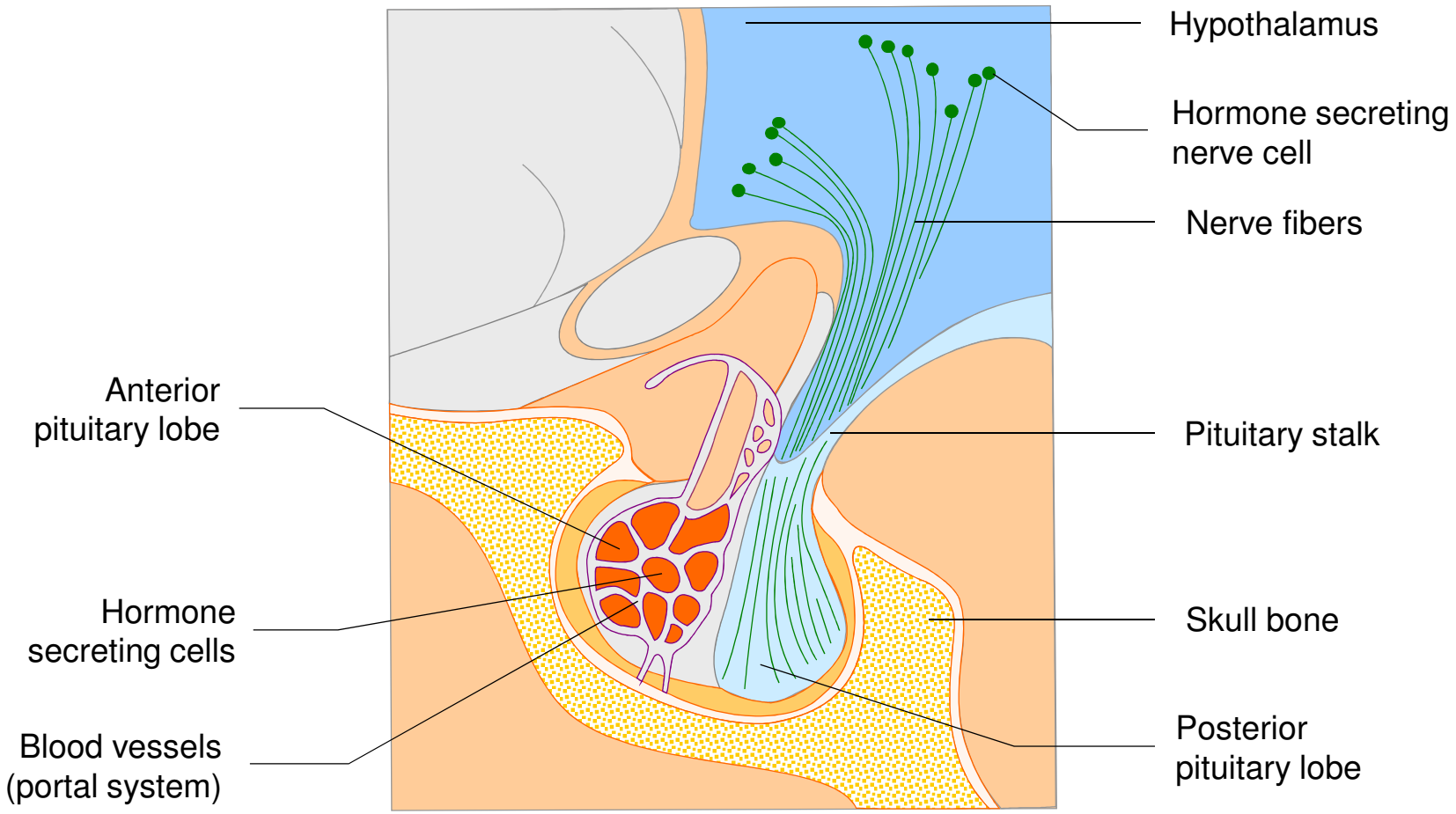
Structure of the pituitary gland

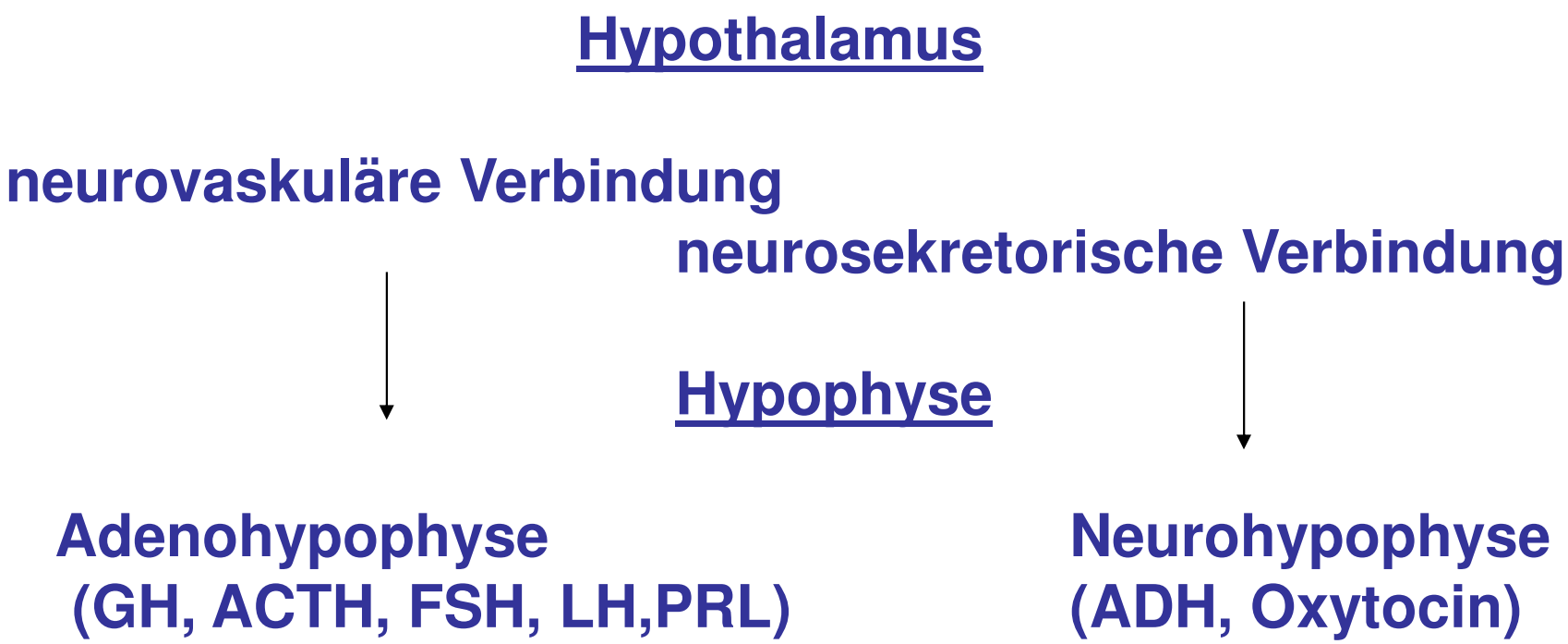


Structure of the pituitary gland
The pituitary gland has an anterior lobe and a posterior lobe. It is linked to the hypothalamus, which lies directly above it, by a short stalk that contains nerve fibers and a specialized network of blood vessels known as a portal system.

1031283

ENDOKRINE ORGANE

1. Hypophyse
2. Nebenniere
   - -Nebennierenrinde
   - -Nebennierenmark – Paraganglien
3. Schilddrüse
4. Nebenschilddrüse
5. Endokrines Pankreas
6. Disseminiertes neuroendokrines System - Darm


Hypothalamus
neurovaskuläre Verbindung
neurosekretorische Verbindung
Hypophyse
Adenohypophyse
(GH, ACTH, FSH, LH,PRL)
Neurohypophyse
(ADH, Oxytocin)

Pituitary gland

Thyroid-stimulated hormone (TSH)
TSH stimulates the thyroid gland to produce and release hormones that affect the rate at which tissues in the body use energy. TSH producrion is under the control of the hypothalamus

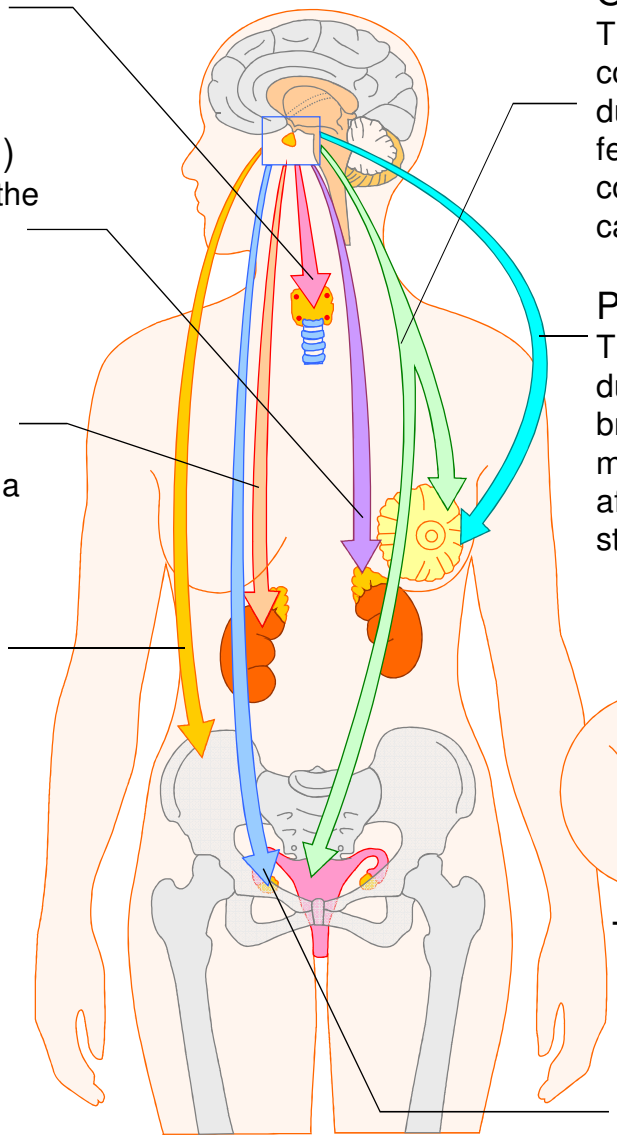
Adrenocorticotrophic hormone (ACTH)
ACTH stimulates the outer layer (cortex) of the adrenal gland to produce and secrete corticosteroid hormones, which in turn influence metabolism in the body.

Growth hormone (GH)
The main function of GH is to stimulate the growth of bones, cartilage, and muscles, particularly during childhood. GH also plays a part in the control of metabolism

Antidiuretic hormone (ADH)
ADH, also called vasopressin, acts on the kidneys, regulating the amount of water excreted in the urine. Release of ADH is primarily influenced by specific changes in blood volume and chemistry

Oxytocin
This hormone stimulates the powerful contractions of the muscles of the uterus during labor. In women who are breast-feeding, oxytocin also stimulates the contraction of cells around the milk ducts, causing milk to be released.

Prolactin
The production of prolactin increases during pregnancy and helps stimulate breast development. It also initiates and maintains the production of brease milk after childbirth. The infant's sucking action stimulates release of prolactin.



FSH and LH

Testis

Testes

Follicle-stimulating hormone (FSH) and luteinizing hormone (LH)
These hormones stimulate ovulation and the secretion of estrogen in females and the development of sperm and secretion of the hormone testosterone in males

Pituitary hormones
Almost all of the pituitary hormones are secreted by the anterior (front) lobe of the gland, but two, antidiuretic hormone (ADH) and oxytocin, are manufactured in the posterior (rear) lobe. Pituitary gland hormones either act on other glands, stimulating them to produce hormones, or act directly on tissues and organs.

1. Adenohypophyse

(GH, ACTH, FSH, LH, PRL)

Hyperfunktion - Hyperpituitarismus

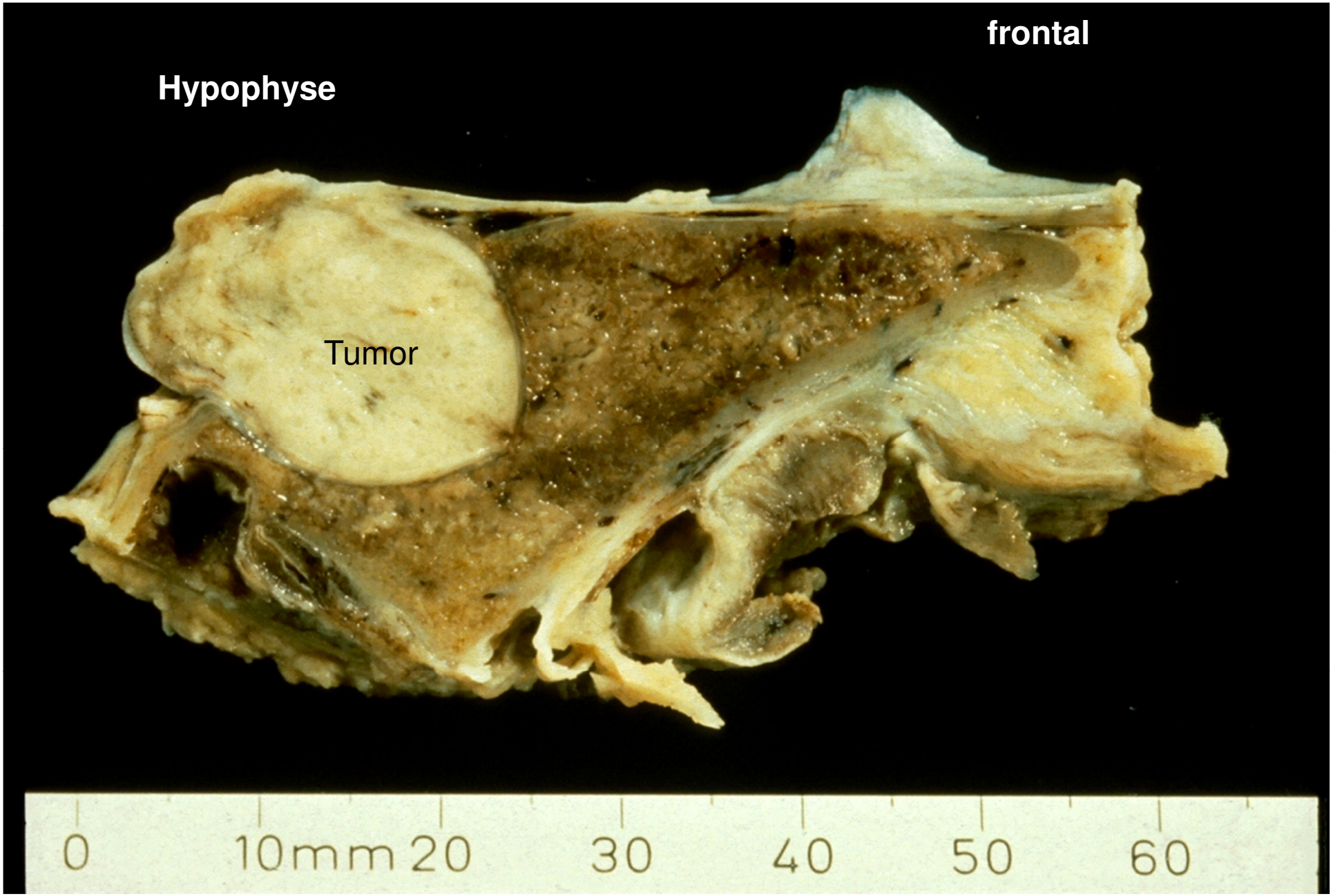
Hyperprolactinämie	PRL	: Adenom
Akromegalie	GH	: Adenom
Cushing-Syndrom	ACTH	: Adenom

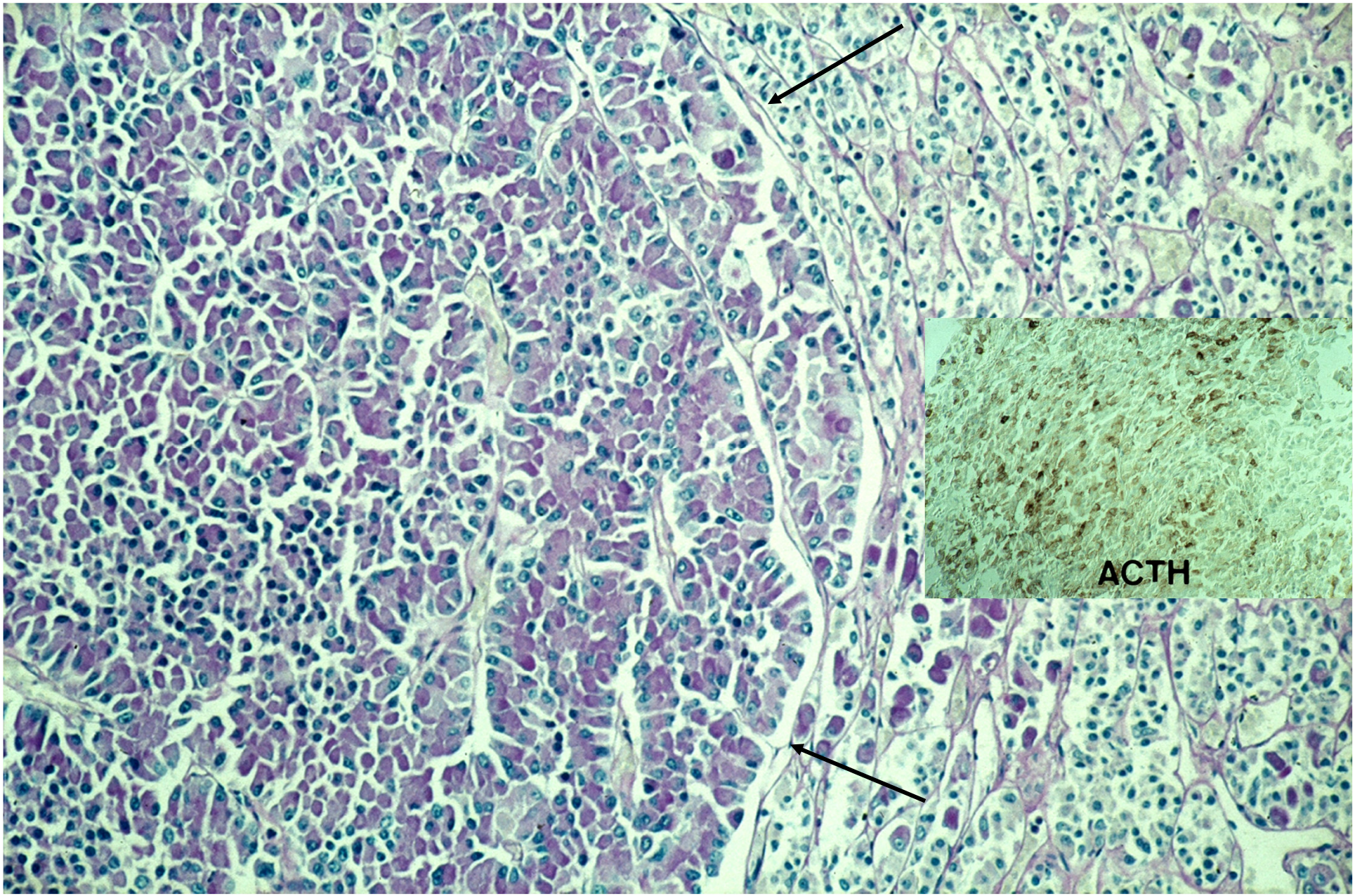
Hypofunktion - Hypopituitarismus

-Infarzierung post-partum : Sheehan-Syndrom

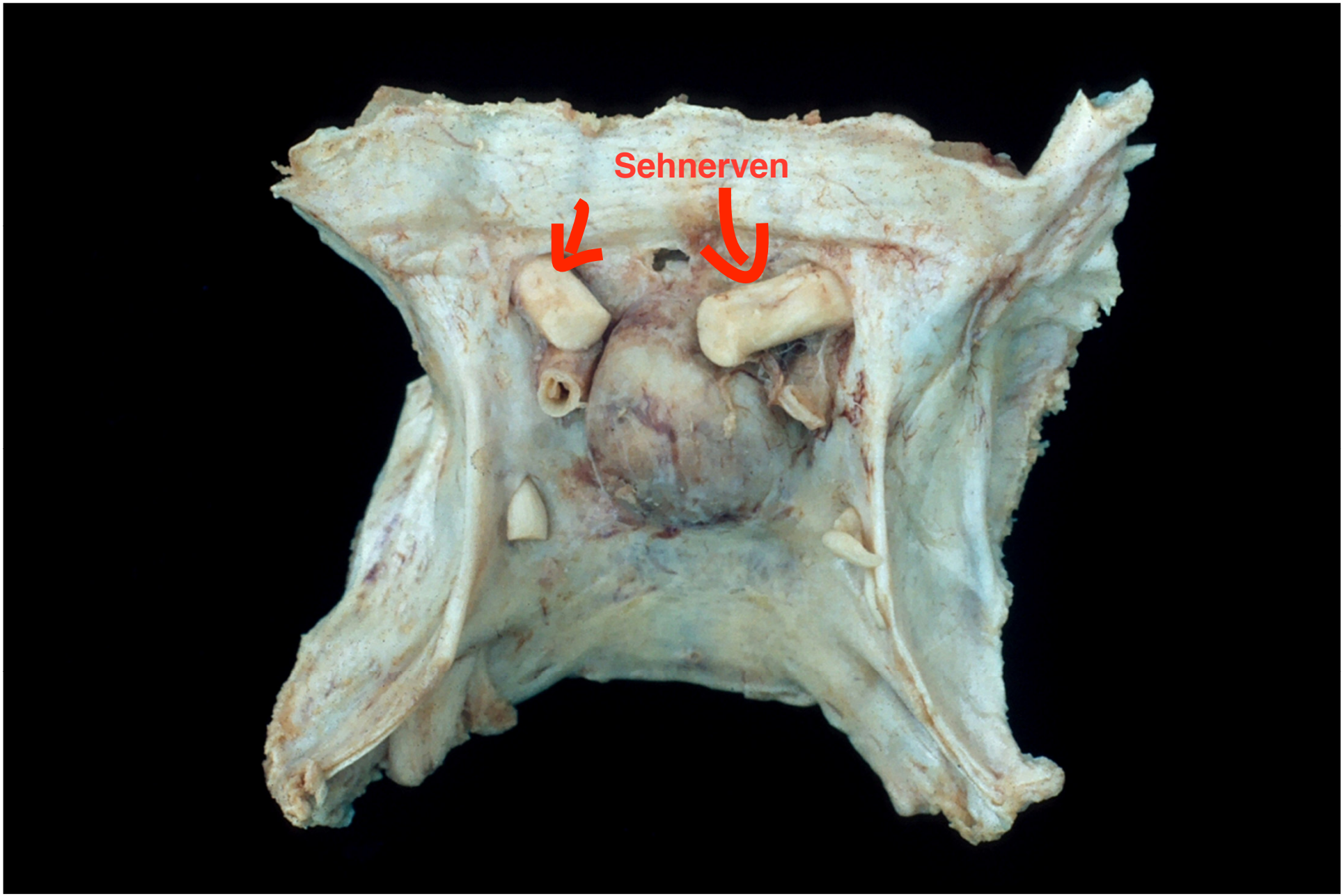
-Kompression des normalen Hyp.-Gewebes und des N. opticus durch ein nicht-funct. Adenom : endokrine Ausfälle wie
-sekundäre Amenorrhoe bei der Frau,
-Libidoverlust beim Mann;
-bitemporale Hemianopsie

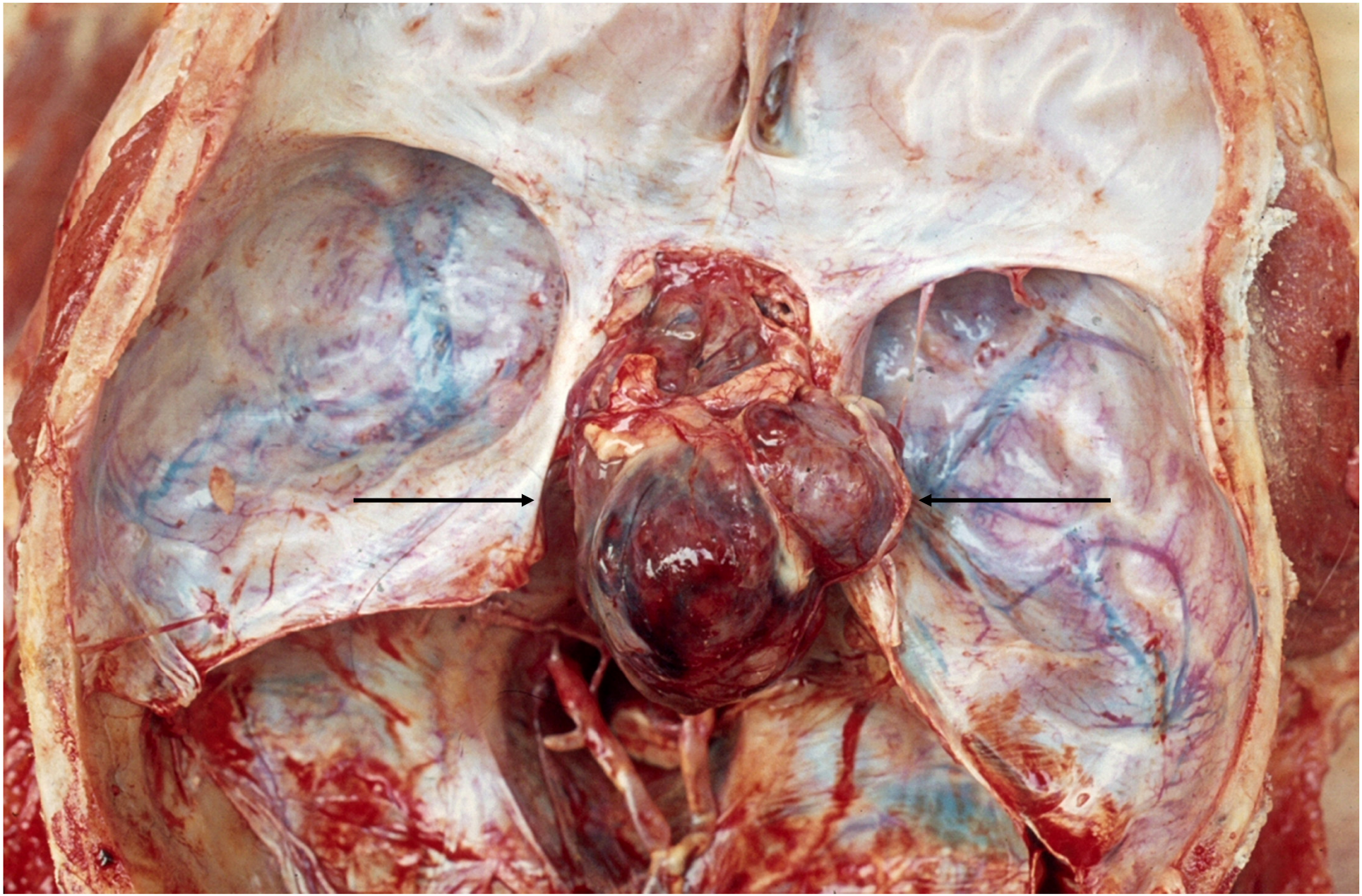
Isolierter GH-Mangel : Zwergwuchs


frontal
Hypophyse
Tumor
0
10mm
20
30
40
50
60



Adenom der Adenohypophyse


Sehnerven



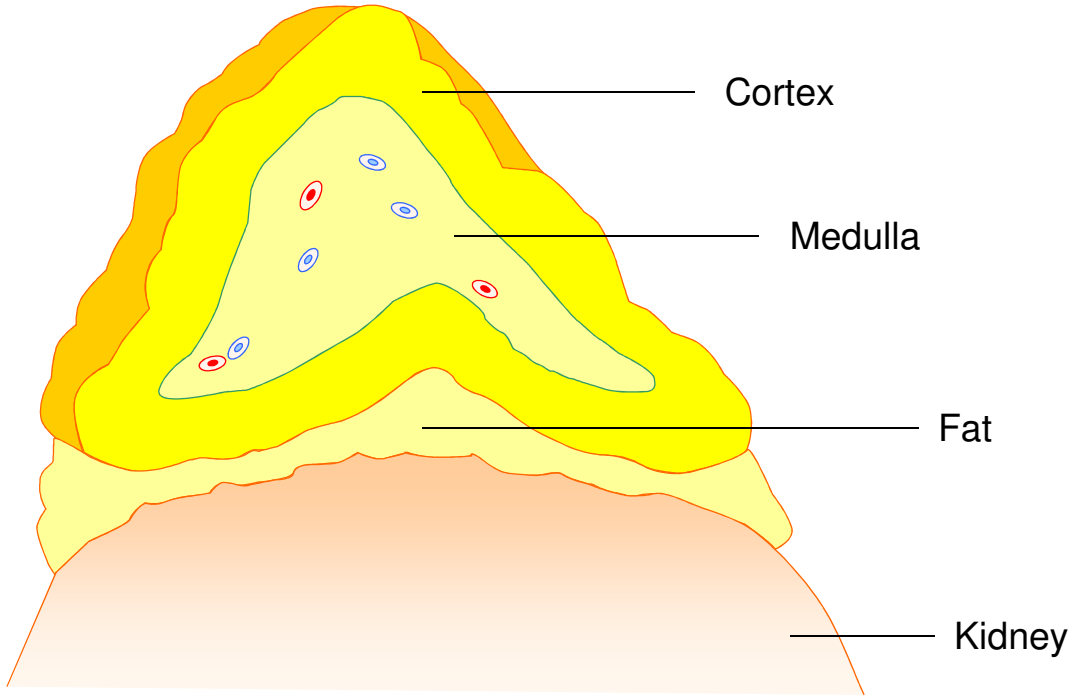
Nicht-funktioneller Hypophysentumor

GH (STH) – Zell-Adenom
20 % aller H.-tumoren

-Akromegalie im Erwachsenenalter
Hervortreten der Akren
Vergrößerung der Organe
Hypertonus, Diabetes

-Gigantismus vor Schluß
der Epiphysenfuge

Structure of the adrenal gland



Structure of the adrenal gland
The adrenal glands rest on pads of fat above the kidneys. Each gland has an outer cortex, which makes up 90 percent of its weight, and an inner medulla.

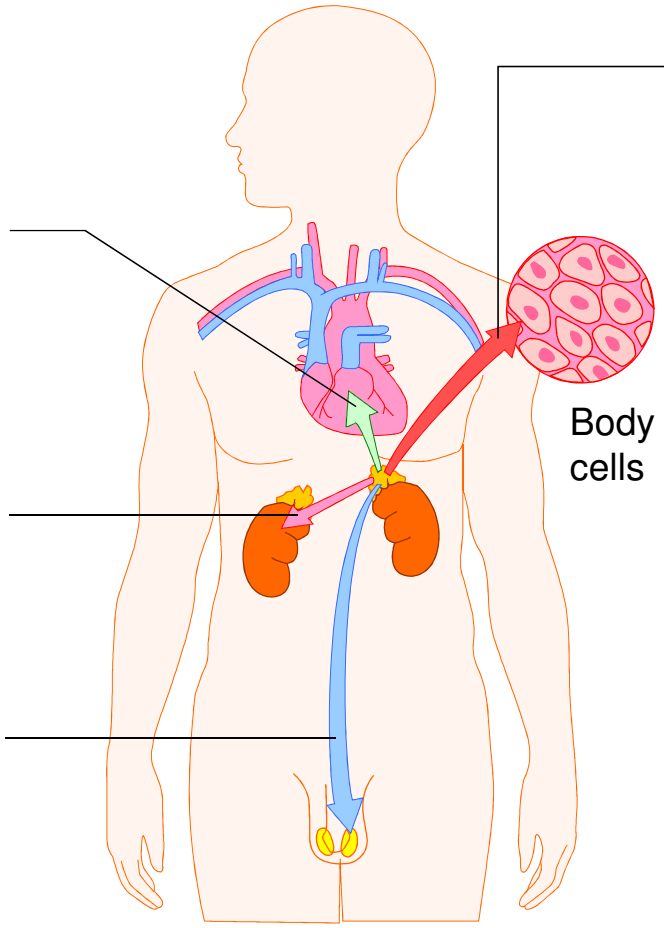
Adrenal hormones

Cortisol
Cortisol helps the body adapt to physical and emotional stress by boosting blood glucose levels.

Epinephrine/norepinephrine
These hormones trigger the “fight or flight” response. They increase heart rate and blood flow to muscles

Aldosterone
The hormone acts on the kidneys to help regulate the excretion of salt to maintain blood pressure

Sex hormone
Adrenal androgens promote the development of secondary male sexual characteristics



Adrenal hormones
The adrenal cortex secretes the important corticosteroid hormones, cortisol and aldosterone, and small amounts of the male sex hormones. The medulla secretes epinephrine and norepinephrine.

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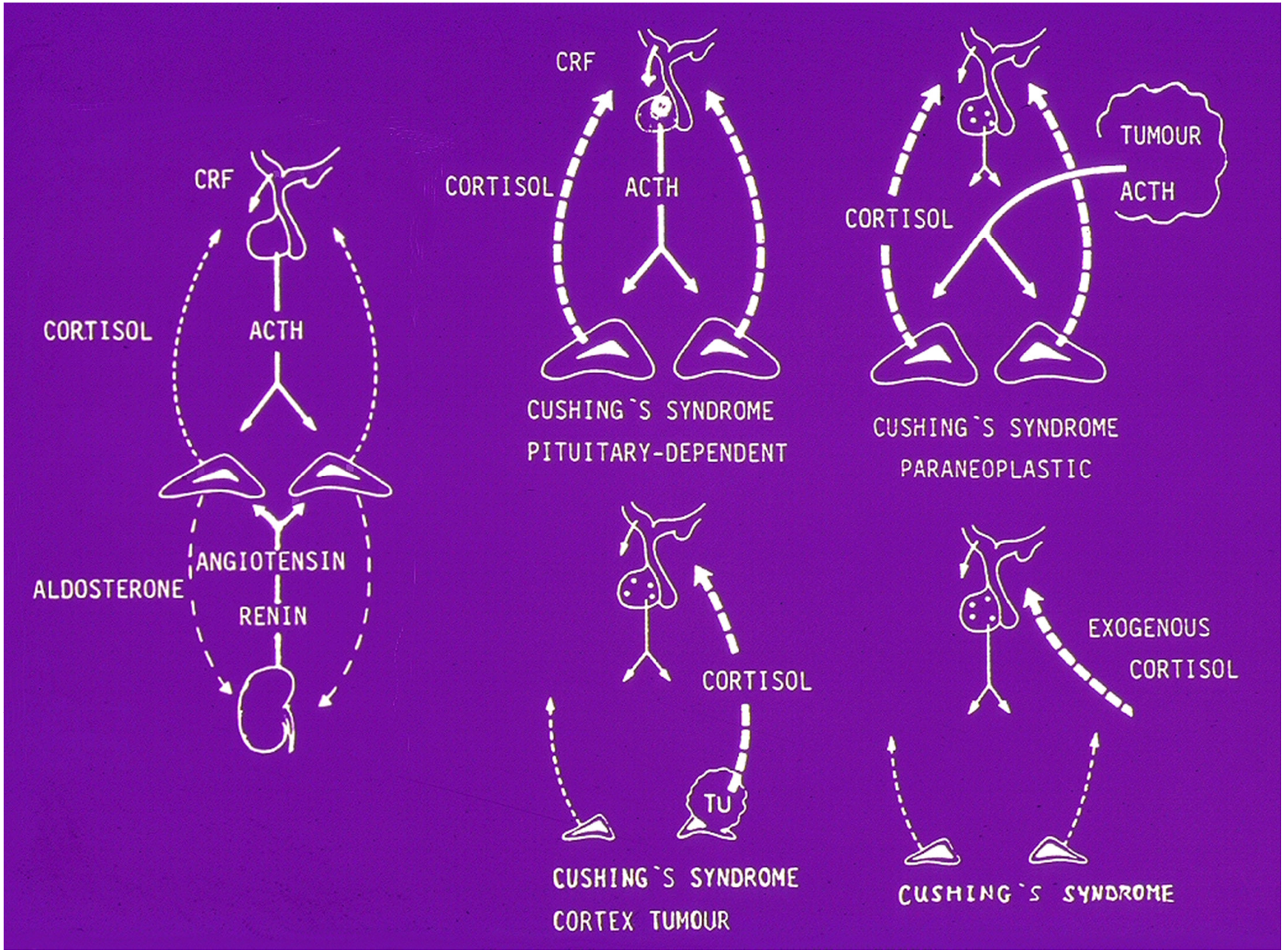
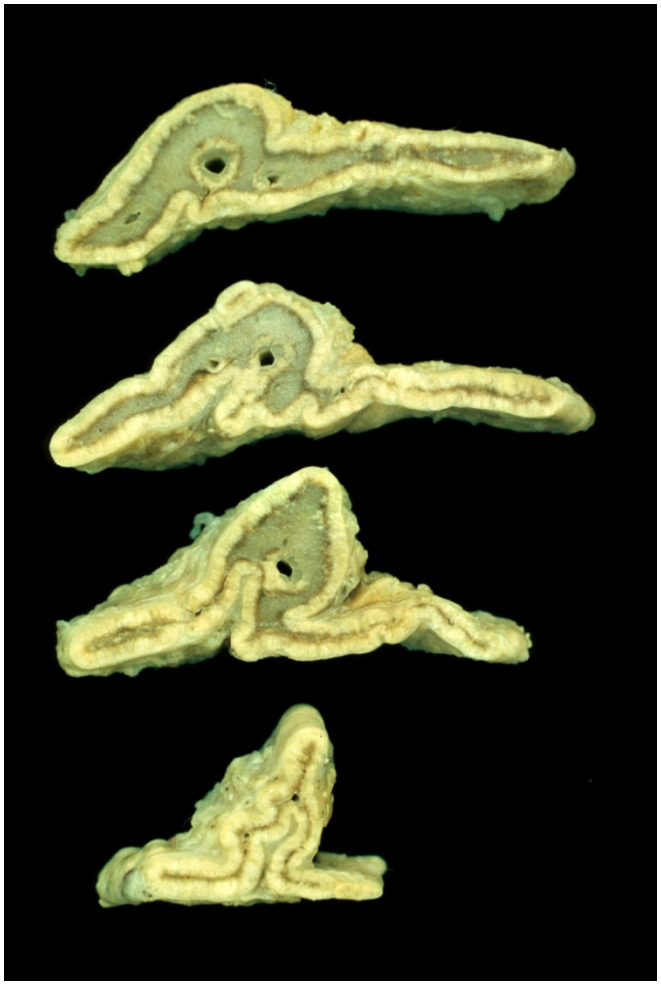
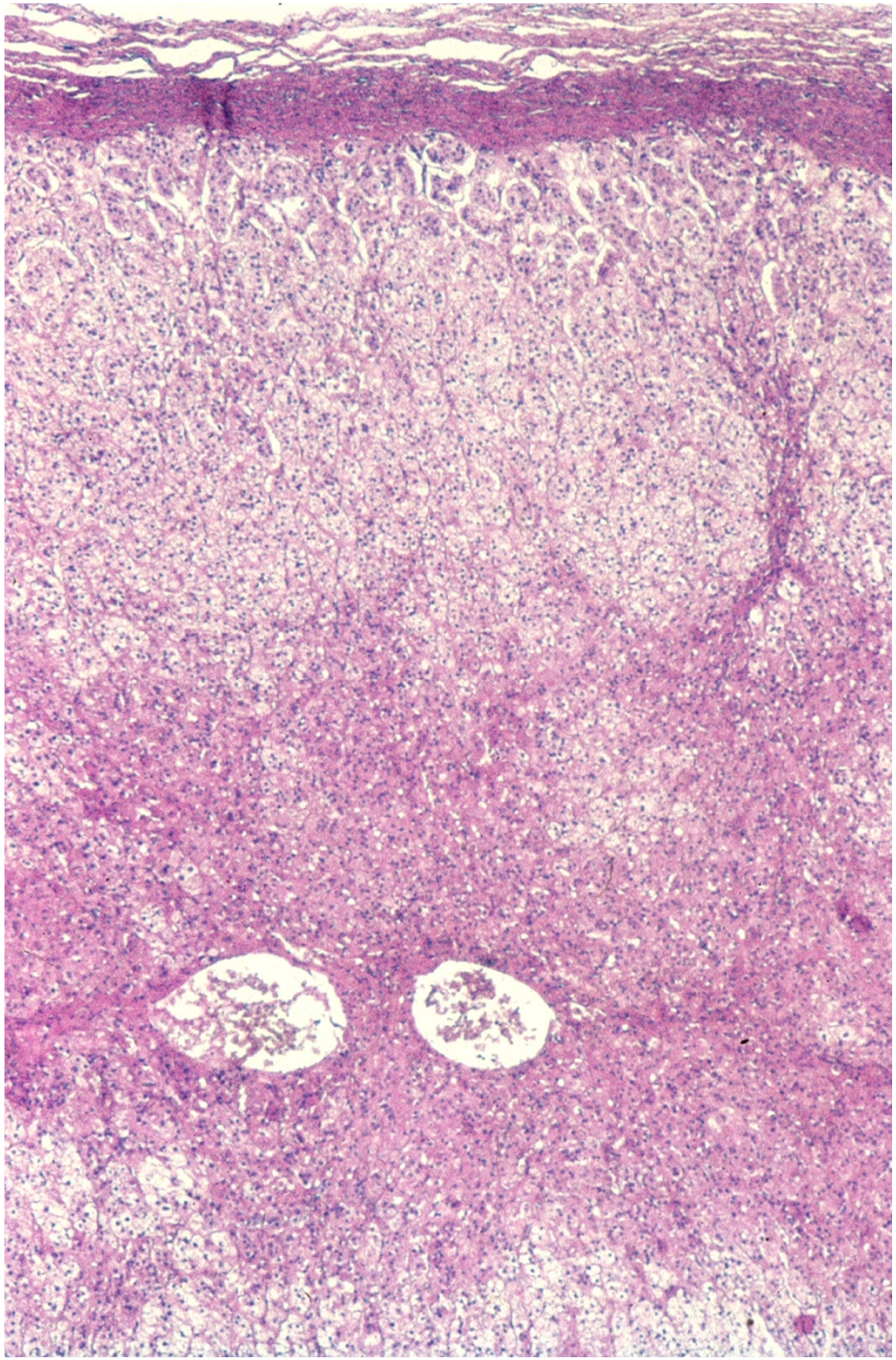
ACTH-Zell-Adenom

-Cushing-Syndrom

Stammfettsucht
Mondgesicht
Muskelschwund
Striae
Osteoporose
Hypertonie
Diabetes
lymphat. Atrophie

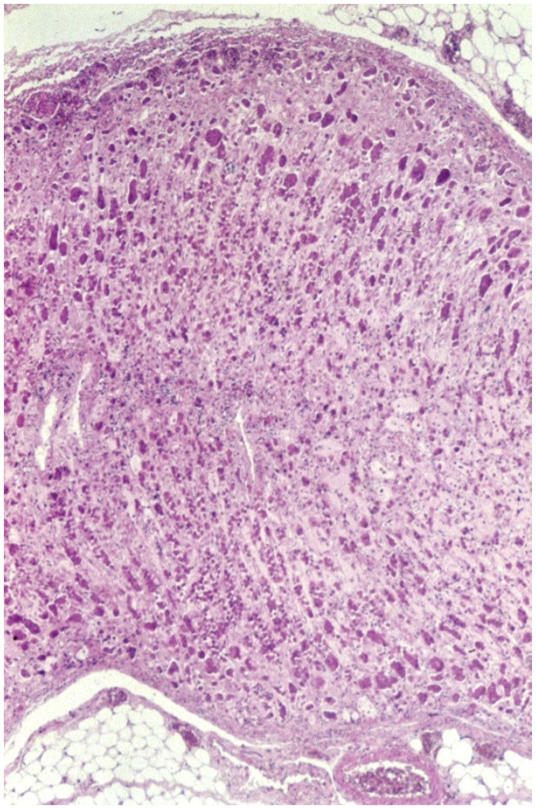

CRF
CORTISOL
ACTH
ANGIOTENSIN
ALDOSTERONE
RENIN
CRF
CORTISOL
ACTH
CUSHING`S SYNDROME
PITUITARY-DEPENDENT
TUMOUR
ACTH
CORTISOL
CUSHING`S SYNDROME
PARANEOPLASTIC
CORTISOL
TU
CUSHING`S SYNDROME
CORTEX TUMOUR
EXOGENOUS
CORTISOL
CUSHING`S SYNDROME





Normale NN

NN Atrophie



Conn-Syndrom : Hyperaldosteronismus
Hypernatriämie, Hypokaliämie,
Hypertonus

2. Nebennierenrinde

Hyperfunktion

-Hyperkortisolismus - Cushing-Syndrom: Stammfettsucht,
Mondgesicht, Striae, Osteoporose, Infekte,
Diabetes, Hypertonus u.a.
-NNR - Hyperplasie infolge
ACTH - Adenom der Hypophyse
-NNR - Adenom oder Karzinom
-Kleinz. Lungen - Ca mit ektopischer ACTH - Sekretion
-NNR – Atrophie bei Cortison-Medikation

-Hyperaldosteronismus - Conn-Syndrom: Hypernatriämie,
Hypokaliämie -> Hypertonus
-NNR-Adenom

Hypofunktion - M. Addison: Adynamie, Hypotonus

NNR-Destruktion durch Entzündung, Blutung

Nebennierenrindenhypofunktion:

Krankheitsbild: M. Addison mit
Adynamie, Hypotonie, Hyperkaliämie

Pathologie:Nebennierenrindenatrophie

- Ursachen:

  Fehlende Stimulation durch ACTH

  Medikation von Cortison (Iatrogen)

Pathologie: Nebennierenrindenzerstörung

Autoimmune Adrenalitis
Blutung
Meningokokkensepsis
TBC

3. Nebennierenmark und sympathische und parasympathische Paraganglien

Tumoren

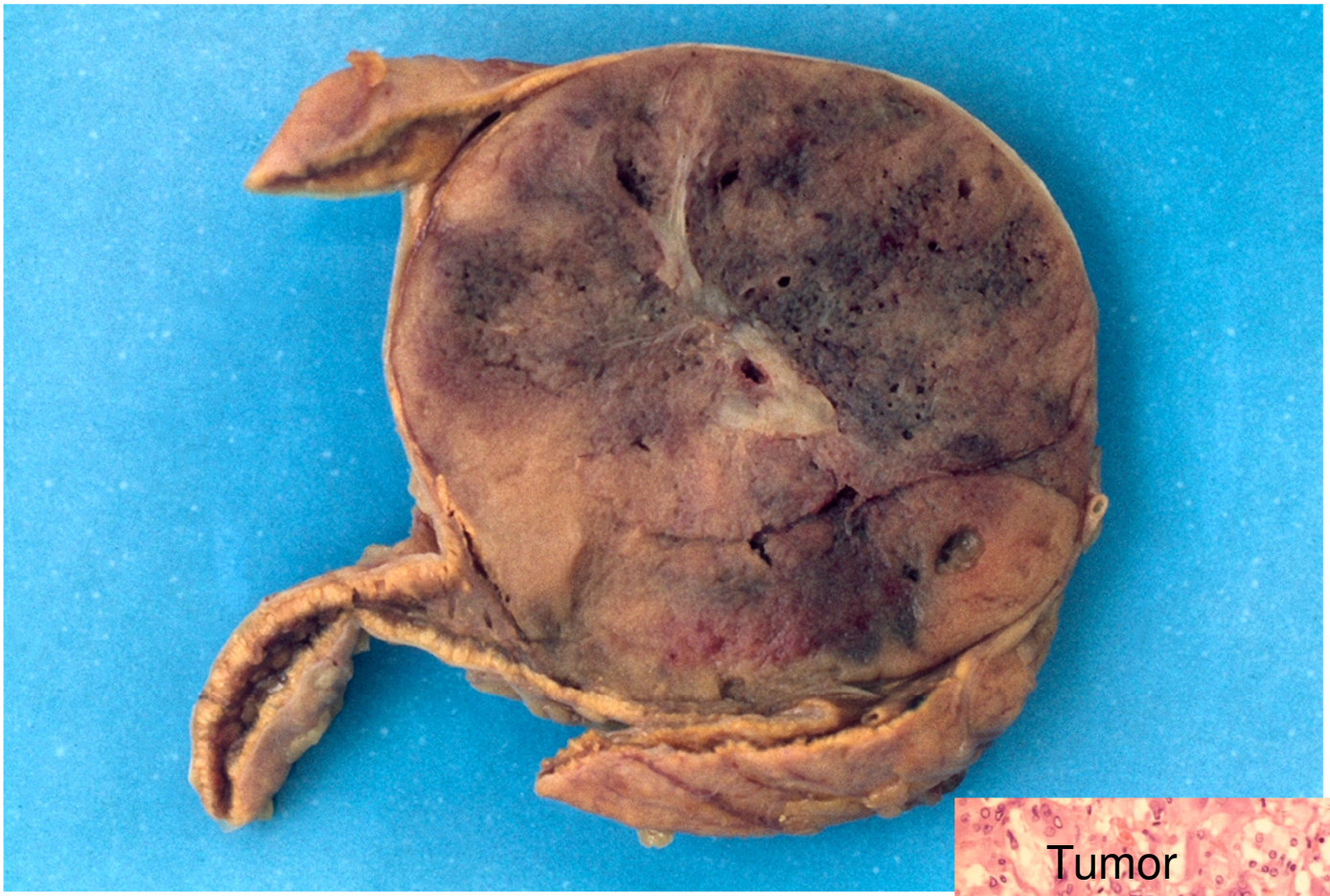
Mit Hyperfunktion = Hyperadrenalismus = Hypertonie-Syndrom

Phaeochromozytom:
meist benigner adrenaler Tumor
gelegentlich extraadrenal (sympathische Paraganglien)

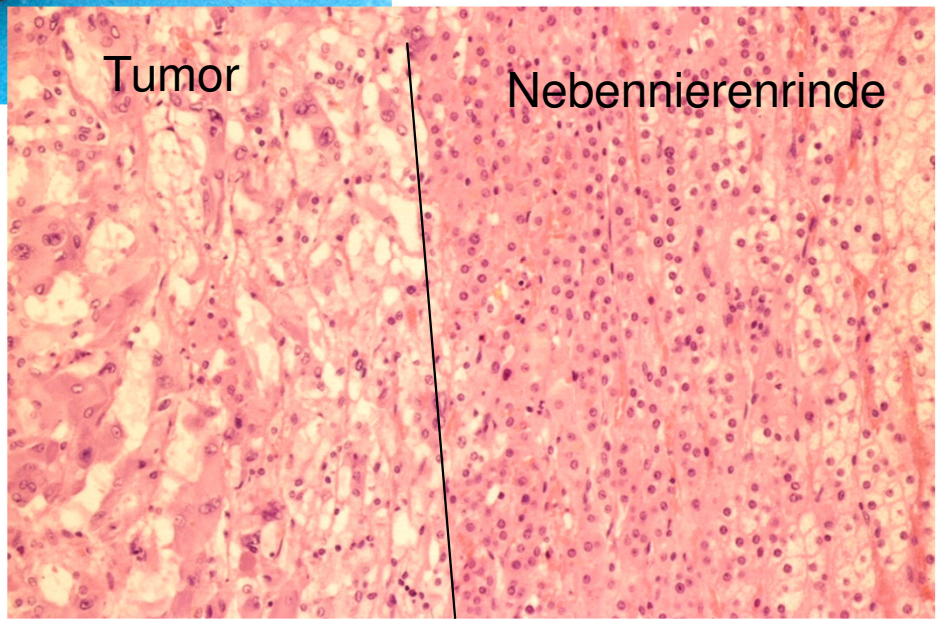
sporadisch: solitär
hereditär: bilateral bei Multipler Endokriner Neoplasie Typ 2

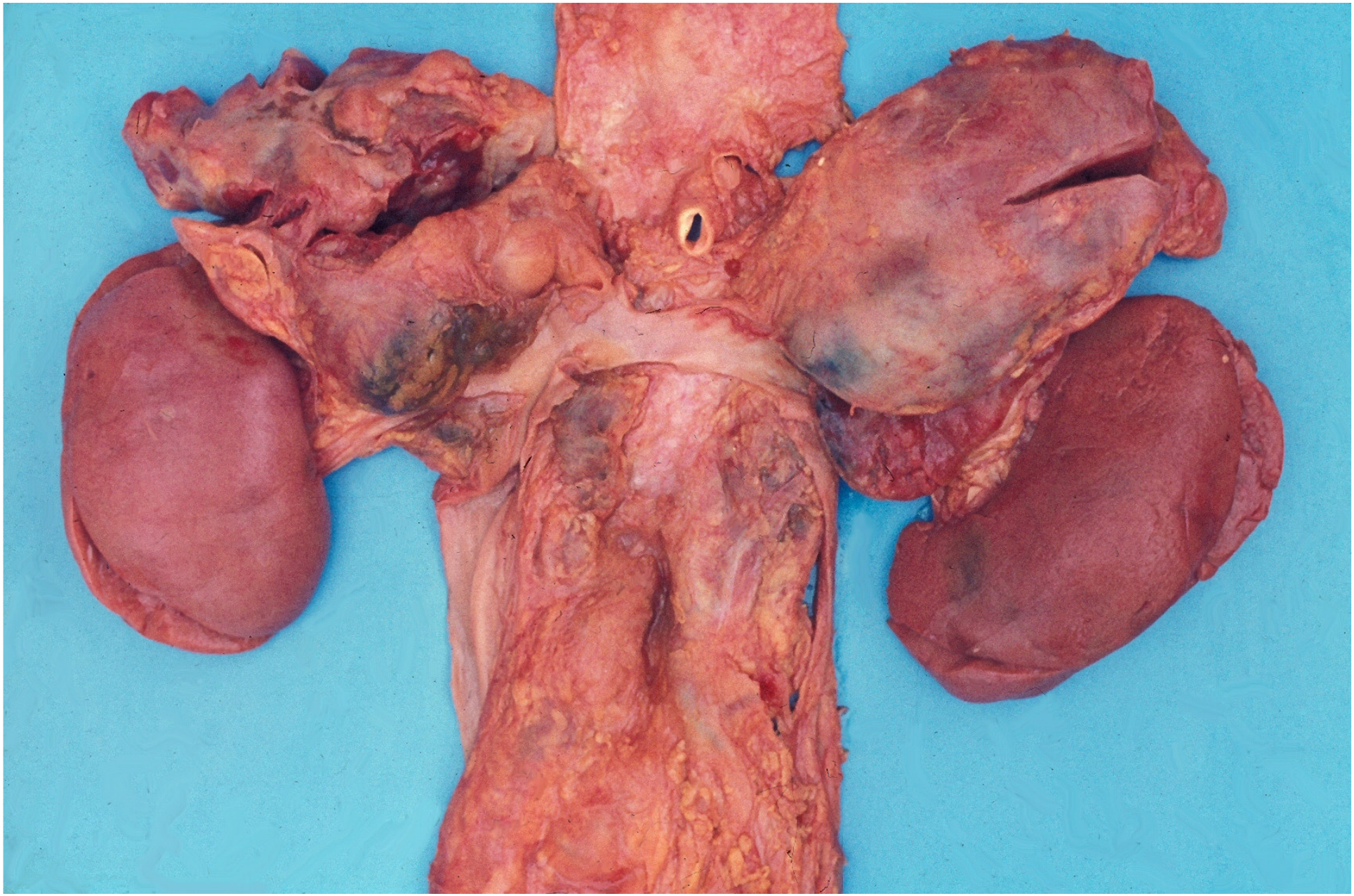
Mit normaler Funktion

Neuroblastom: häufigster maligner Tumor bei Kindern < 4 J
Paragangliom: meist benigner Tumor der parasympathische Paraganglien



Nebenniere mit
Phäochromozytom





Bilaterale hereditäre Phäochromozytome bei Multipler Endokriner Neoplasie Typ 2

3. Nebennierenmark und sympathische und parasympathische Paraganglien

Tumoren

Mit Hyperfunktion = Hyperadrenalismus = Hypertonie-Syndrom

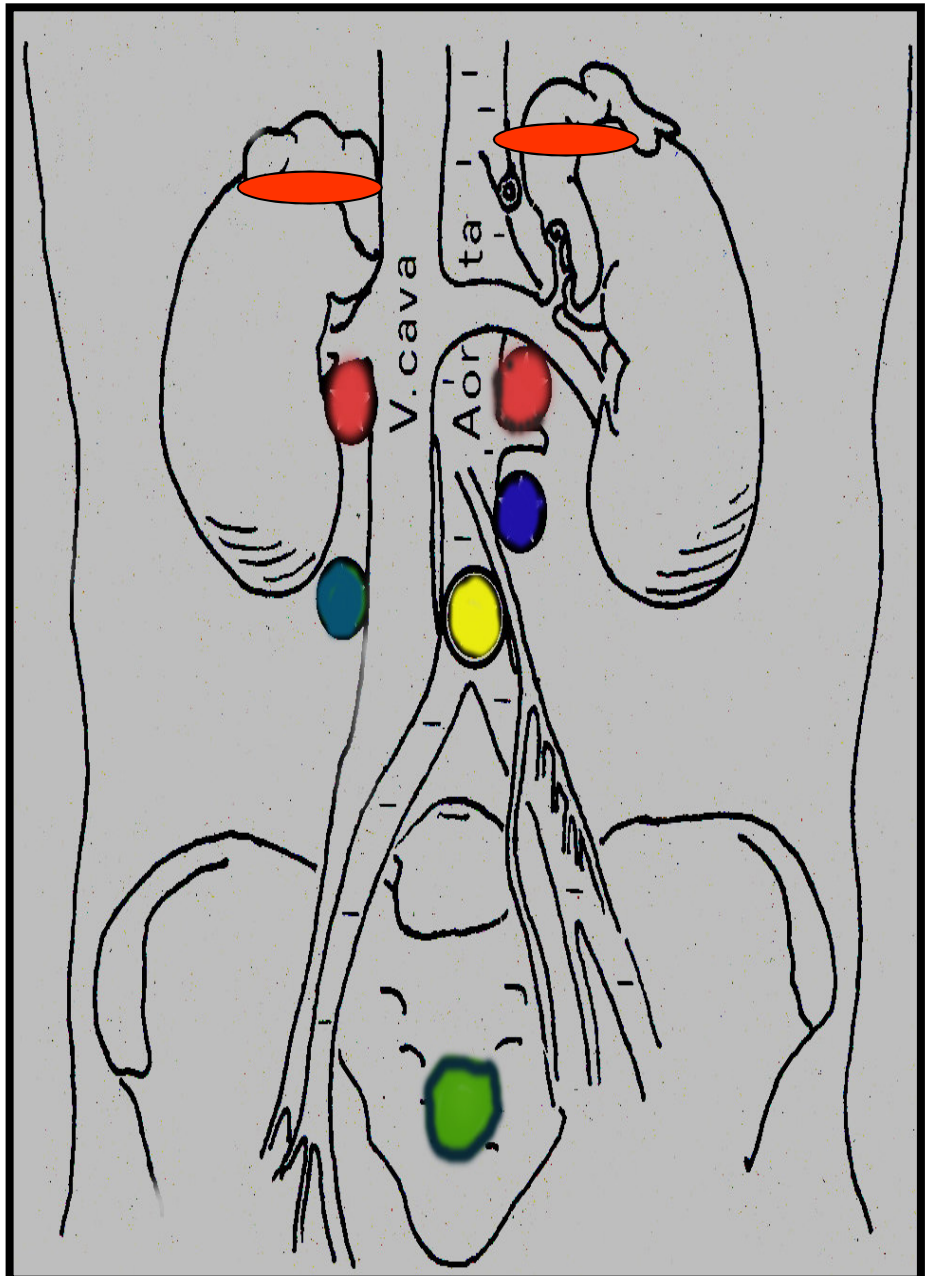
Phaeochromozytom:
meist benigner adrenaler Tumor
gelegentlich extraadrenal (sympathische Paraganglien)

sporadisch: solitär
hereditär: bilateral bei Multipler Endokriner Neoplasie Typ 2

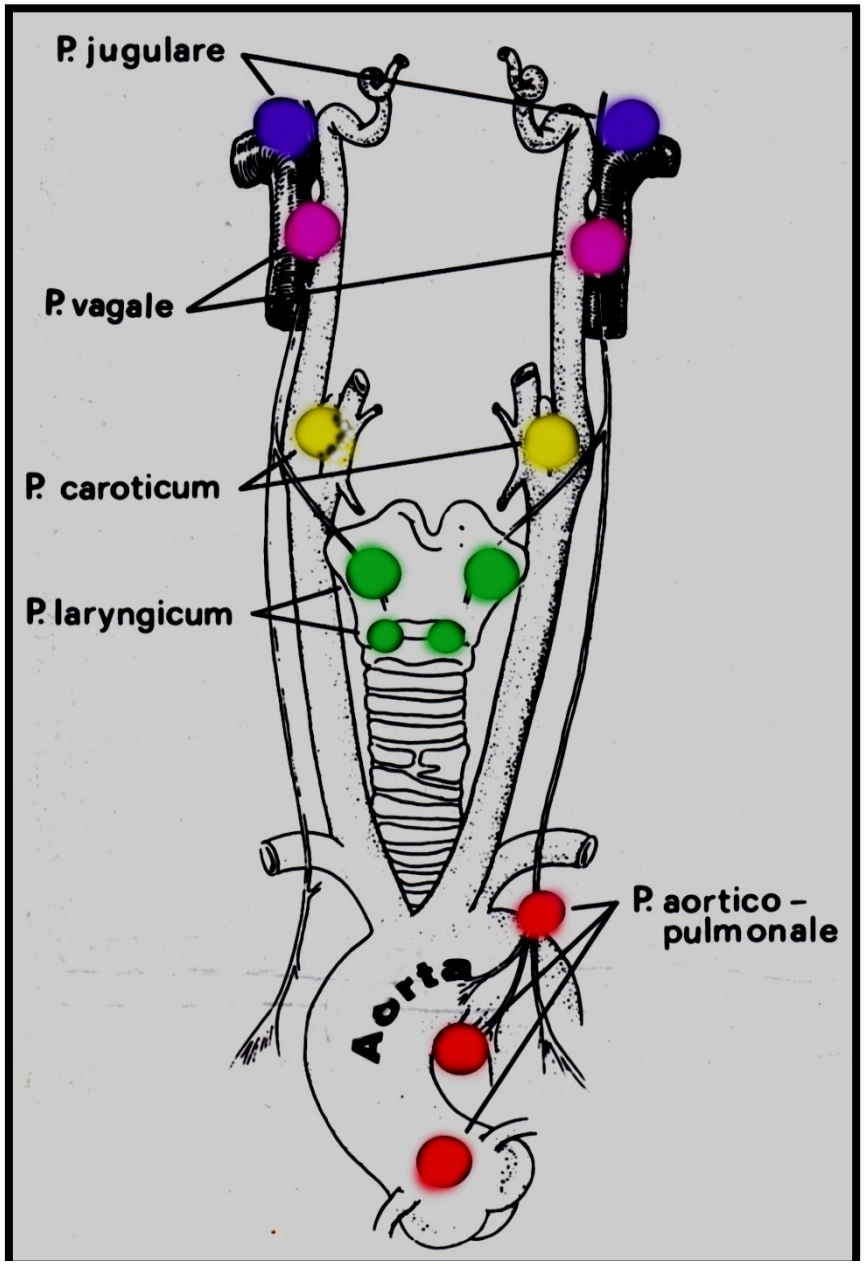
Mit normaler Funktion

Neuroblastom: häufigster maligner Tumor bei Kindern < 4 J
Paragangliom: meist benigner Tumor der
parasympathische Paraganglien

Sympathische Paraganglien



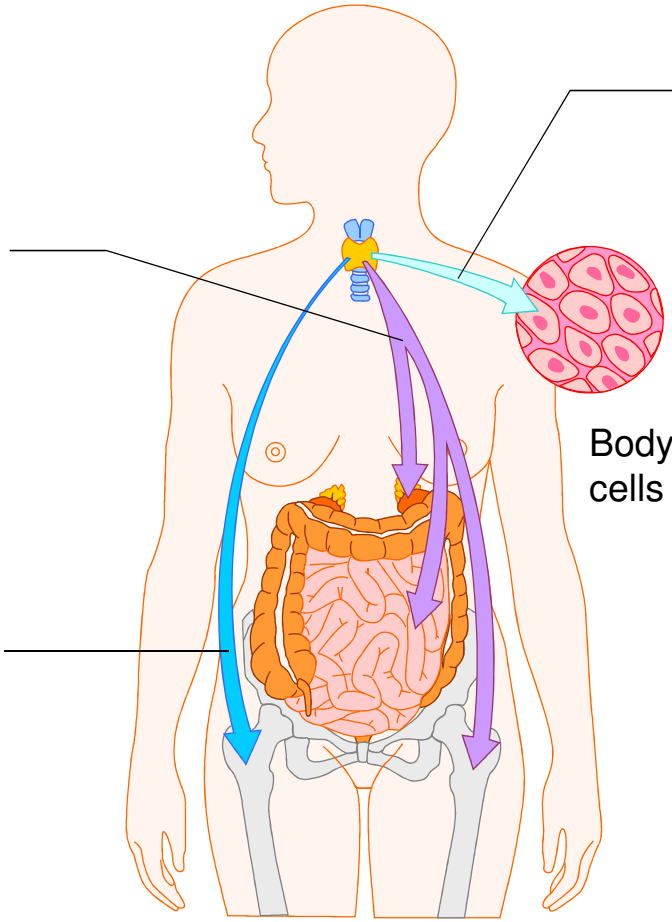
Parasympathische Paraganglien



Thyroid and parathyroid hormones

Parathyroid hormone (PTH)
If blood calcium is low, PTH secretion is increased. The hormone acts on the bones to release calcium into the blood, on the intestines to increase the absorption of calcium from food, and on the kidneys to prevent calcium loss in urine.

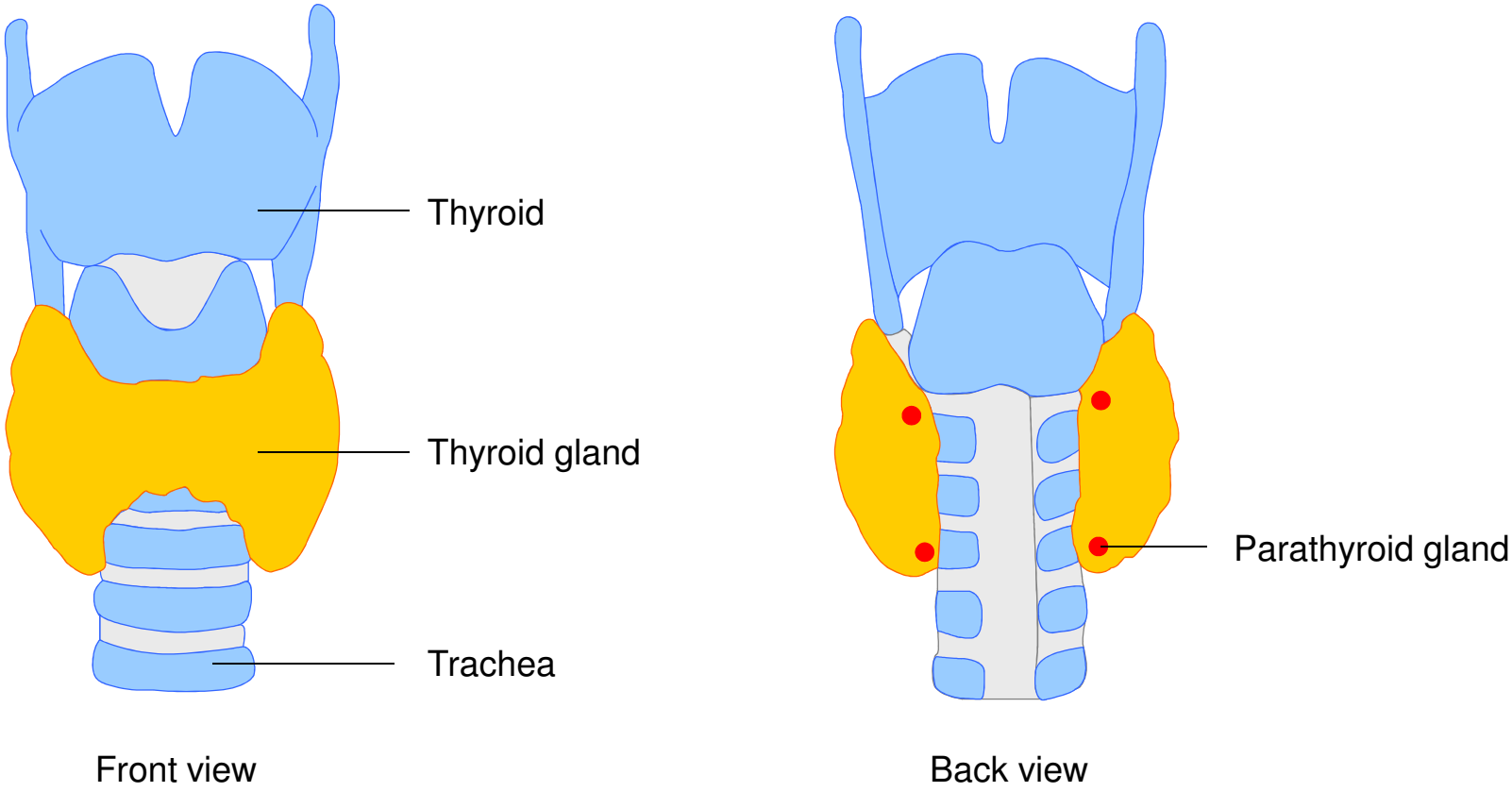
Calcitonin
This hormone inhibits calcium release from the bones if blood calcium levels are high



T_4 and T_3
These hormones regulate the rate of all chemical processes in the body, including the use of energy

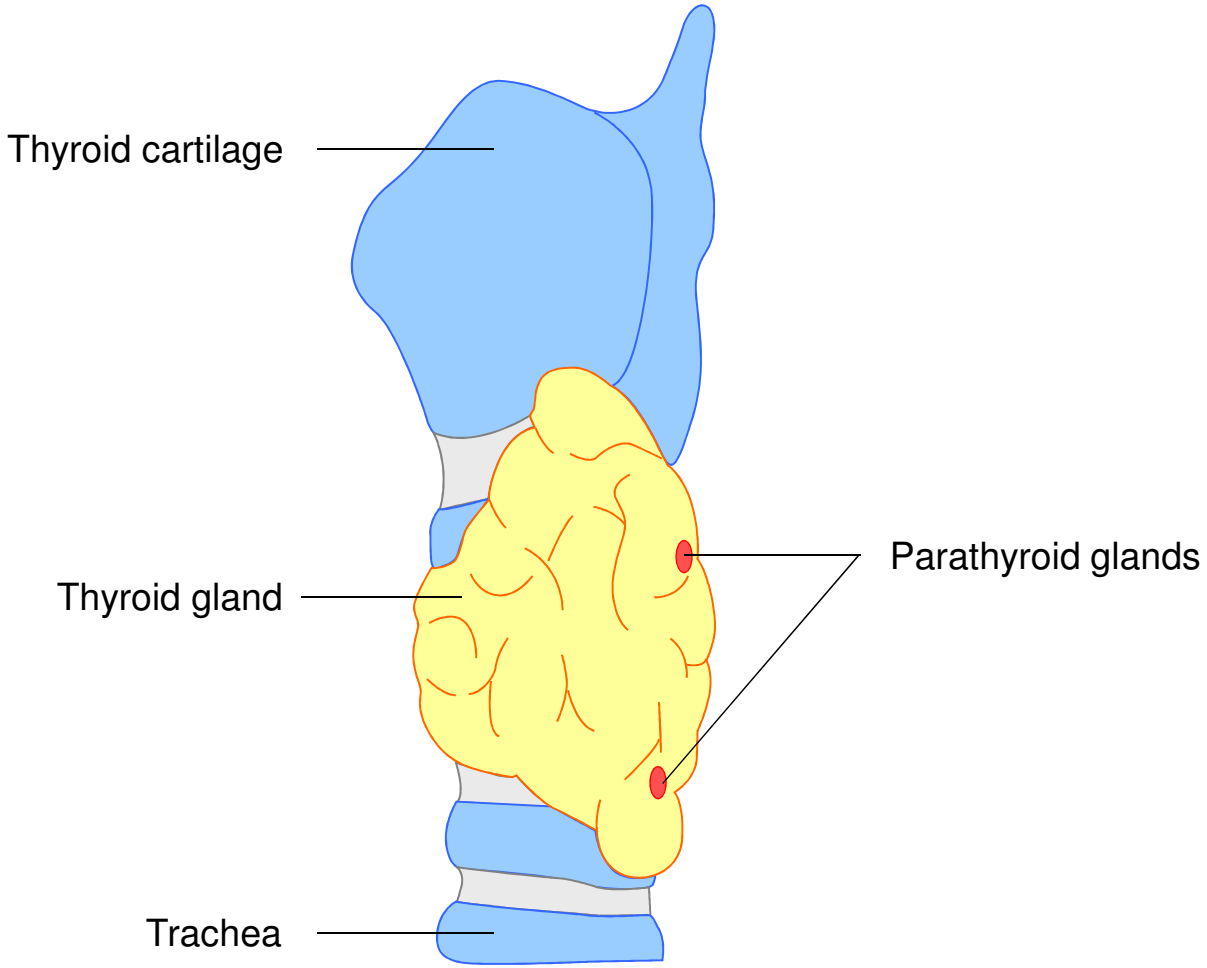
Thyroid and parathyroid hormone
Iodine from the diet is used to make the hormones T_4 and T_3. These hormones are produced by the thyroid gland and regulate body metabolism. Parathyroid hormone (PTH) and, to a lesser extent, calcitonin regulate levels of calcium and phosphate.

Structure of the thyroid and parathyroid glands



Structure of the thyroid and parathyroid glands
The thyroid gland is wrapped around the front of the trachea. The four parathyroid glands are at the back of the thyroid gland.

Thyroid and parathyroid glands



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4. Schilddrüse

Hyperfunktion- Hyperthyreose

M. Basedow-Graves : diffuse Struma u. Exophthalmie
--> Autoimmune Erkrankung

Funktionelle Autonomie: -toxische multinoduläre Struma
: -toxisches Adenom

Hypofunktion - Hypothyreose

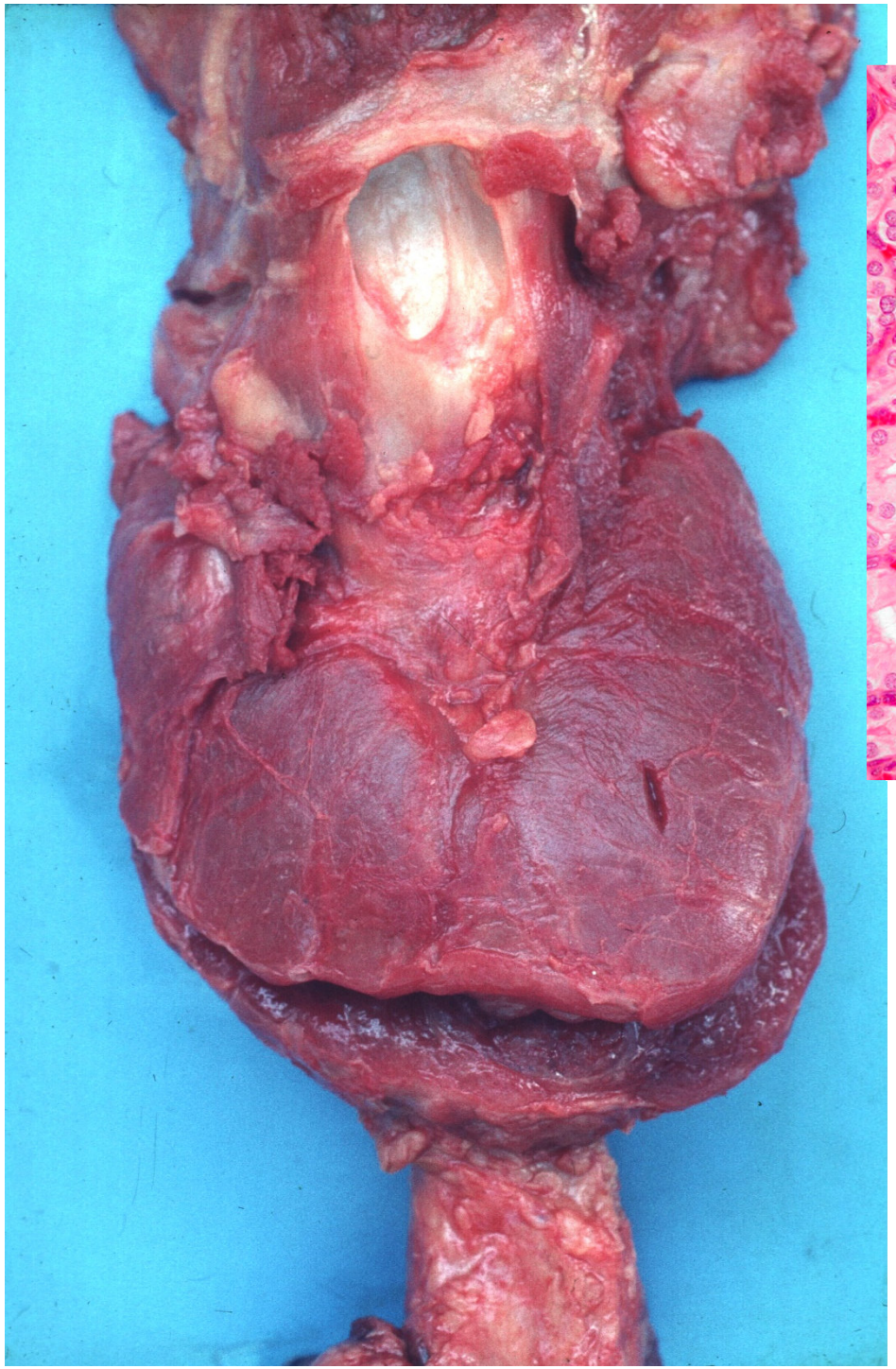
kongenital : Kretinismus : Agenesie, Enzymmangel
erworben : M. Hashimoto : Autoimmunthyreoiditis

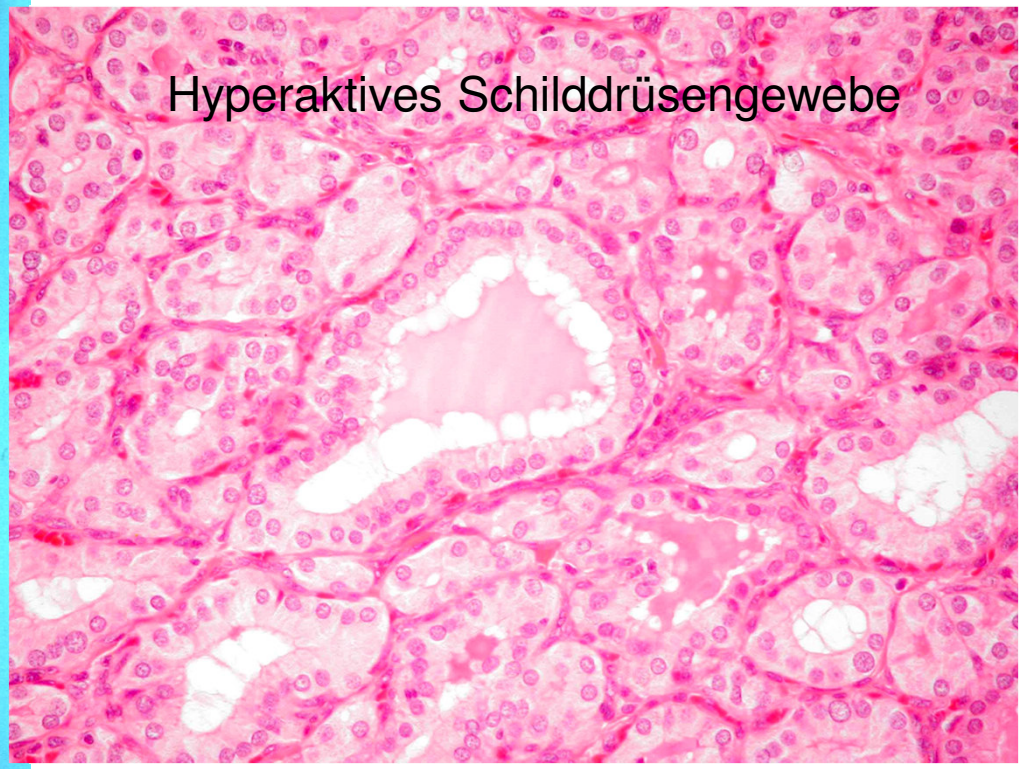
Erkrankungen ohne Funktionsstörung

infektiöse (virale) Thyreoiditis DeQuervain
nodöse Struma ("Knotenkropf")
Jodmangel - endemisch (Anden)

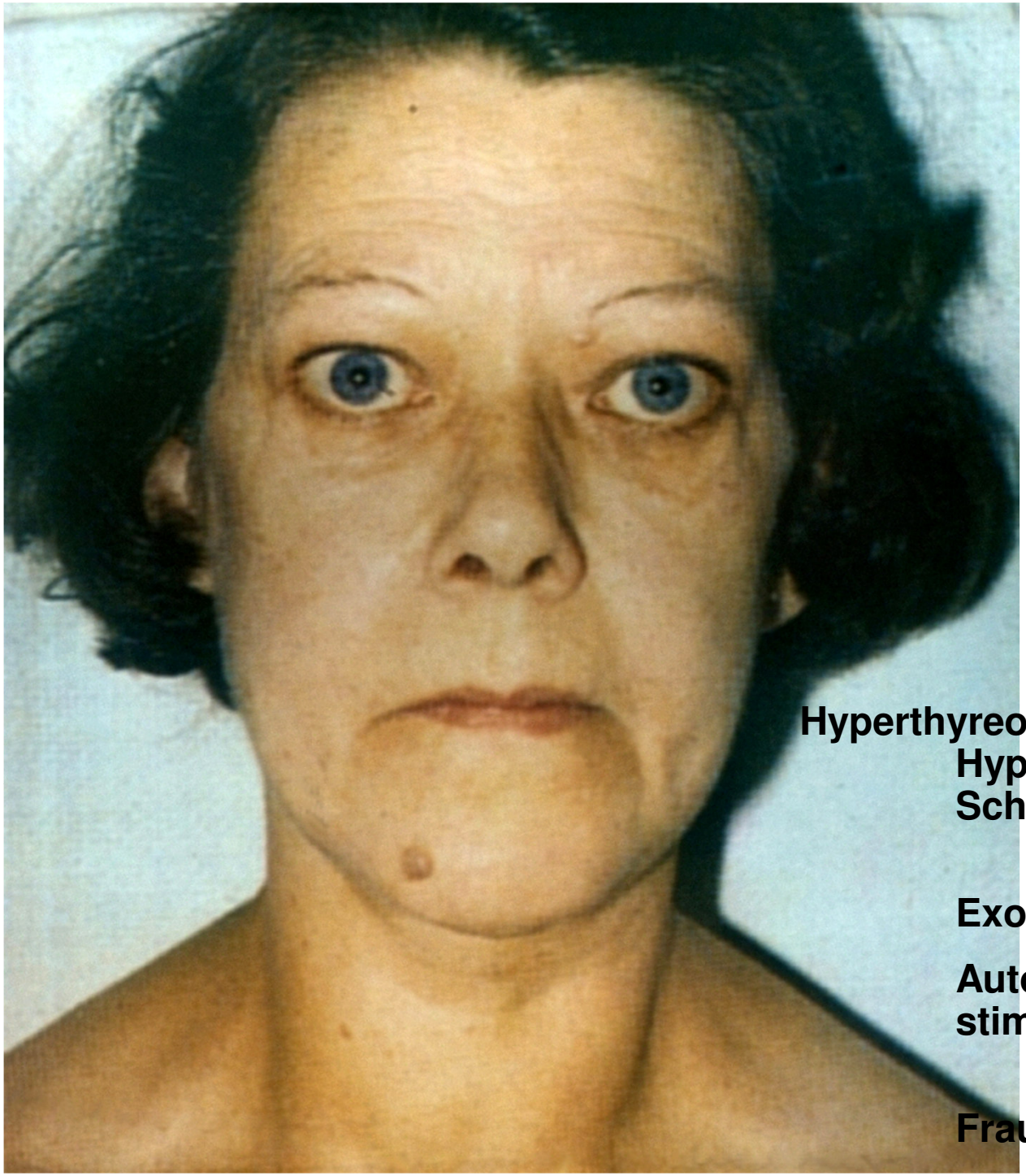
Tumoren

follikuläres Adenom
follikuläres Karzinom
papilläres Karzinom
anaplastisches Karzinom
medulläres (C-Zell) Karzinom (Kalzitoninproduktion)




Hyperaktives Schilddrüsengewebe


Normaktives Schilddrüsengewebe

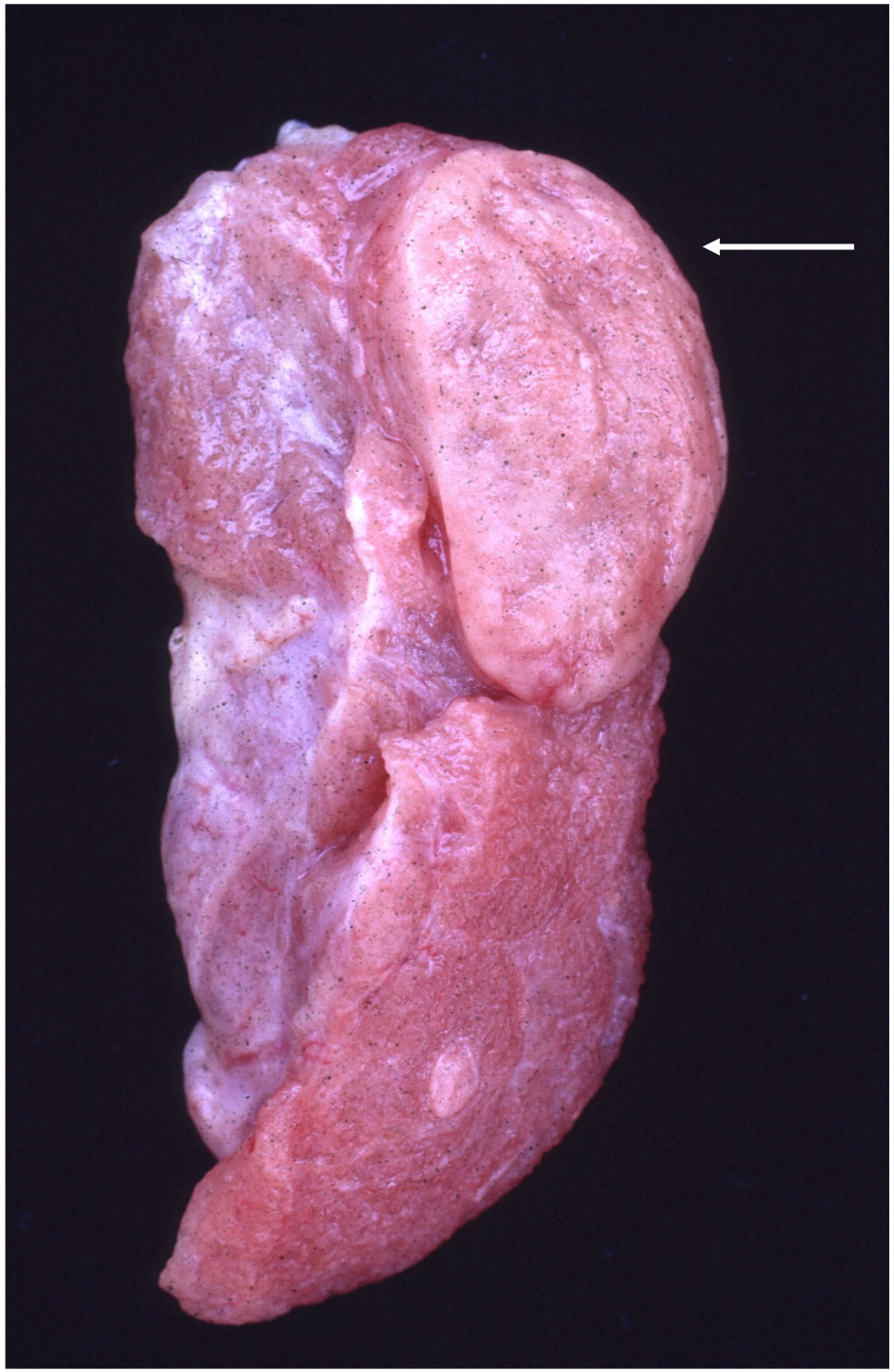


Hyperthyreose: Tachykardie, Hypertonus, leichtes Schwitzen, Unruhe, erhöhter Grundumsatz

Exophthalmus

Autoantikörper: Thyroid stimulating immunoglobulin (TSI)

Frauen 9 : Männer 1; 40 – 50 J



Toxisches “autonomes” Adenom

Hyperthyreose
ohne Autoantikörper/
ohne Exophtalmus

Ursache: Mutationen des
TSH Rezeptor Gens
(gain of function mutation)

↓

Monoklonale Proliferation von
hyperfunktionellen Thyreozyten

4. Schilddrüse

Hyperfunktion- Hyperthyreose

M. Basedow-Graves : diffuse Struma u. Exophthalmie
--> Autoimmune Erkrankung

Funktionelle Autonomie: -toxische multinoduläre Struma
: -toxisches Adenom

Hypofunktion - Hypothyreose

kongenital : Kretinismus : Agenesie, Enzymmangel

erworben : M. Hashimoto : Autoimmunthyreoiditis

Erkrankungen ohne Funktionsstörung

infektiöse (virale) Thyreoiditis DeQuervain

nodöse Struma ("Knotenkropf")
Jodmangel - endemisch (Anden)

Tumoren

follikuläres Adenom

follikuläres Karzinom

papilläres Karzinom

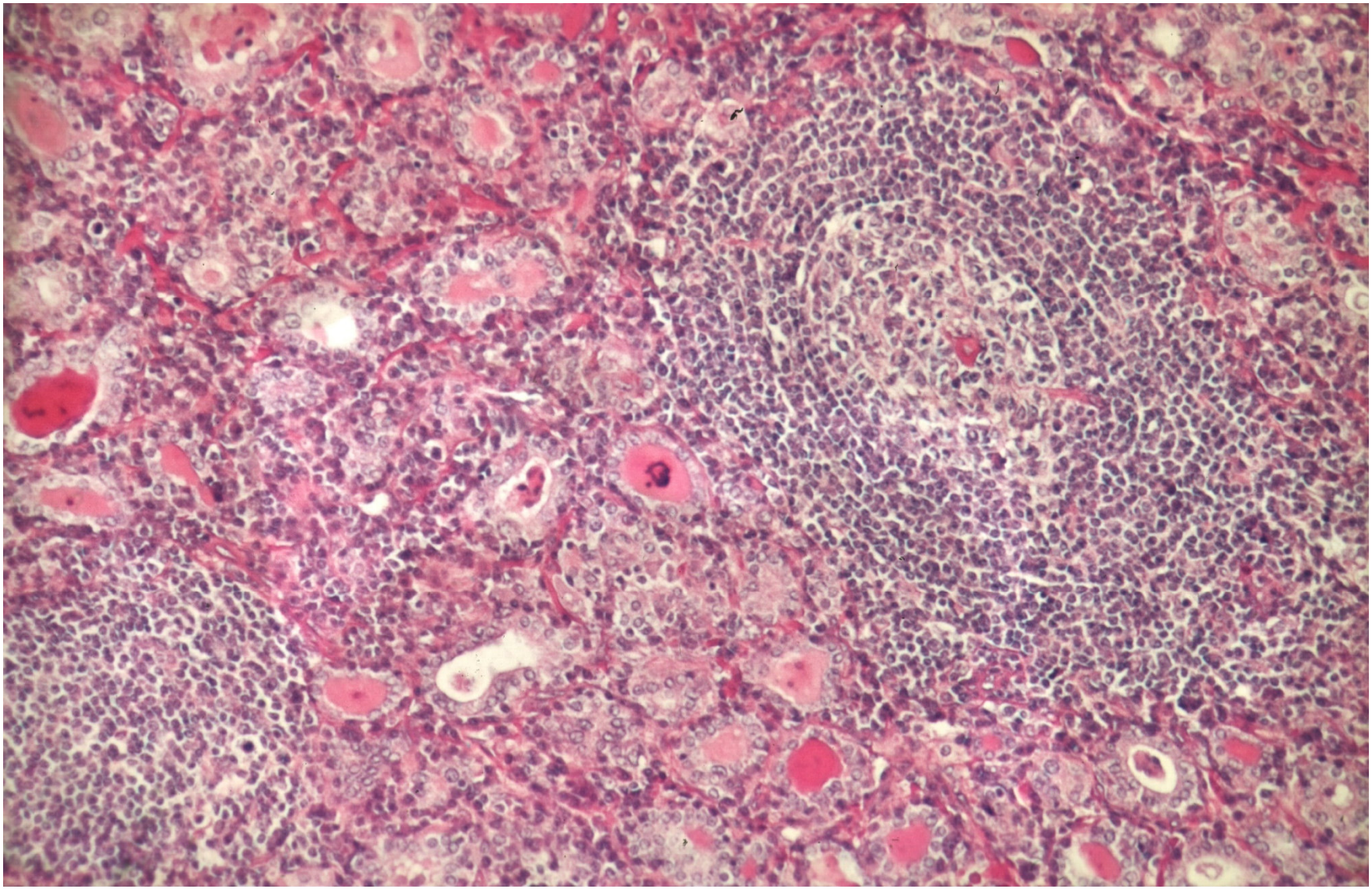
anaplastisches Karzinom

medulläres (C-Zell) Karzinom (Kalzitoninproduktion)


Hashimoto
Beginnstadium


Endstadium

Autoimmune Schilddrüsenerkrankung



Hashimoto Thyreoditis – chron. lymphozytäre Thyreoiditis

4. Schilddrüse

Hyperfunktion-Hyperthyreose

M. Basedow-Graves : diffuse Struma u. Exophthalmie
--> Autoimmune Erkrankung
Funktionelle Autonomie: toxische multinoduläre Struma
: toxisches Adenom

Hypofunktion - Hypothyreose

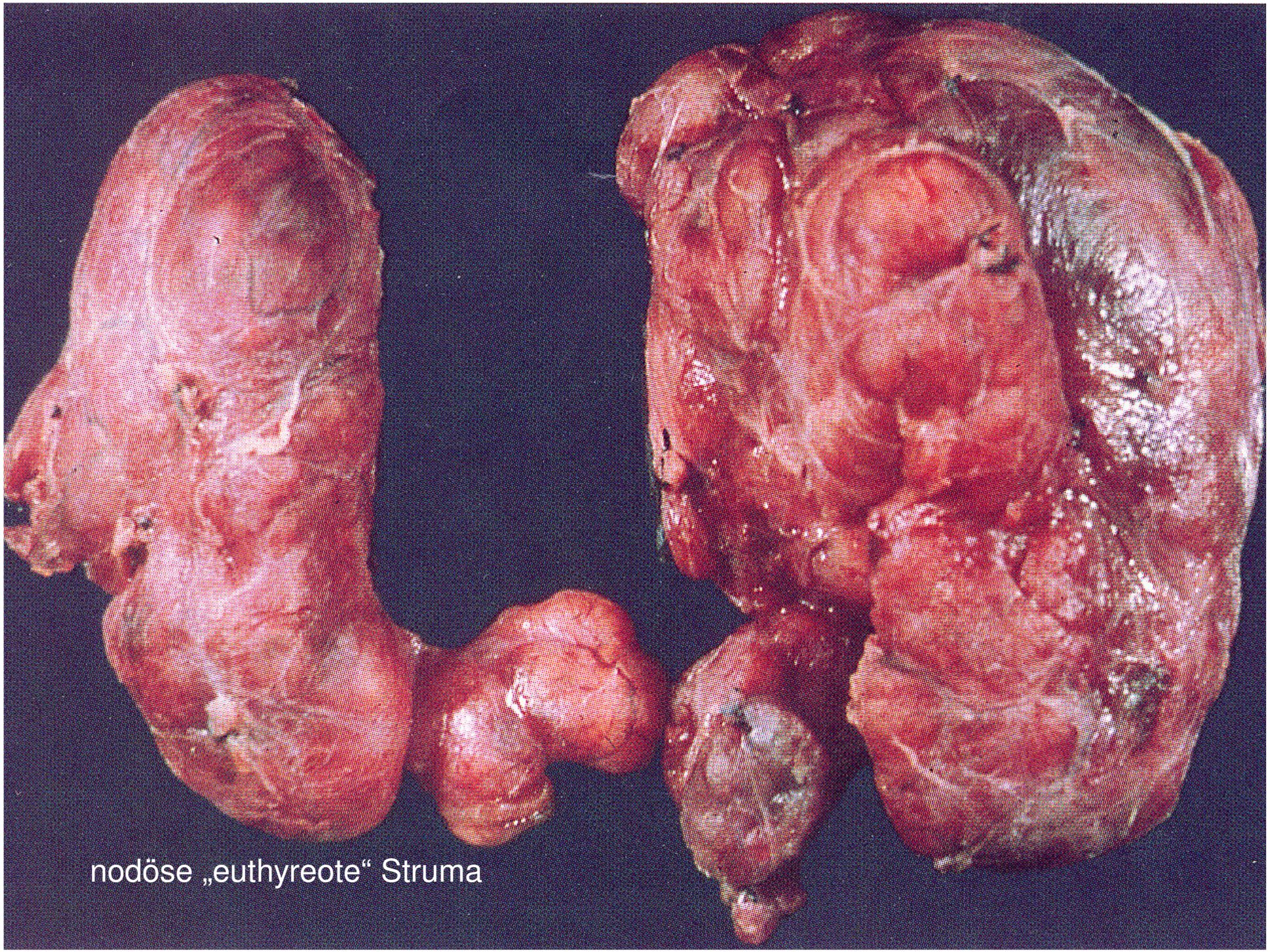
kongenital : Kretinismus : Agenesie, Enzymmangel
erworben : M. Hashimoto : Autoimmunthyreoiditis

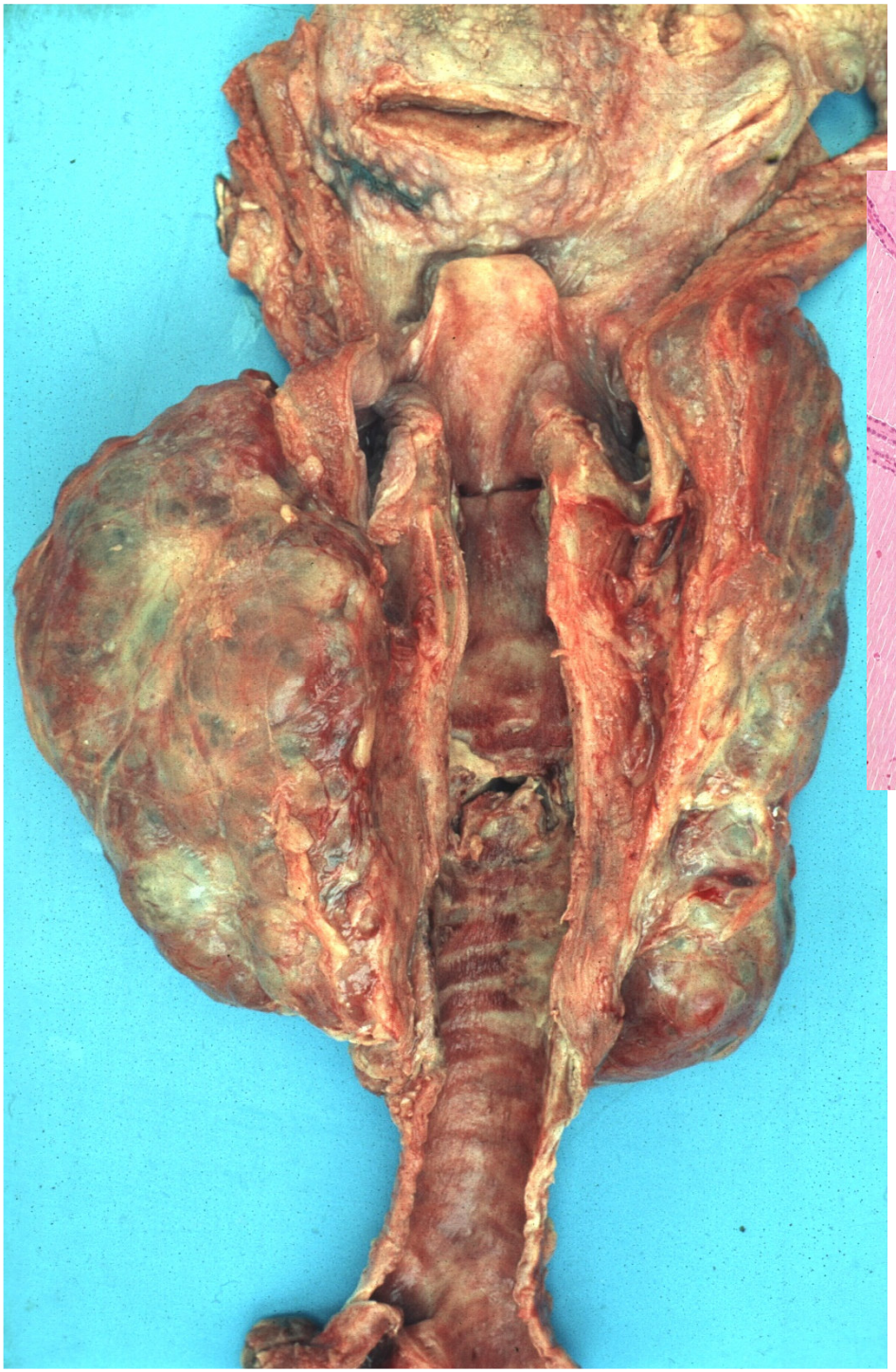
Erkrankungen ohne Funktionsstörung

: infektiöse (virale) Thyreoiditis DeQuervain
: nodöse „euthyreote“ Struma (“Knotenkropf”)
Jodmangel - endemisch (Anden)

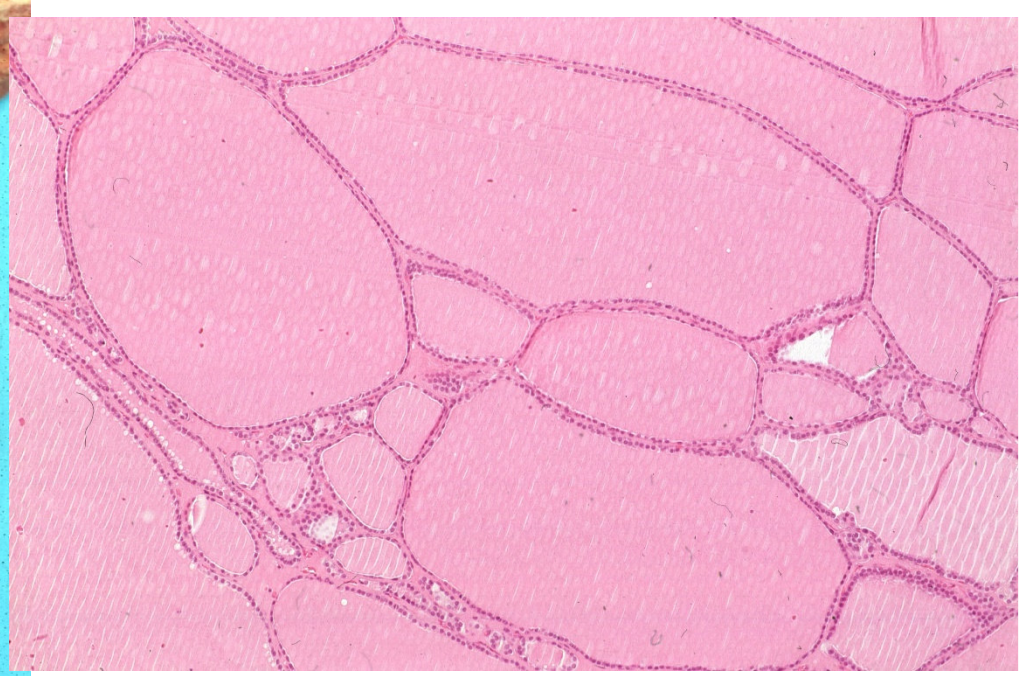
Tumoren

: follikuläres Adenom
: follikuläres Karzinom
: papilläres Karzinom
: anaplastisches Karzinom
: medulläres (C-Zell) Karzinom (Kalzitoninproduktion)


nodöse „euthyreote“ Struma



Nodöse „euthyreote“ Struma



Hypoaktives Schilddrüsengewebe

4. Schilddrüse

Hyperfunktion-Hyperthyreose

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--> Autoimmune Erkrankung

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: infektiöse (virale) Thyreoiditis DeQuervain

: nodöse Struma ("Knotenkropf")
Jodmangel - endemisch (Anden)

Tumoren

: follikuläres Adenom

: follikuläres Karzinom - gute Prognose

: papilläres Karzinom - gute Prognose

: anaplastisches Karzinom - schlechte Prognose

: medulläres (C-Zell) Karzinom (Kalzitoninproduktion) – mäßige Prognose


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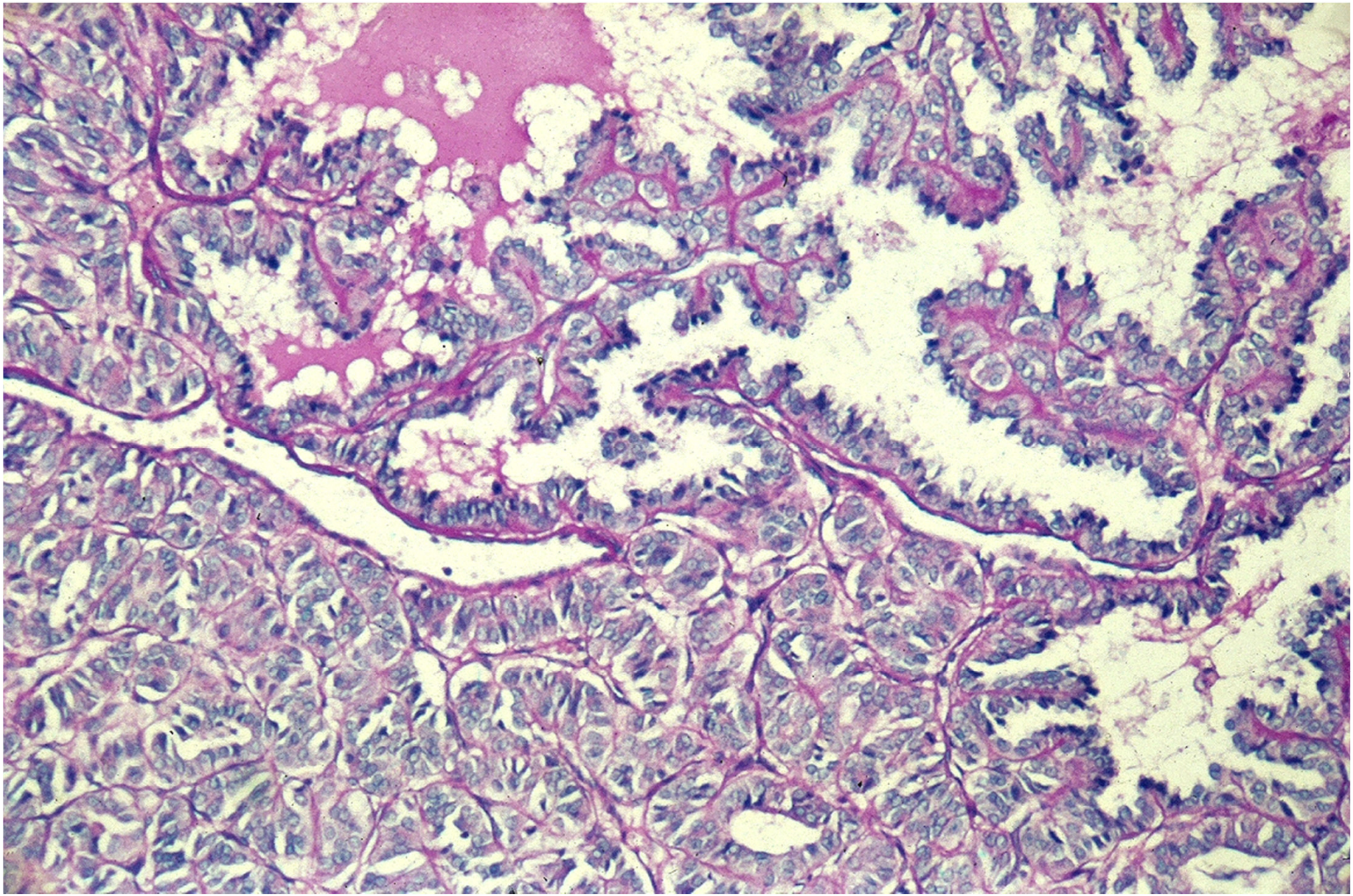

Thyroid and parathyroid hormones

Parathyroid hormone (PTH)
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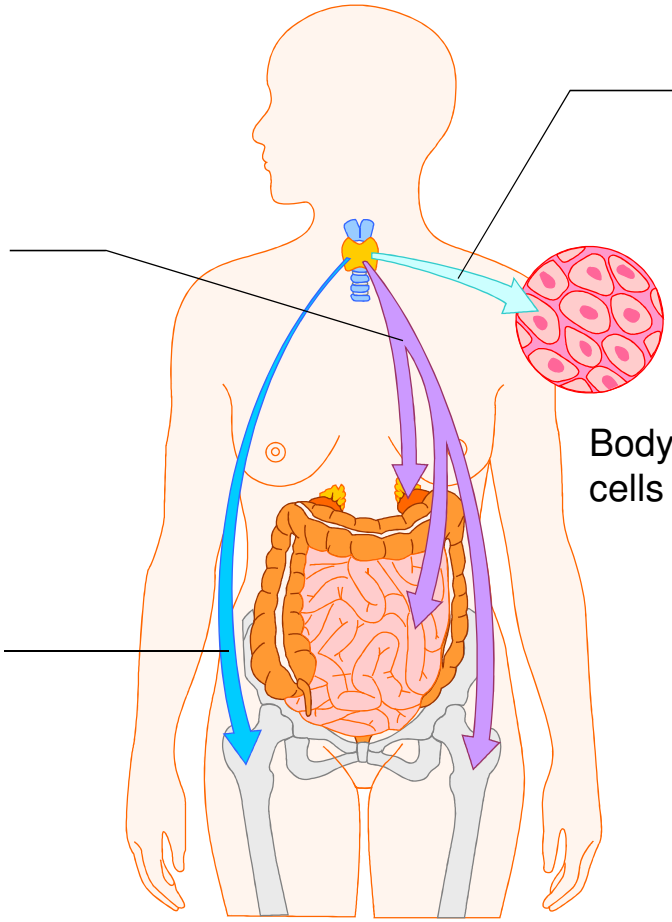
Calcitonin
This hormone inhibits calcium release from the bones if blood calcium levels are high



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Thyroid and parathyroid hormone
Iodine from the diet is used to make the hormones T_4 and T_3. These hormones are produced by the thyroid gland and regulate body metabolism. Parathyroid hormone (PTH) and, to a lesser extent, calcitonin regulate levels of calcium and phosphate.

4. Nebenschilddrüsen

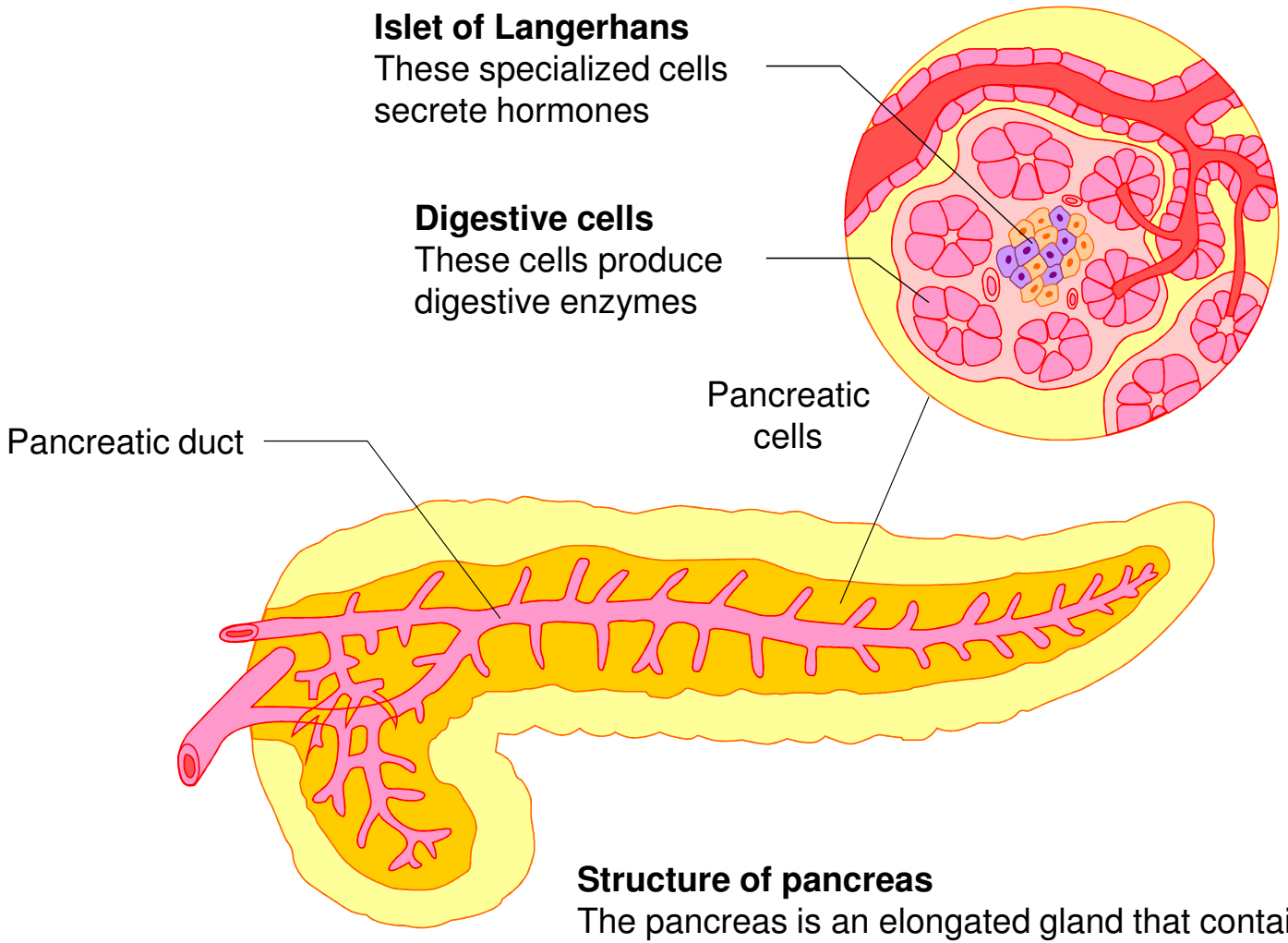
Hyperparathyreoidismus

- primär Solitäres Adenom
- sekundär bei Niereninsuffizienz: Hyperplasie

Hypoparathyreoidismus

- meist sek. nach Schilddrüsenresektion

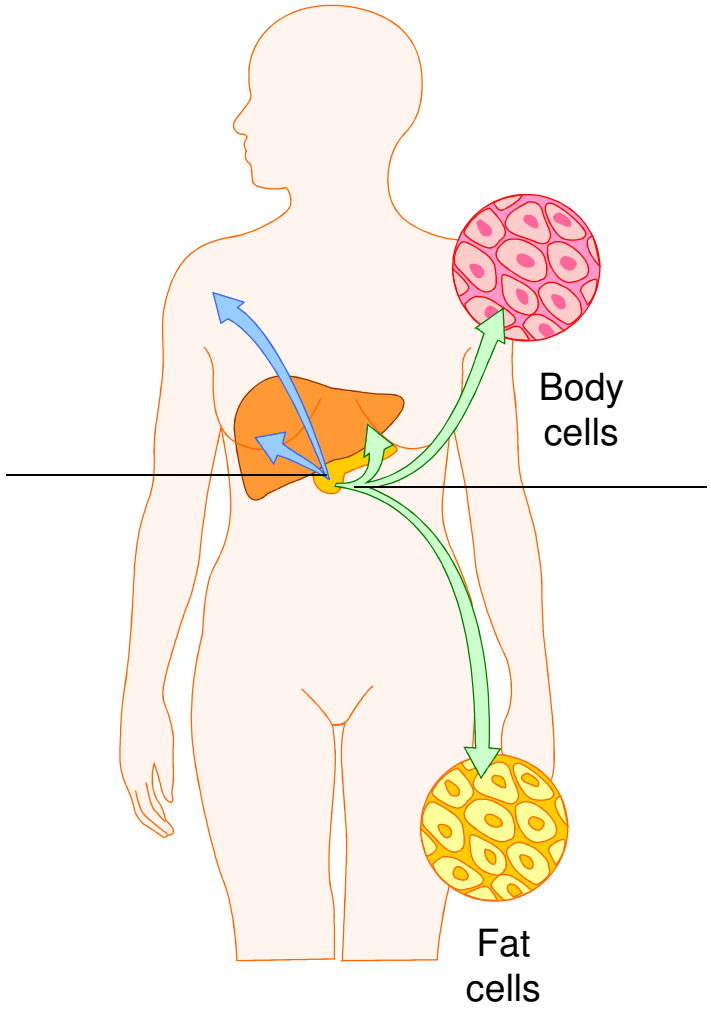
Pancreas



Structure of pancreas
The pancreas is an elongated gland that contains clusters of hormone-producing cells and enzyme-secreting cells.

Pancreatic hormones

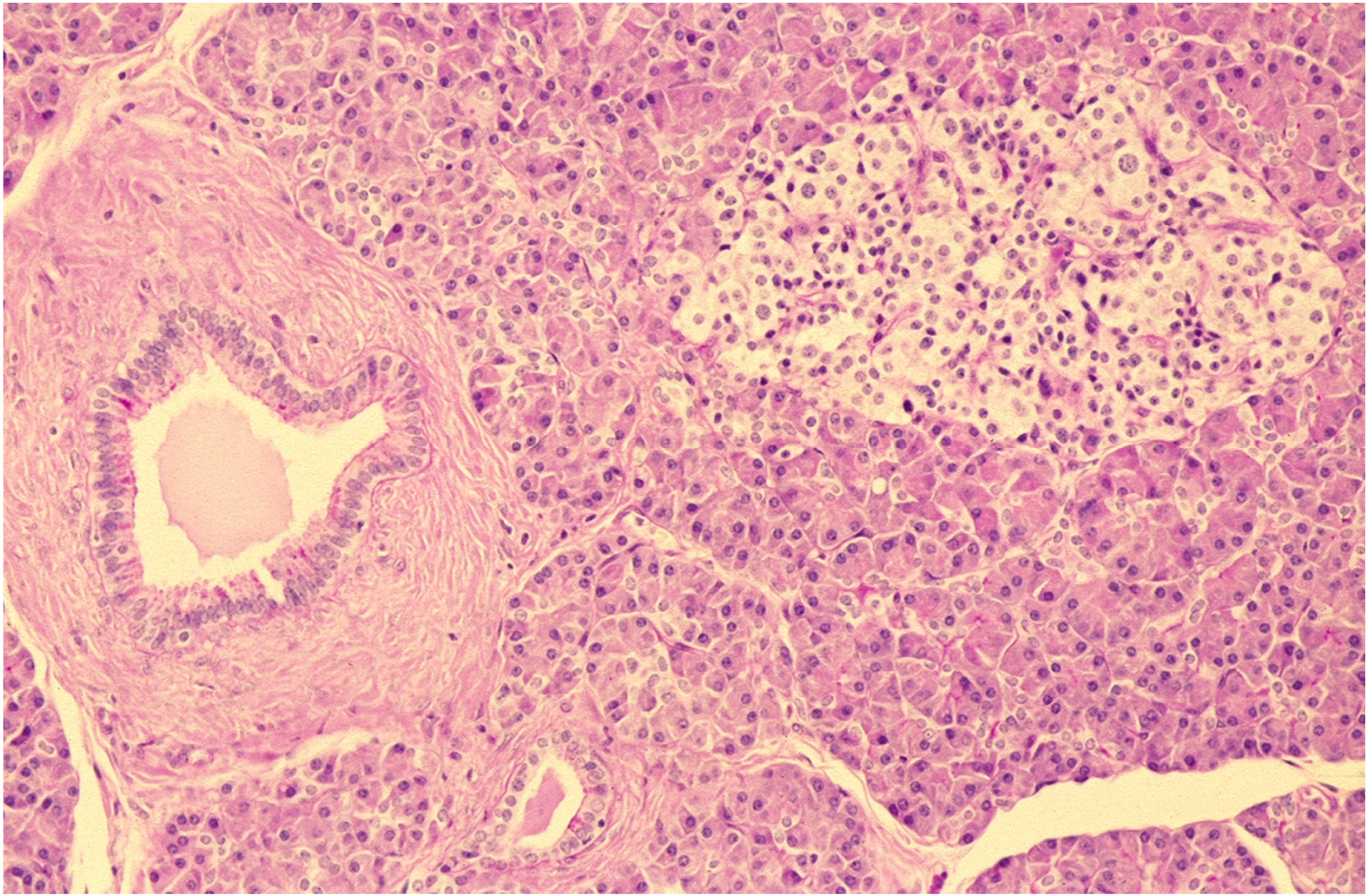
Glucagon
Glucagon raises glucose levels in the blood by stimulating the breakdown of glycogen stored in the liver and in the muscle cells



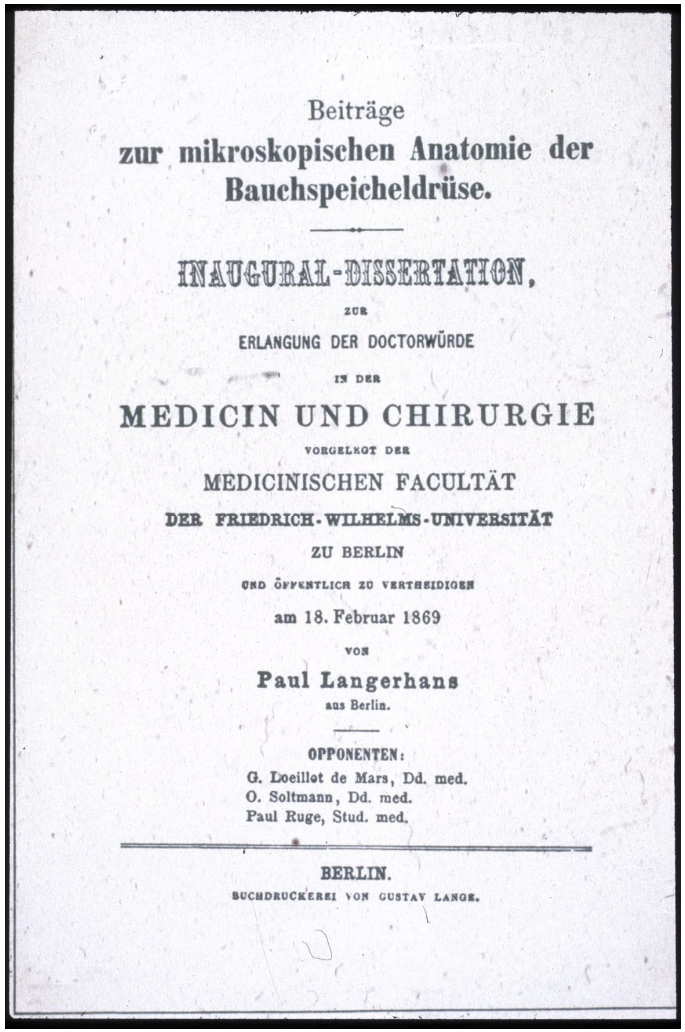
Insulin
Insulin lowers glucose levels in the blood by stimulating body cells to absorb glucose, the liver to store glucose as glycogen, and fat cells to convert glucose into fatty acids

Pancreatic hormones
Insulin and, to a lesser extent, glucagon maintain a stable level of glucose in the body. Both of these hormones are produced by cells in the pancreas.

1031290



Langerhans 1869:



Beiträge

zur mikroskopischen Anatomie der Bauchspeicheldrüse.

INAUGURAL-DISSERTATION,

ZUR

ERLANGUNG DER DOCTORWÜRDE

IN DER

MEDICIN UND CHIRURGIE

VORGELEGT DER

MEDICINISCHEN FACULTÄT

DER FRIEDRICH-WILHELMS-UNIVERSITÄT

ZU BERLIN

UND ÖFFENTLICH ZU VERTHEIDIGEN

am 18. Februar 1869

VON

Paul Langerhans

aus Berlin.

OPPONENTEN:

G. Loeillot de Mars, Dd. med.
O. Soltmann, Dd. med.
Paul Ruge, Stud. med.

BERLIN.

BUCHDRUCKEREI VON GUSTAV LANGE.

„neun verschiedene Zelltypen“

„Die Zellen liegen meist in größerer Anzahl beieinander, eigenthümlich verteilt im Parenchym der Drüse“

5. Endokrines Pankreas

Hypofunktion

Diabetes Typ 1	- Insulin-abhängig:	autoimmune Beta-Zellzerstörung
Diabetes Typ 2	- nicht-Insulin-abhängig:	Keine Beta-Zelldestruktion Insulinresistenz und Insulinsekretionsdefekt

Diabetes bei chronischer Pankreatitis, Hämochromatose, Mukoviszidose

Hyperfunktionssyndrome durch endokrine Tumore

Hypoglykämie	:	Insulinom
Zollinger-Ellison-S.	:	Gastrinom (im Pankreas)

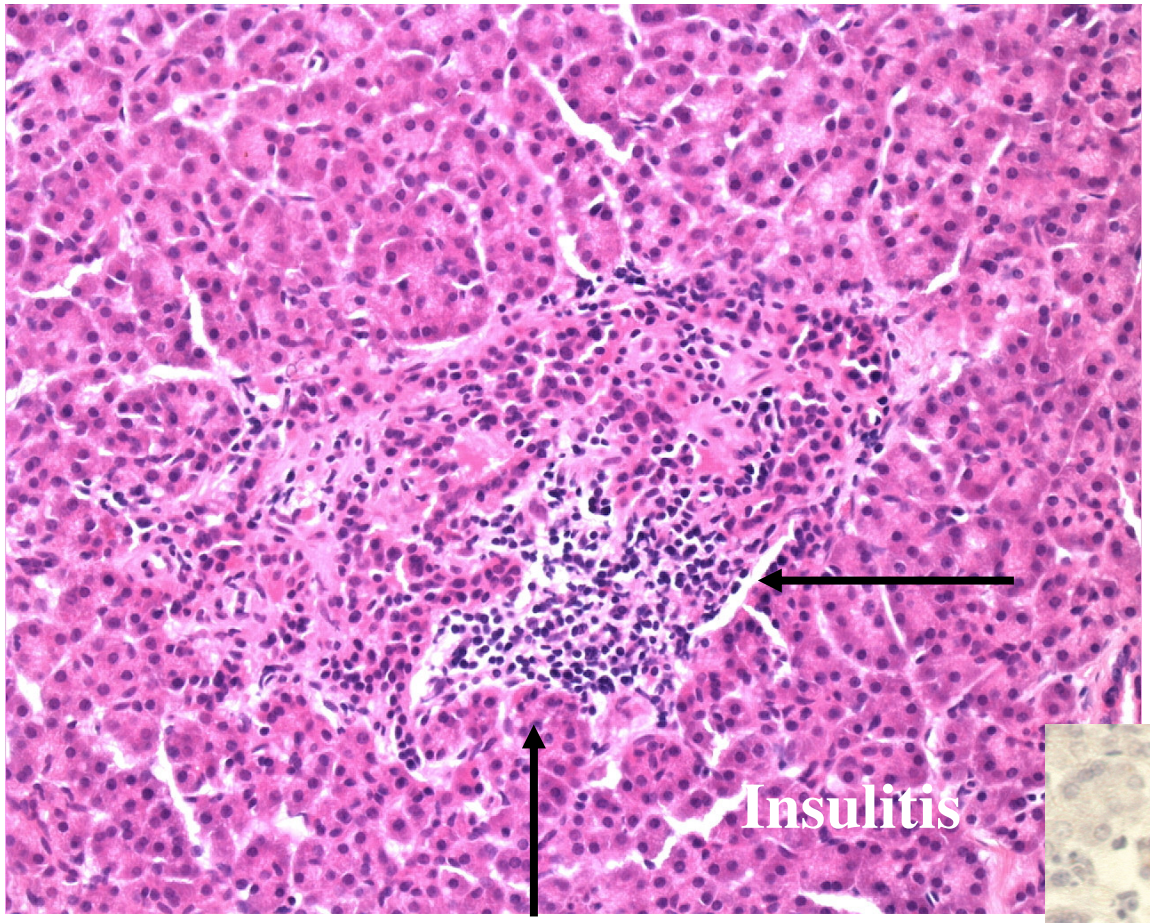
Hyperfunktionssyndrom durch Beta-Zellhyperaktivität
(=neonatale hyperinsulinämische Hypoglykämie)

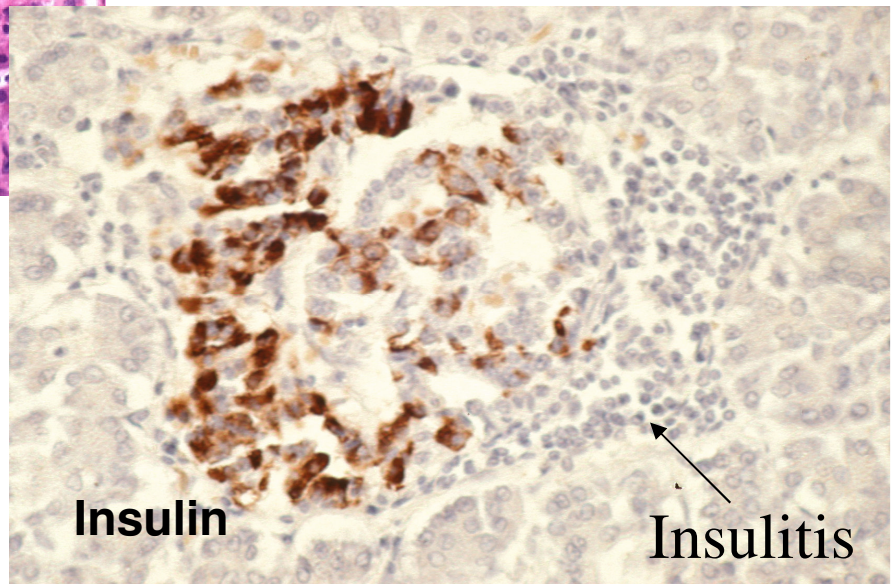
DIABETES MELLITUS

- Typ-1-Diabetes ß-Zelldestruktion absoluter Insulinmangel
- Typ-2-Diabetes Insulinresistenz relativer Insulinmangel >85% aller Diabetiker

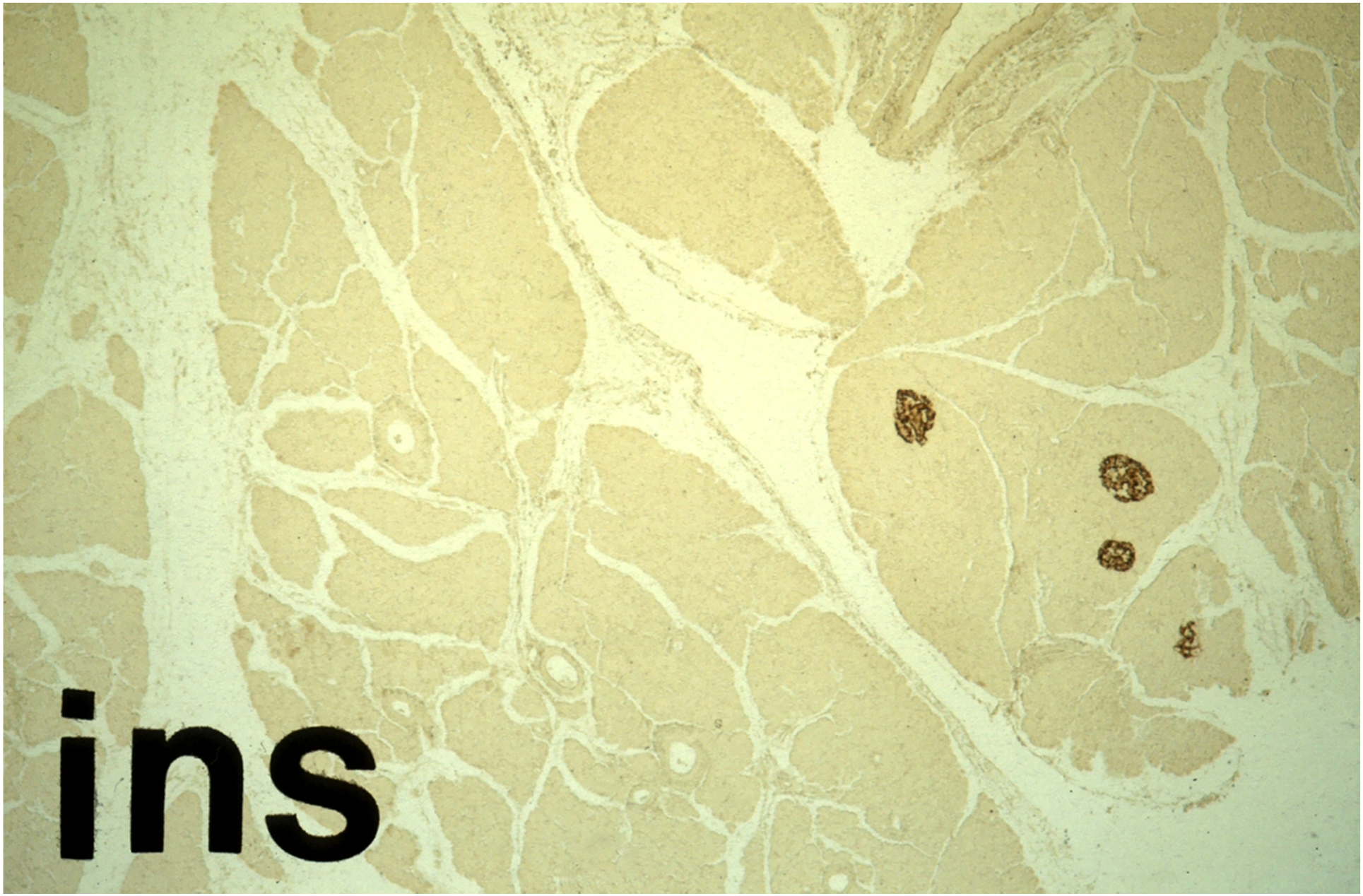
Typ-1-(juveniler) Diabetes

- Zerstörung der ß-Zellen durch Autoimmun-insulitis
- Inselzellautoantikörper (ICA)
- Meist 5. - 20. Lj.
- genetische Faktoren prädisponierend: HLA-Merkmale DR3 u/o DR4 (>90%)
- positive Familienanamnese aber nur in ca. 20%





Insulitis bei frisch erkranktem Typ 1 Diabetiker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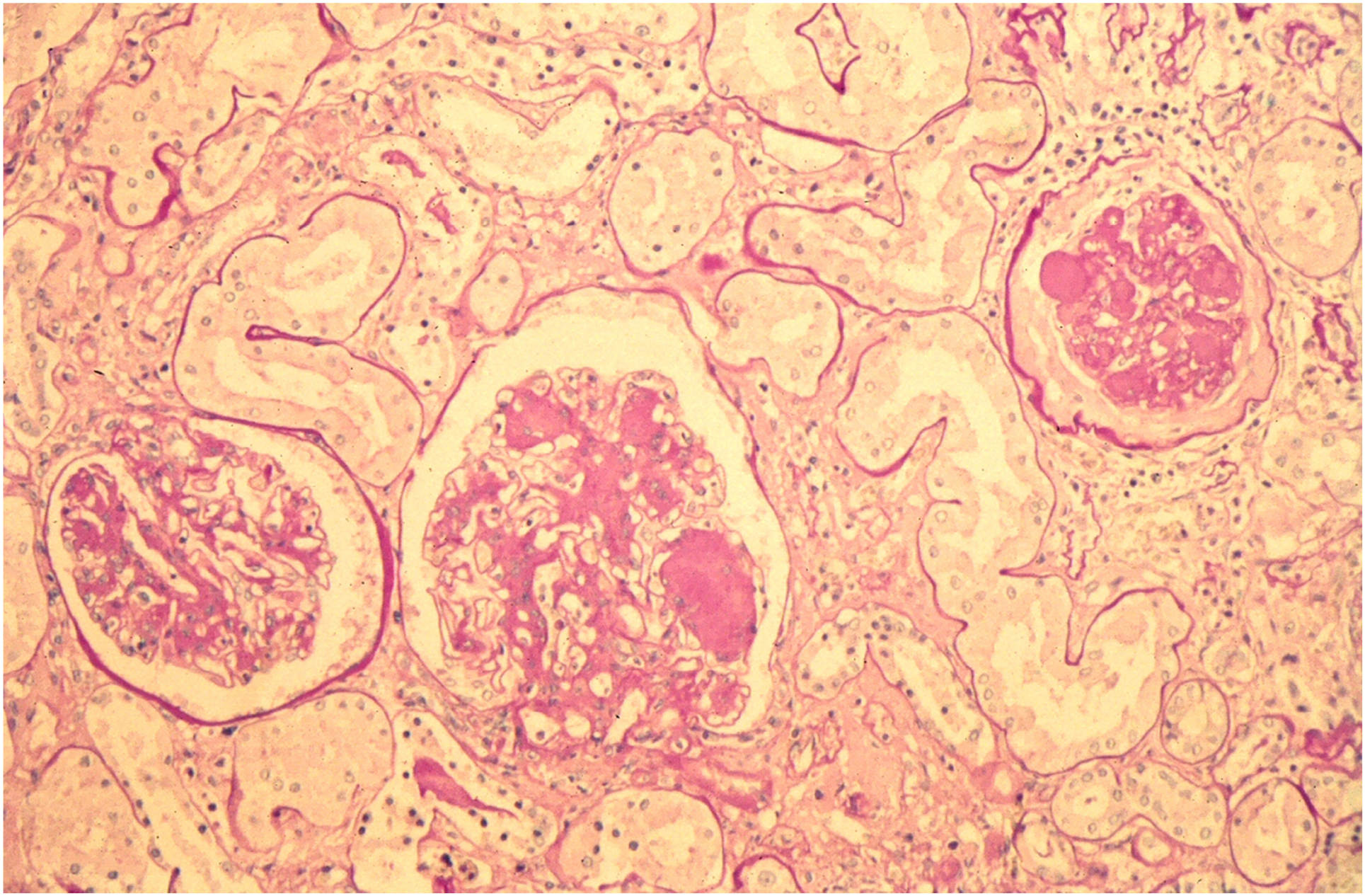
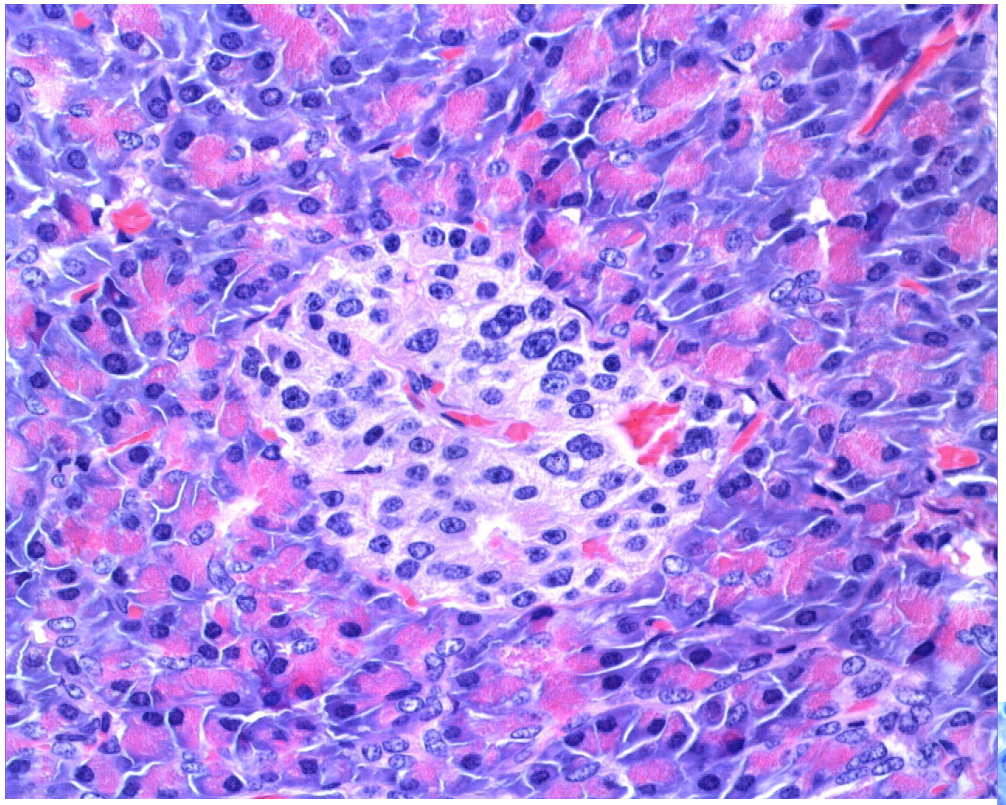


Langzeitige Folgen des Diabetes mellitus ?

Typ-2-(adulter) Diabetes mellitus

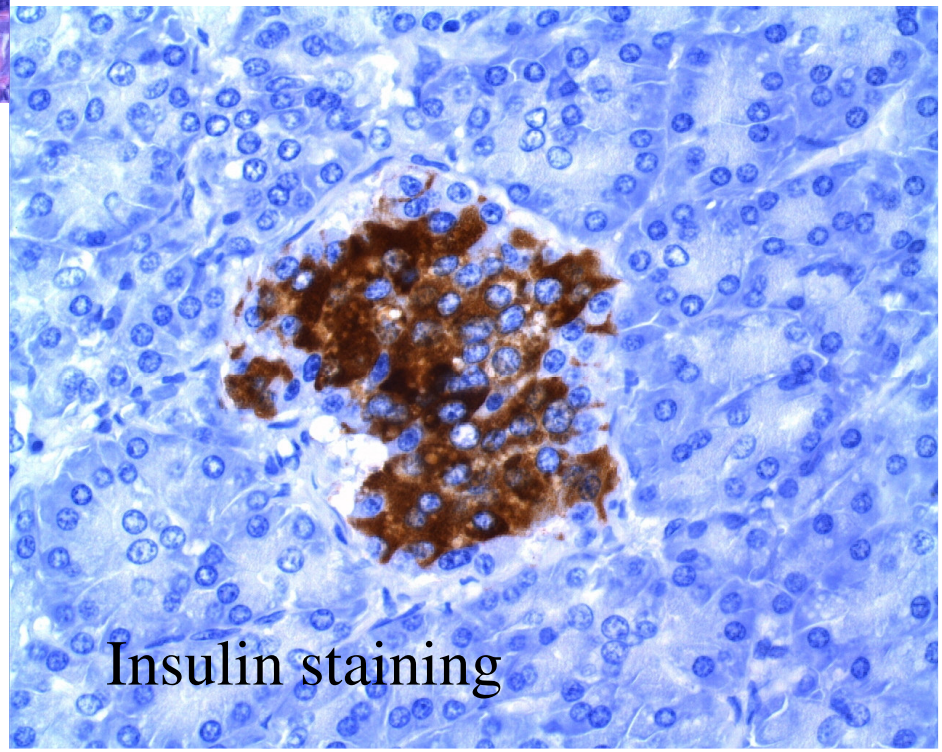
- Wohlstandsdiabetes
- Adipositas (mit Hochdruck -> metabol. Syndrom)
- Insulinresistenz / Insulinsekretionsschwäche
- Zahl der ß-Zellen normal oder vermindert

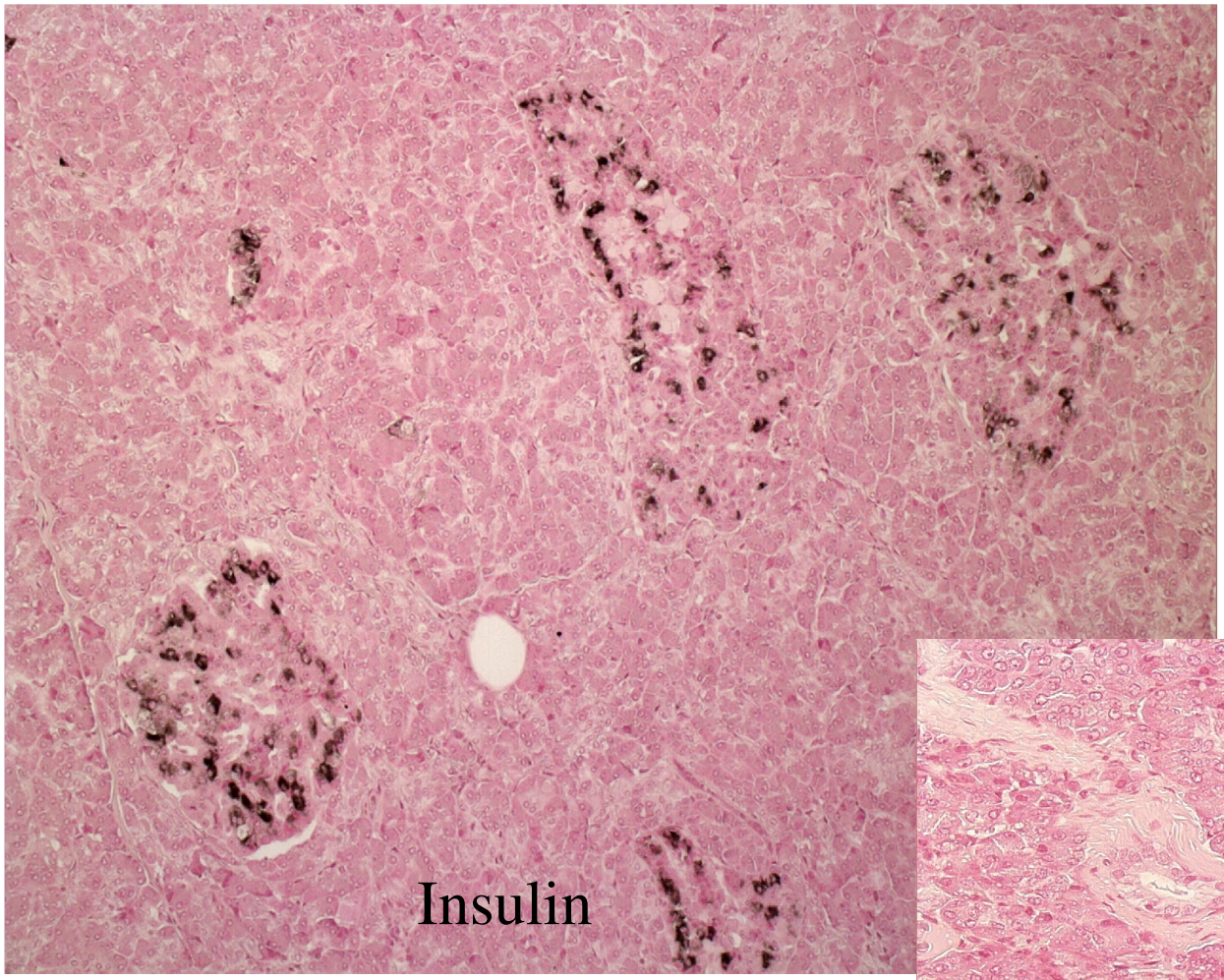
  Inselamyloidose !
- häufig positive Familienanamnese (bei eineiigen Zwillingen nahezu 100% Konkordanz)
- meist nach 40. Lj., im Alter zunehmend
- schleichender Beginn



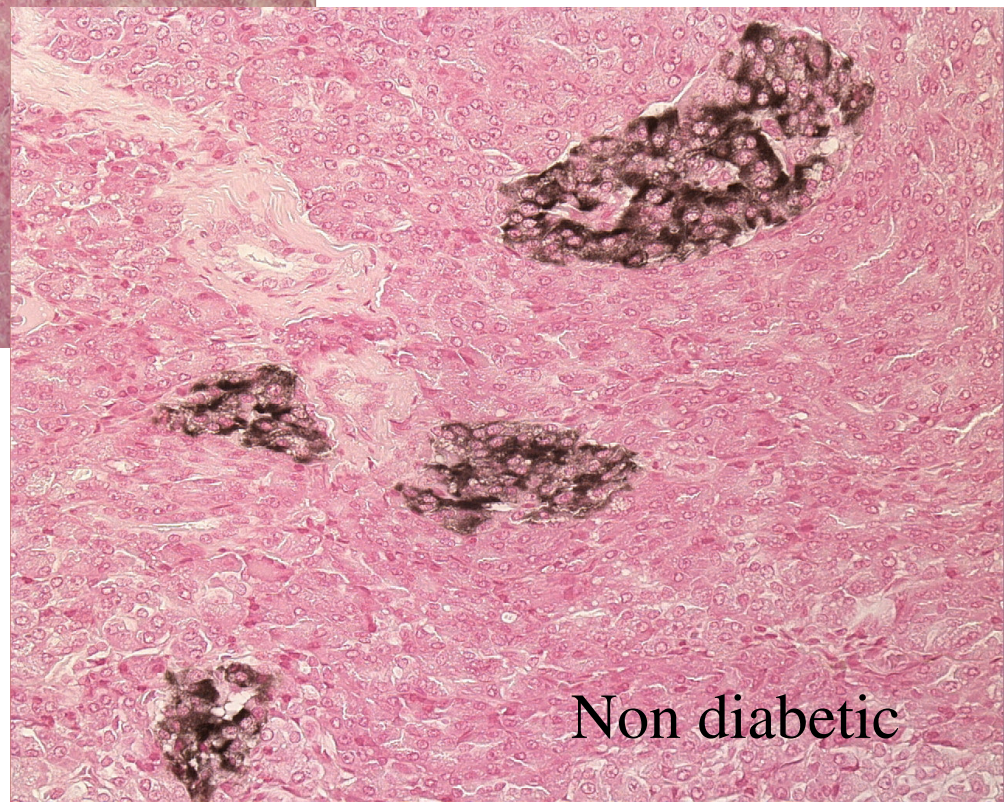
Islet of type 2 diabetic; 65 y diabetes duration 15 years

Normal appearing
islet of a type 2 diabetic





Type 2 diabetic
with low beta cell number



Paul Langerhans

1865

1871

„Ich muß leider meine Mittheilungen mit der Erklärung eröffnen, daß ich in keiner Weise im Stande bin, die abgeschlossenen Resultate einer erfolgreichen Untersuchung vorzulegen.“

1888