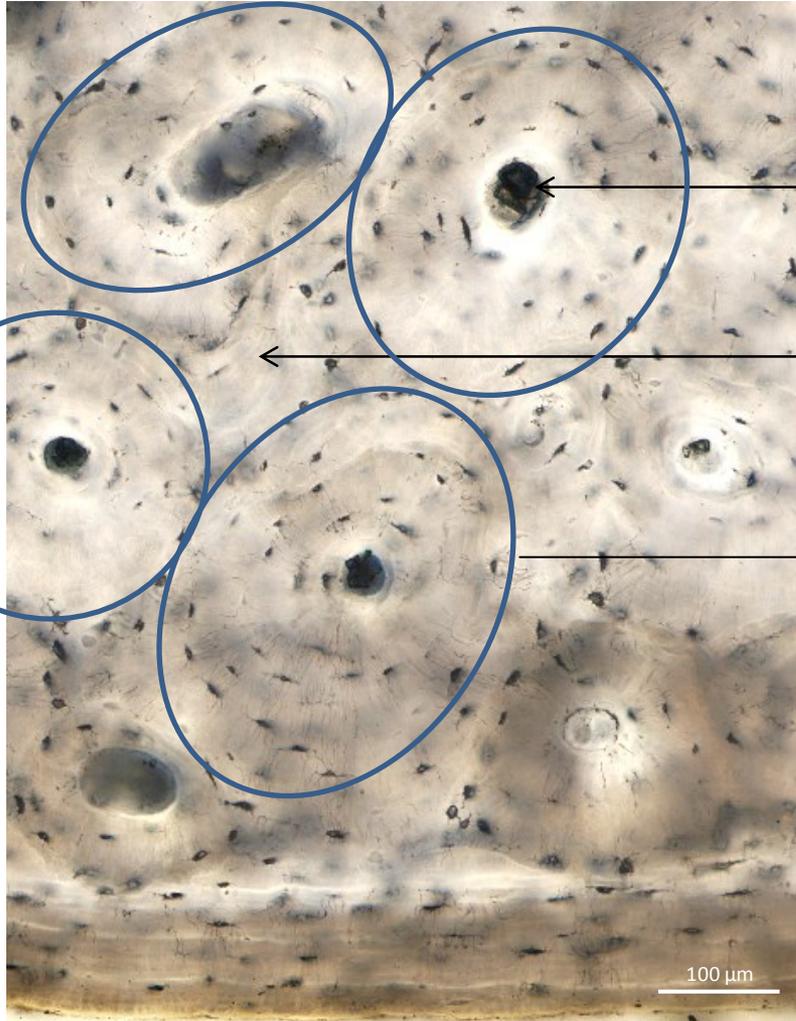


# Knochengewebe

Osteozyten + Grundsubstanz + kollagenen Fibrillen + Kittsubstanz + Salzen

Osteoid

Organische (Fibrillen) und anorganische (Salze) Anteil



Havers-Kanal

Laminae intercalares

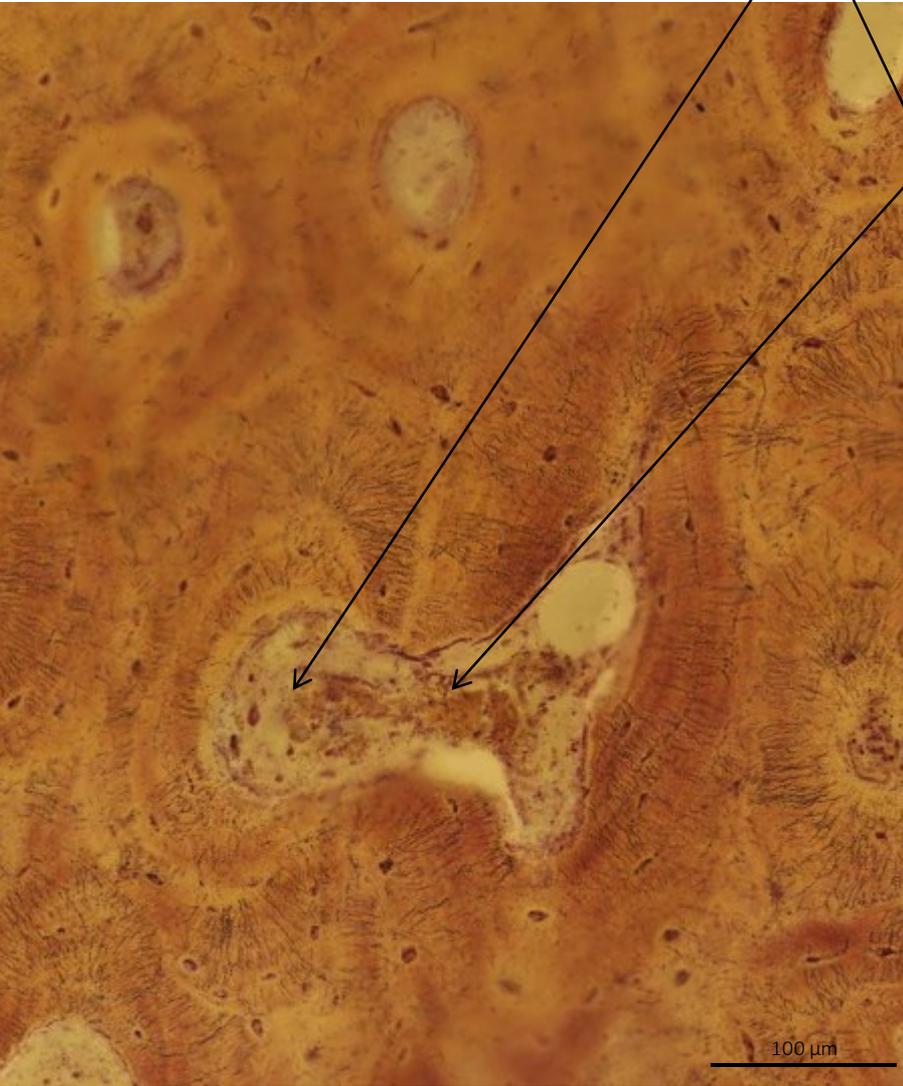
Laminae speciales

Laminae generales externae

100 µm

Knochenschliff

Havers-Kanal und Volkmann-Kanal



# Knochenbildung

1. Primäre Knochenbildung ANGIOGENE
2. Secundäre Knochenbildung (aus Stützgewebe)
  1. Desmale Verknöcherung (direkt)
  2. Chondrale Verknöcherung (indirekt)

# Desmale Verknöcherung

direkte Entwicklung aus vaskularisiertem Bindegewebe

Mesenchymzellen (inselartig)  
=Verknöcherungspunkte



Osteoprogenitor-zellen



Osteoblasten



Osteoid



Umbau (Osteoblast + Osteoklast)

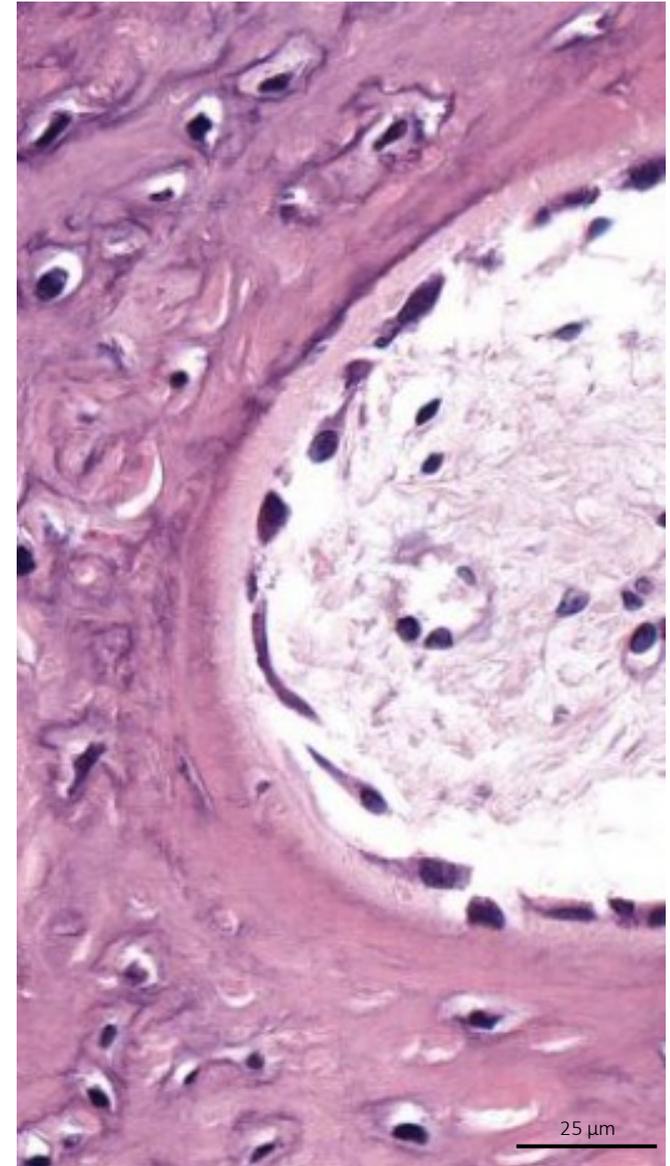


Ablagerung von Mineralen

- Knochen des Schädeldaches
- Knochen des Gesichtsschädels
- Clavicula



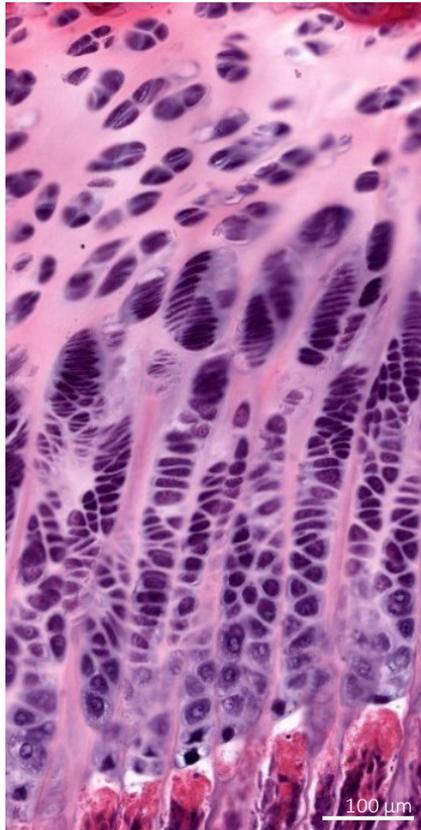
Knochenumbau: Osteoklasten



# Chondrale Verknöcherung

knorpelig vorgebildete Skelettstücke

- Perichondrale (eigentlich desmal ablaufend) » Diaphyse » Knochenmanschette  
Perichondrium > Periosteum  
appositionelle Ossifikation
- Enchondrale » Epiphyse  
Knorpeldegeneration in der Diaphyse– Einwachstum von Blutgefäße aus dem Periost, Einwanderung von Mesenchym-, Osteoprogenitorzellen und Chondroklasten– Knorpel-Knochen Umbau erstreckt zur Epiphyse – Innenraum für primär Mark (primäre Markhöhle)

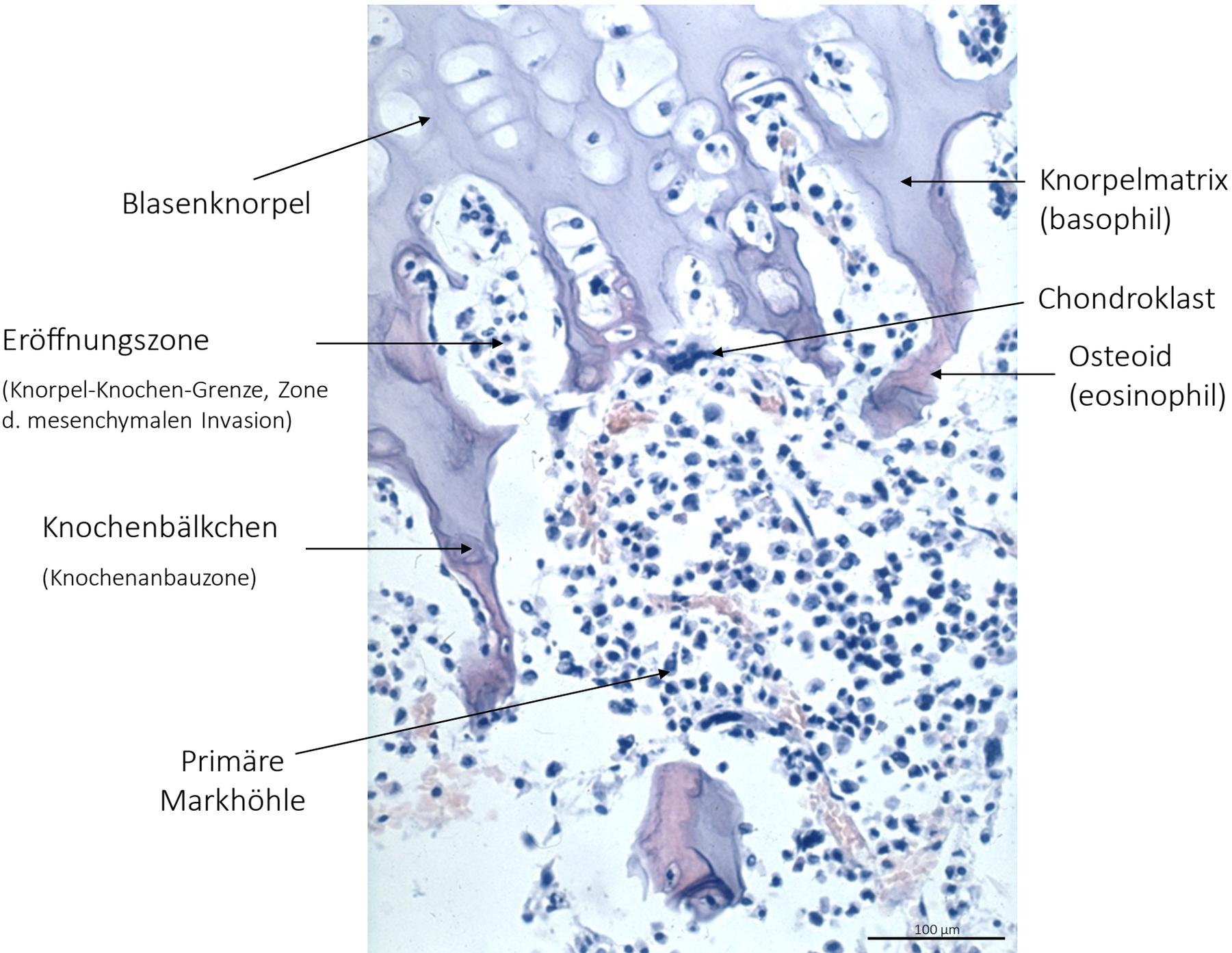


RESERVEZONE  
Chondronen

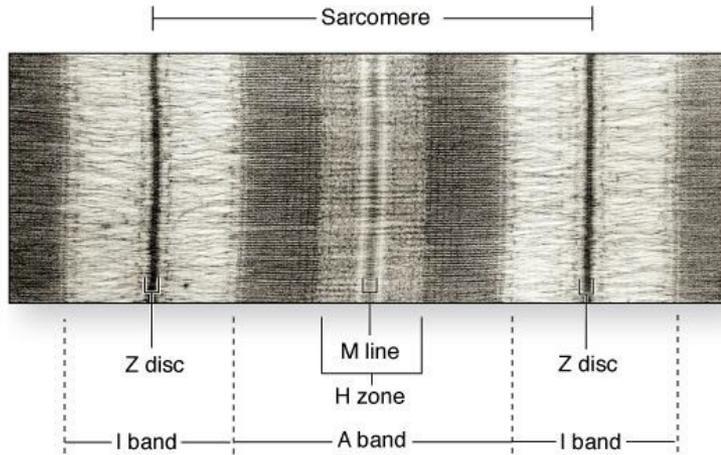
PROLIFERATIONSZONE  
Vermehrung der Knorpelzellen

RESORPTIONSZONE  
Verkalkung der Knorpelgrundsubstanz

VERKNÖCHERUNGSZONE  
degenerierende Knorpelzellen  
Knochenbalken

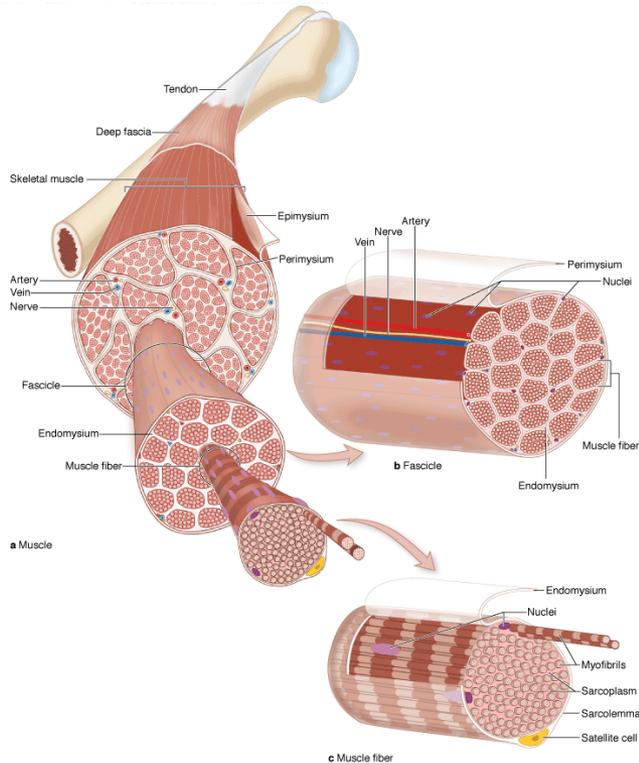


# Muskelgewebe



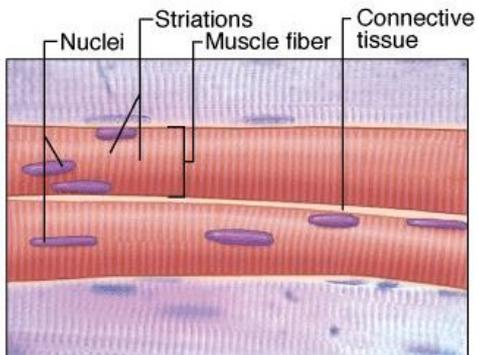
Anizotropen/doppelbrechenden Streifen (A):  
H-Streifen, M-Streifen  
Izotropen/einfachbrechenden (I): Z-Streifen

d

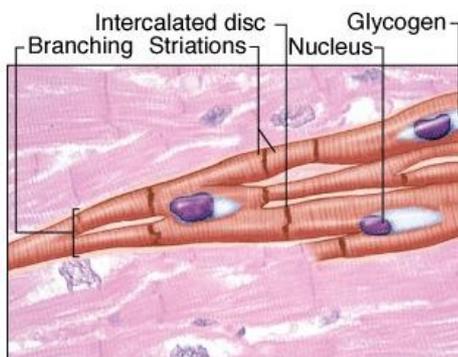


Epimysium - Muskel  
Perimysium - Fasciculus  
Endomysium - Muskelfaser

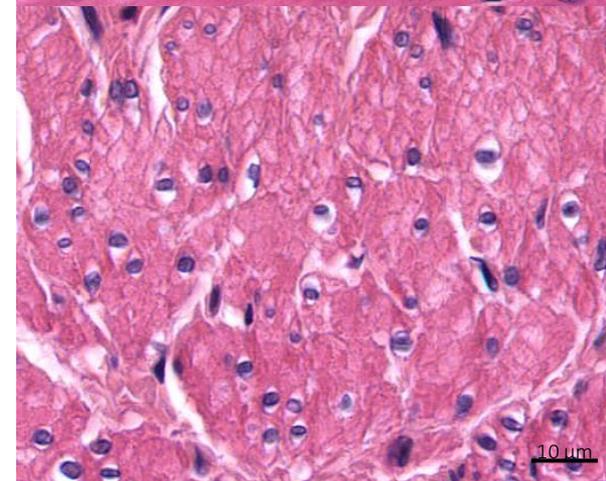
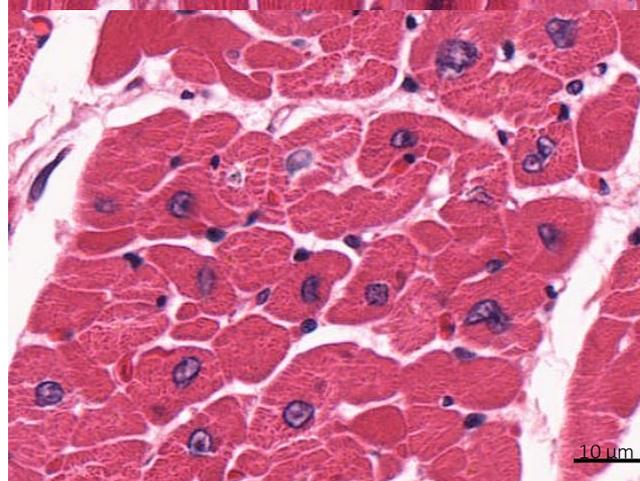
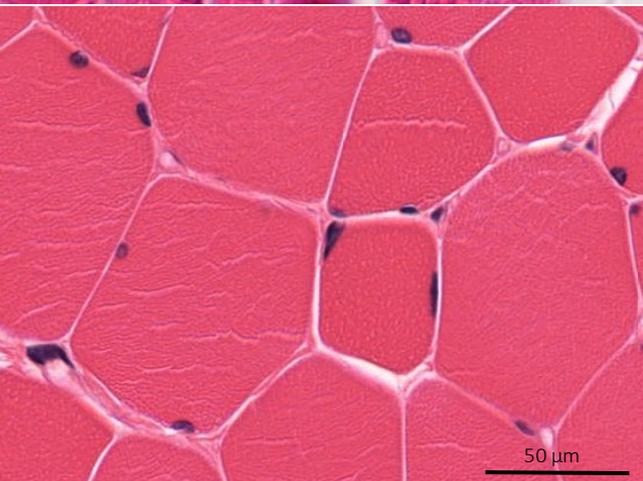
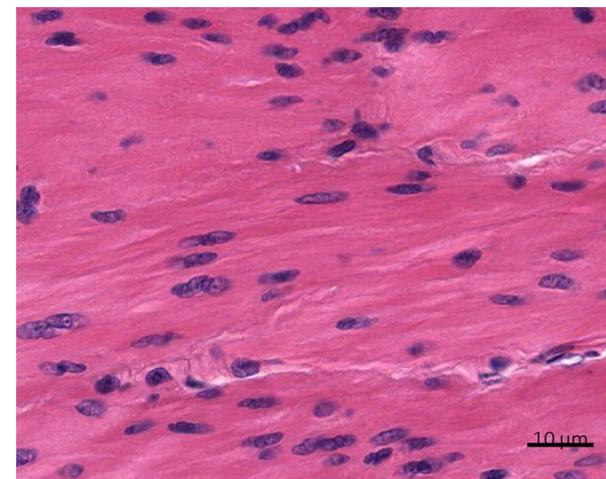
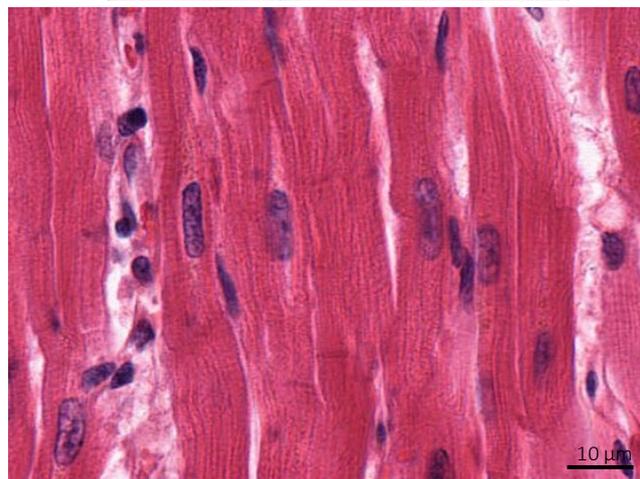
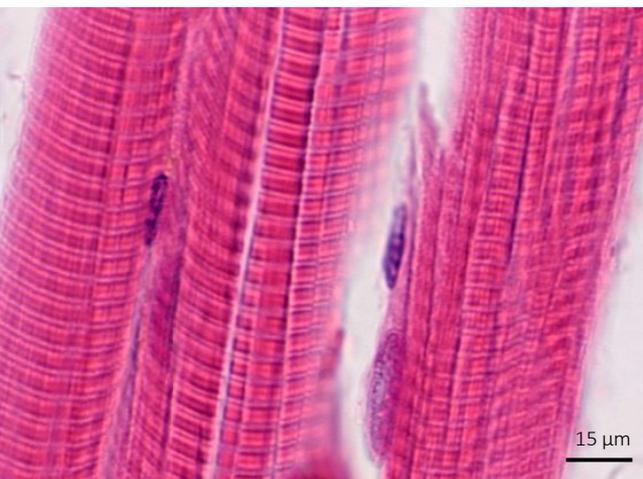
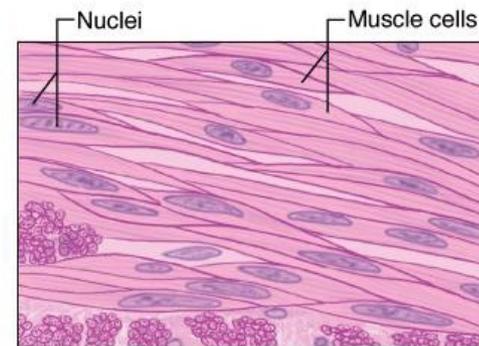
# Quergestreifte Muskulatur



# Herzmuskulatur



# Glatte Muskulatur

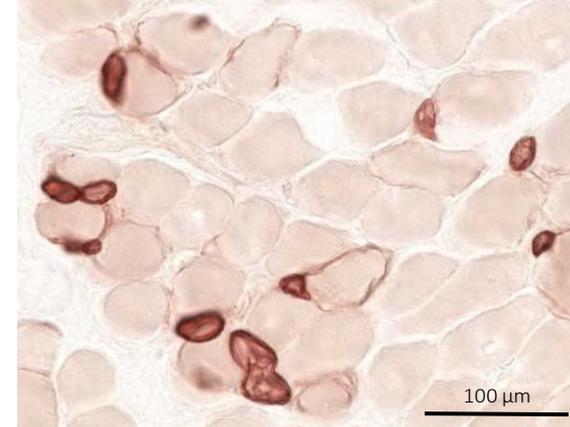


## Quergestreifte Muskulatur

## Herzmuskulatur

## Glatte Muskulatur

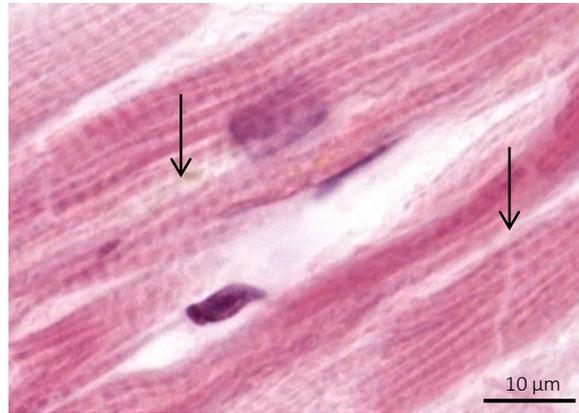
### Neuromuskuläre Synapse



Enzymhistochemischer Nachweis der Cholinesterase

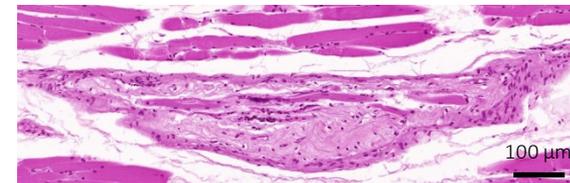
### Eberth-Linien/Disci intercalares/Glanzstreifen

### Lipofuscin Granülen



### Myometrium

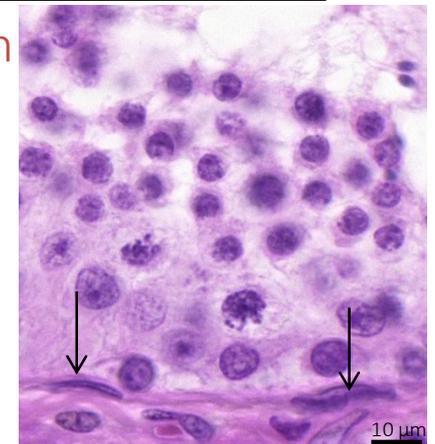
### Muskelspindel



### Myoepithel Zellen (Drüsenendstücke)



### Myofibroblasten (Hodenkanälchen)



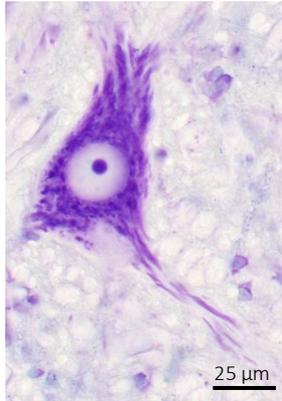
# Nervengewebe

## Nervenzellen

Zellkörper/Perikaryon    Aufnahme der Erregung  
 Dendrit                      Leitung der Erregung  
 Axon                          Erregungsübertragung: Synapse

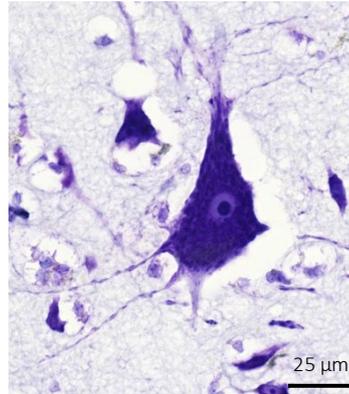


Multipolar



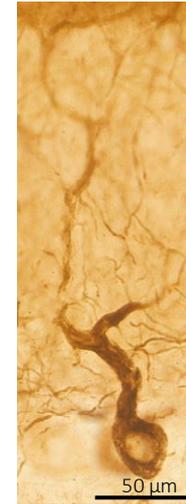
25 µm

Rüchenmark (LFB)



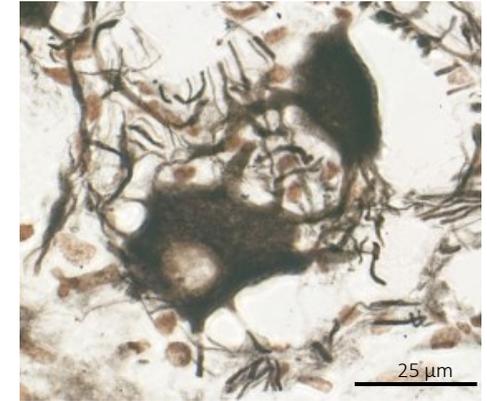
25 µm

Hirnrinde (KV)



50 µm

Kleinhirnrinde (SMI311)



25 µm

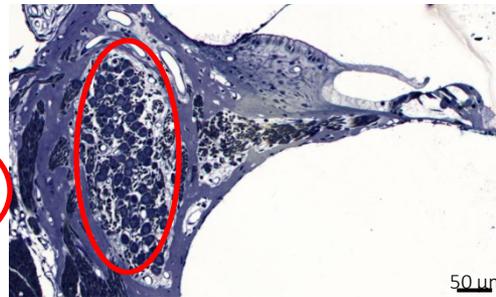
Vegetative Ganglien (Ag Impr.)



25 µm

Bipolar

Retina - Str. granulosum internum – Bipolare Zellen



50 µm

Ggl. spirale

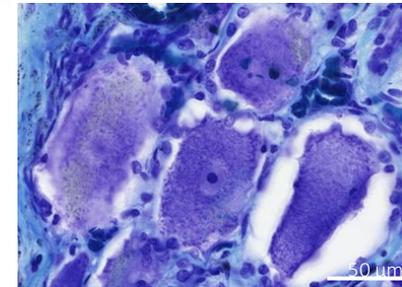


Pseudounipolar



2,5mm

Spinalggl. (LFB+KV)

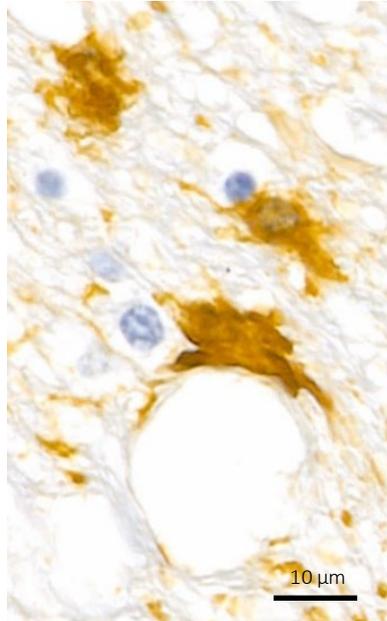


50 µm

Hirnnervkernen (Nucl. mesenc. N. V.)

# Gliazellen: Stütz- und Hüllzellen

## ZNS



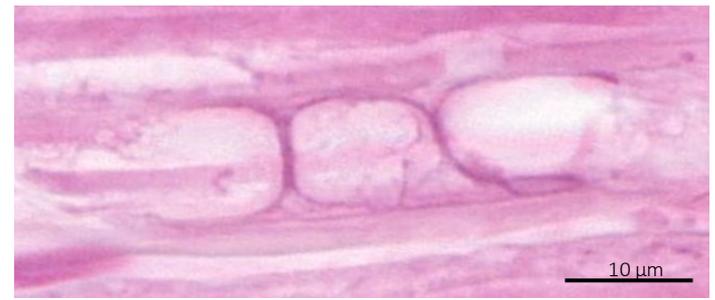
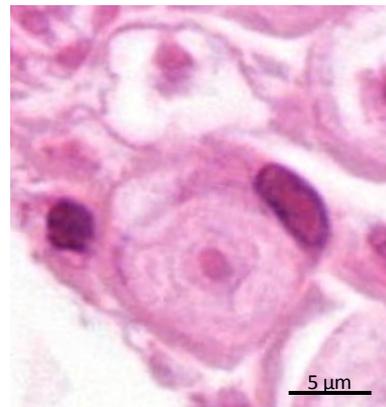
Astrozyten (GFAP)  
Protoplasmatische – graue Substanz  
Faserastrozyten – weisse Substanz

Membrana limitans gliae superficialis  
Membrana limitans gliae perivascularis

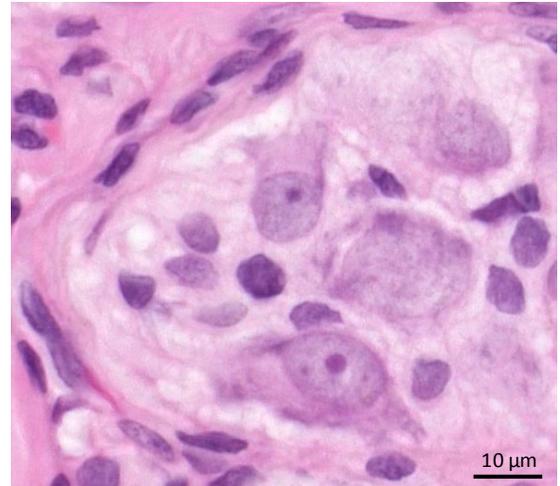
Oligodendrozyt  
Micro/mesoglia  
Ependymzellen

## PNS

### Schwann-Zellen



### Satellitenzellen



Pl. myentericus

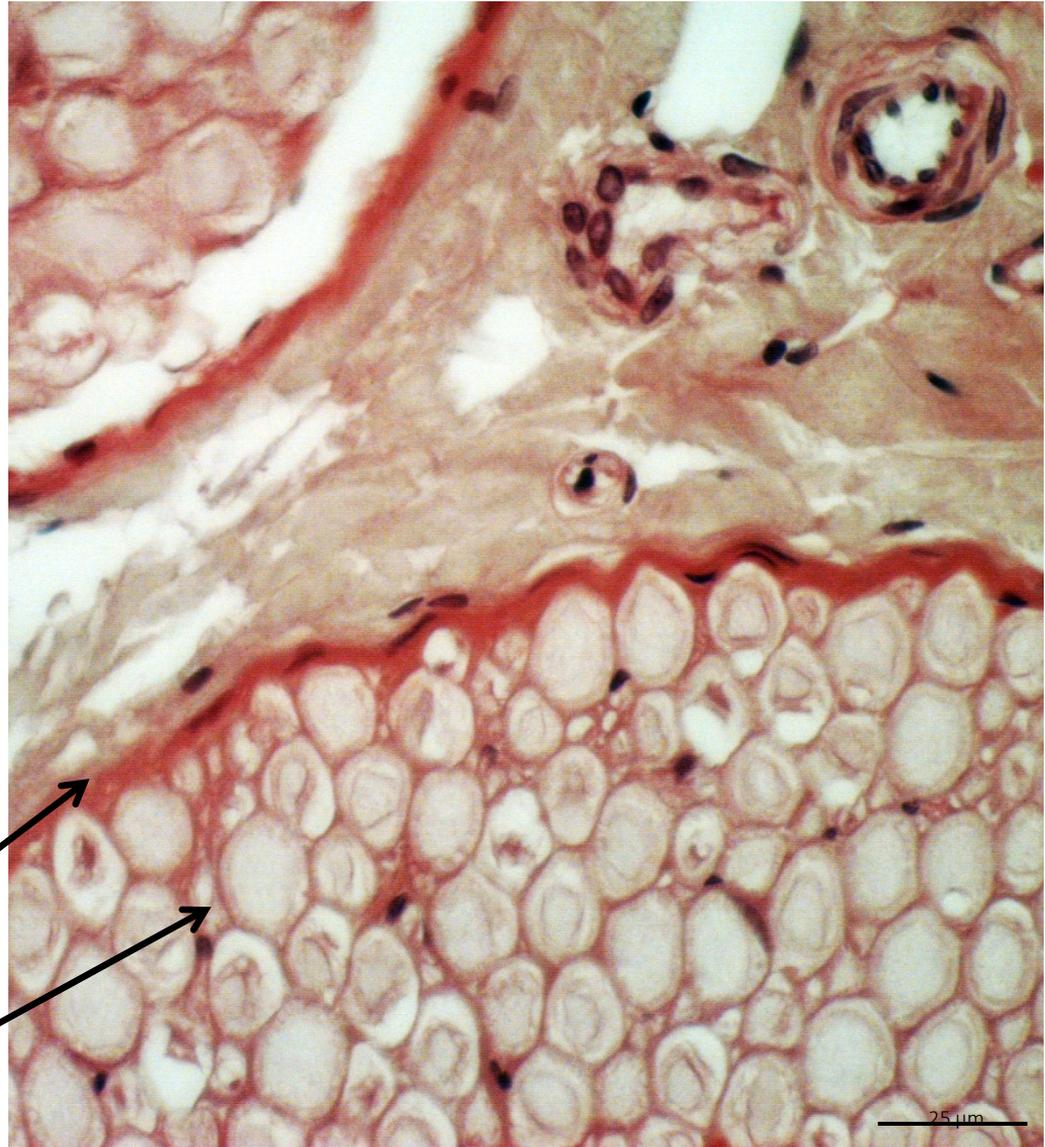
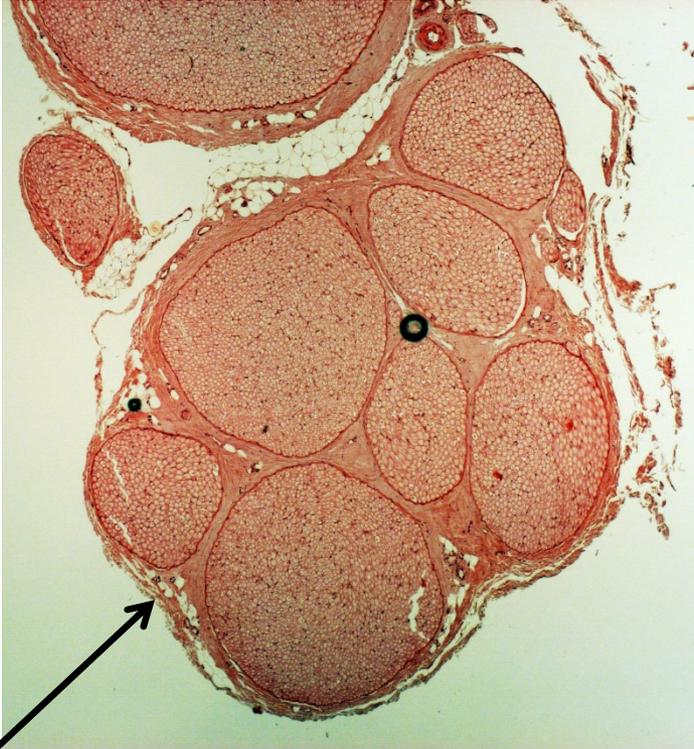


Vegetative Ganglien (Ag Impr.)

# Peripherer Nerv

Nervenfaser (neurofibra) = Axon (neurit) + Umhüllung

Nervenfaserband PNS: Nerv (nervus)



**Epineurium:** Bindegewebe, Gefäße, Fettzellen

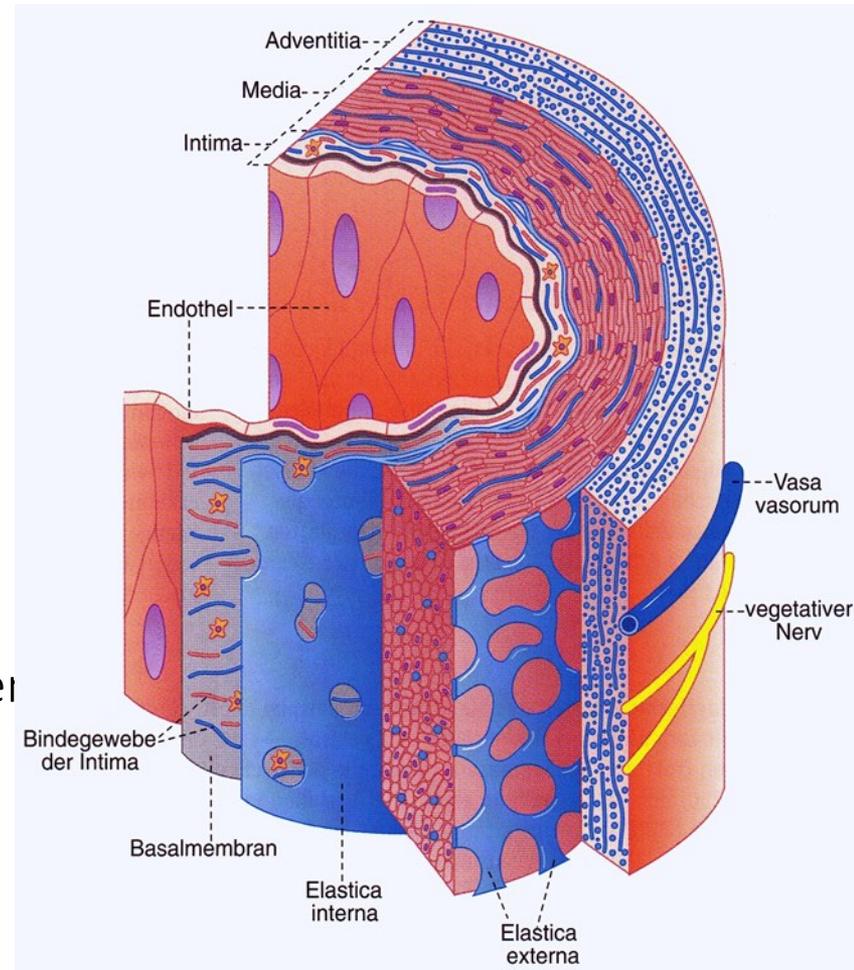
**Perineurium:**  
zwischen die Fasciculi, platte epithel förmige Zellen

**Endoneurium:** um der Nervenfasern,  
interstitielles Bindegewebe, Kollagenfasern, Fibrozyten, Kapillaren

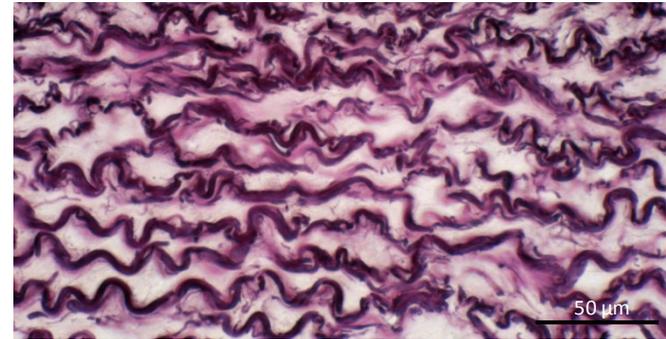
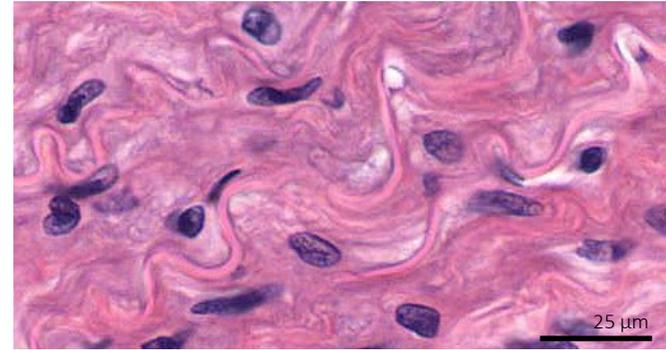
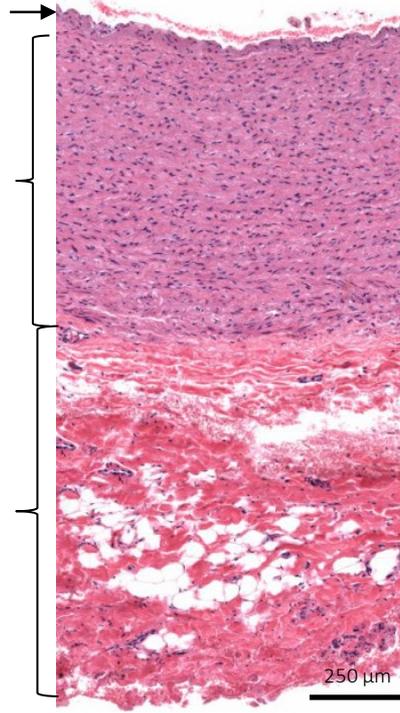
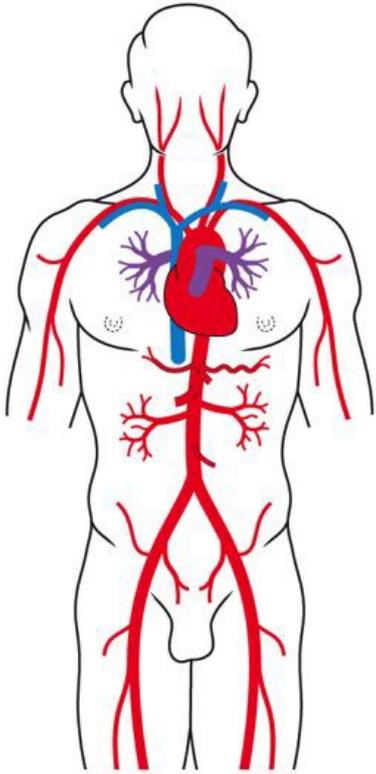
# Blutgefäße

Wandaufbau:

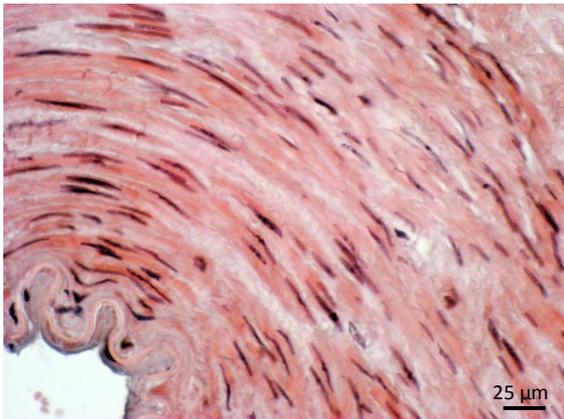
- **Tunica intima**
  - Endothel
  - Straum subendotheliale
- **Tunica media**
  - zirkulär angeordneten glatten Muskelzellen
  - Bindegewebsfasern
- **Tunica adventita**
  - Kollagenfibrillen, zahlreichen elastischen Fasern sowie, Fibroblasten
  - Vasa vasorum



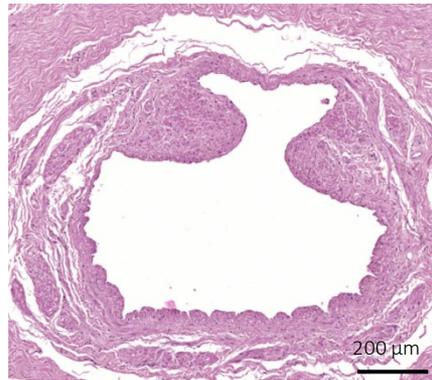
# Arterien



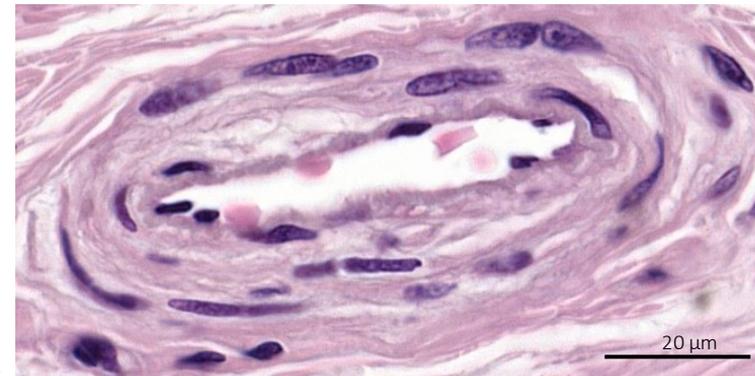
Elastische Arterien



Muskuläre Arterien  
MEI, MEE



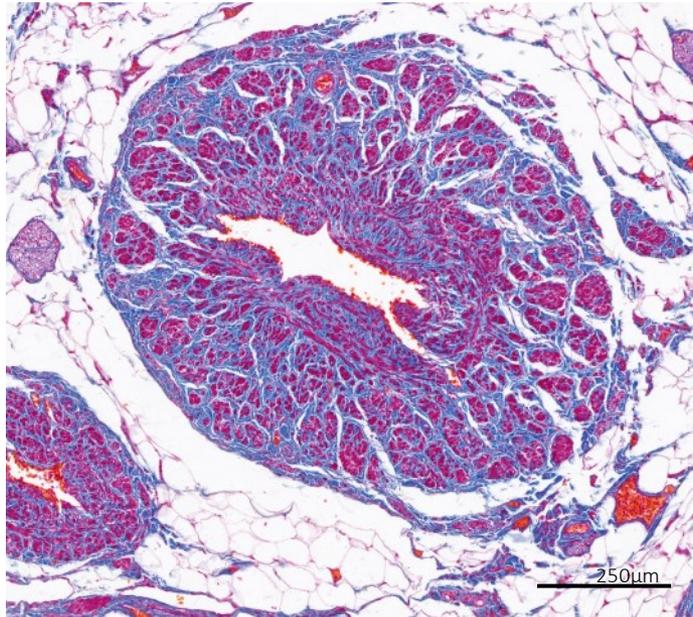
Ebnersche Kissen/Intimapolster  
A. dorsalis penis  
V. cavernosa (Corp. spongiosum)



Ateriolen

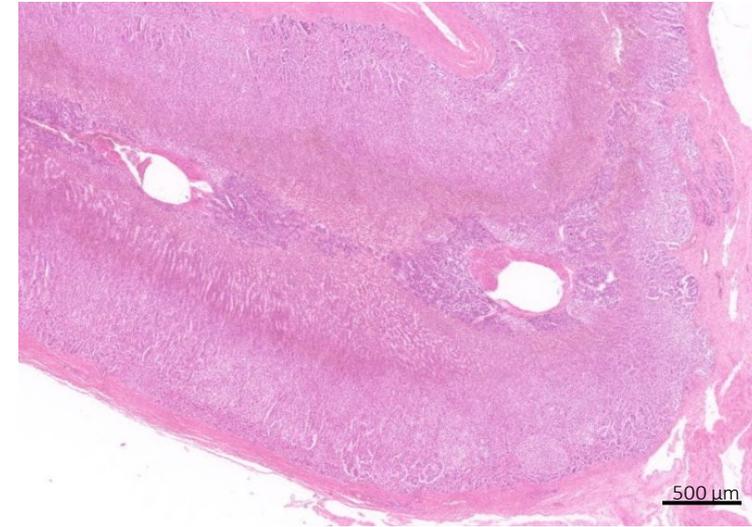
# Venen

## Muskuläre Venen



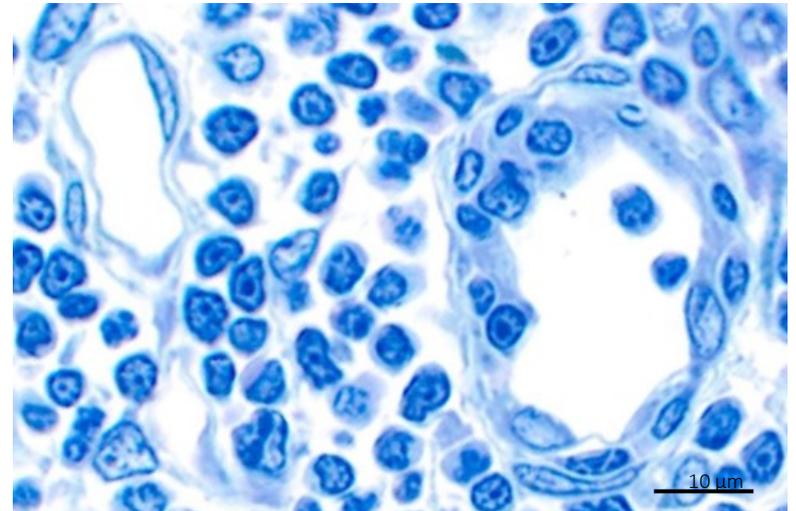
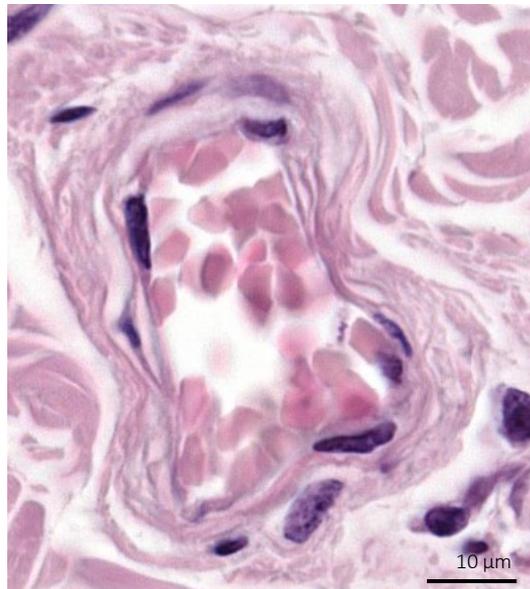
Pl. pampiniformis

Trichrom



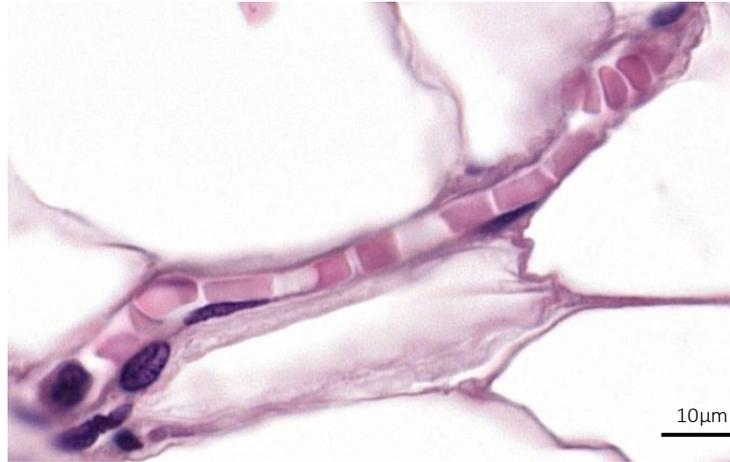
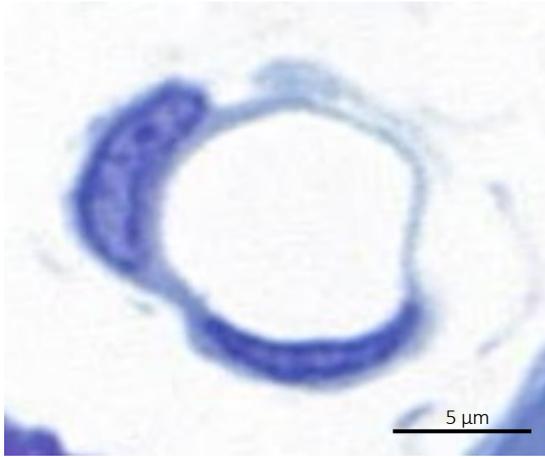
Nebennierenrinde

# Venolen

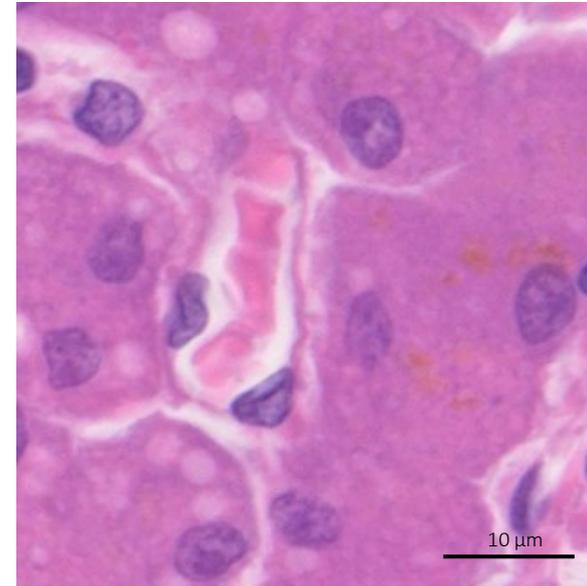


HEV

## Kapillaren

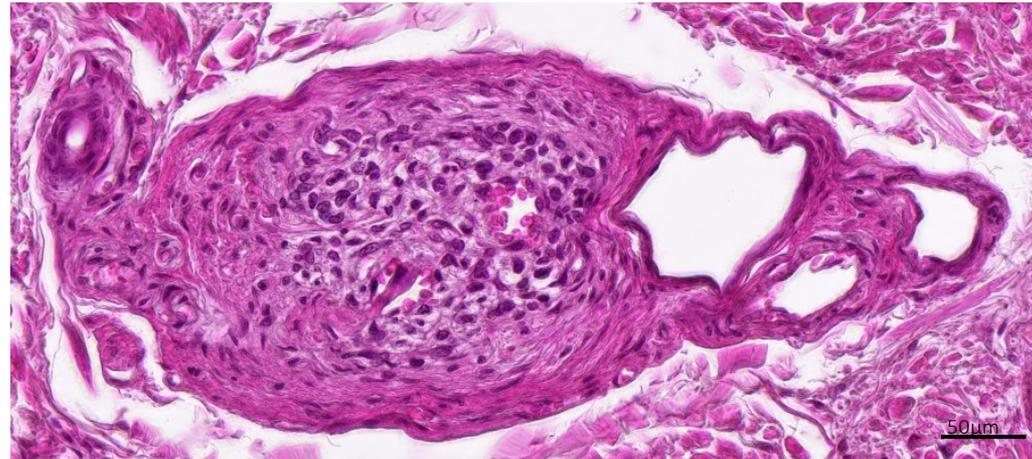


## Sinusen

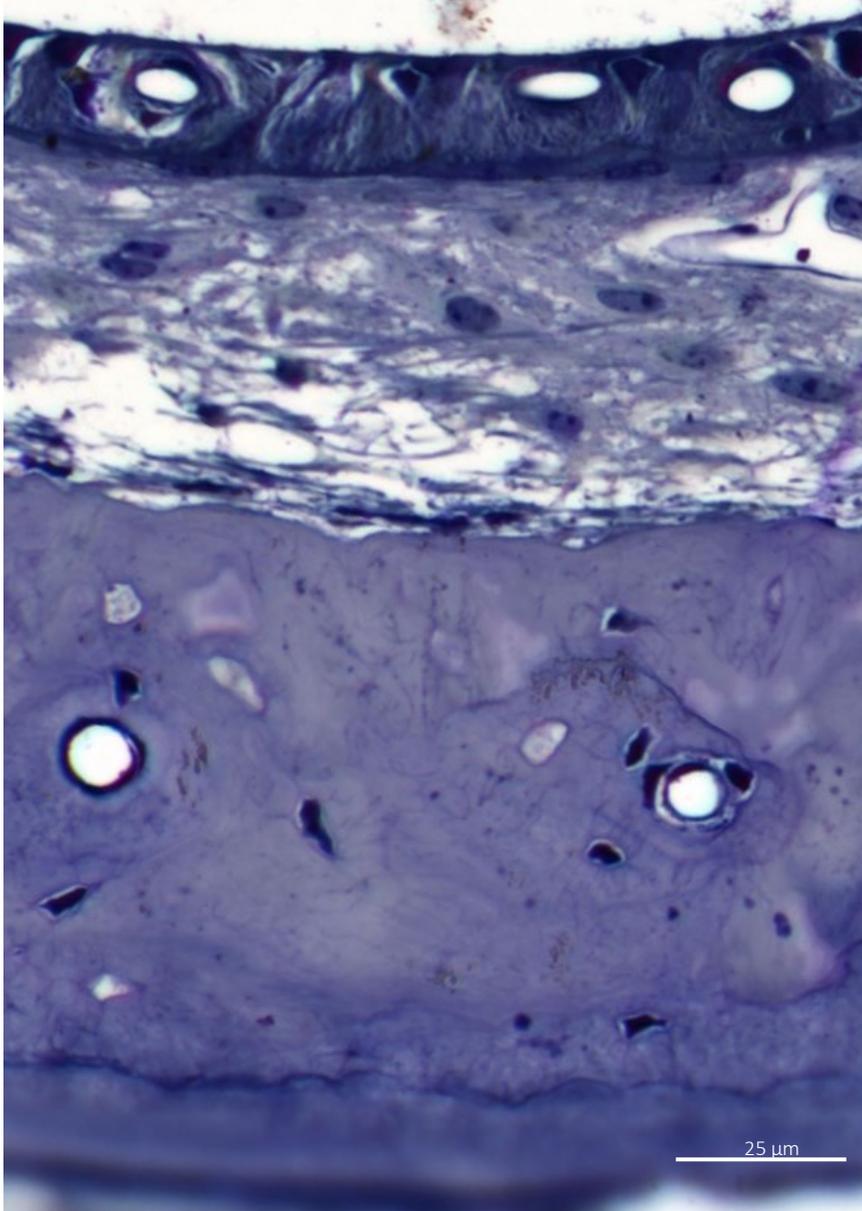


Leber – Disse Raum

## Arteiovenöse Anastomosen



Epithelium mit Gefäßen



Fenestrierte Venen in endokrinen Geweben

Stria vascularis: mehrschichtiges Epithel + Gefäße (Cochlea)

Danke für die Aufmerksamkeit!

Dr. Gábor Baksa: Ossification

Dr. András Csillag: Knochenentwicklung

Röhlich: Szövettan

Kahle, Leonhardt, Platzer: Taschenatlas der Anatomie