

Endocrine system Anatomy

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Introduction

- The endocrine system consists of **glands** and **diffuse cell groups** scattered in epithelial tissues
- Synthesize and secrete **hormones**
- Hormones uptake by capillaries and distribution throughout the body

Organs of the endocrine system

- **Pituitary gland**
- **Thyroid gland**
- **Parathyroid glands**
- **Adrenal glands**
- **Pineal gland**
- **Pancreas**

Hypothalamus

Antidiuretic hormone (ADH)
Oxytocin (OT)
Regulatory hormones

Pituitary gland

Anterior pituitary secretes:

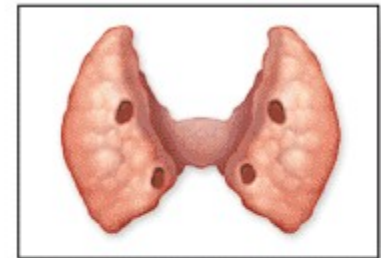
Adrenocorticotrophic hormone (ACTH)
Follicle-stimulating hormone (FSH)
Growth hormone (GH)
Luteinizing hormone (LH)
Melanocyte-stimulating hormone (MSH)
Prolactin (PRL)
Thyroid-stimulating hormone (TSH)

Posterior pituitary releases:

Antidiuretic hormone (ADH)
Oxytocin (OT)

Pineal gland

Melatonin



Parathyroid glands

(located on posterior surface of thyroid)
Parathyroid hormone (PTH)

Thyroid gland

Calcitonin (CT)
Thyroid hormone (TH)

(Thymus)

Thymopoietin
Thymosins

(Heart)

Atrialpeptin

Adrenal glands

Cortex:

Corticosteroids

Medulla:

Epinephrine (E)

Norepinephrine (NE)

(Kidney)

Calcitriol

Erythropoietin (EPO)

Renin

Gastrointestinal (GI) tract

Cholecystikinin (CCK)

Gastric inhibitory peptide (GIP)

Gastrin

Secretin

Vasoactive intestinal peptide (VIP)

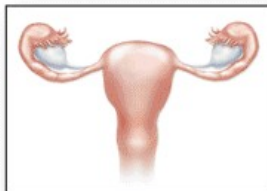
Pancreatic islets

Glucagon

Insulin

Somatostatin

Pancreatic polypeptide



(Ovaries)

Estrogen

Inhibin

Progesterone

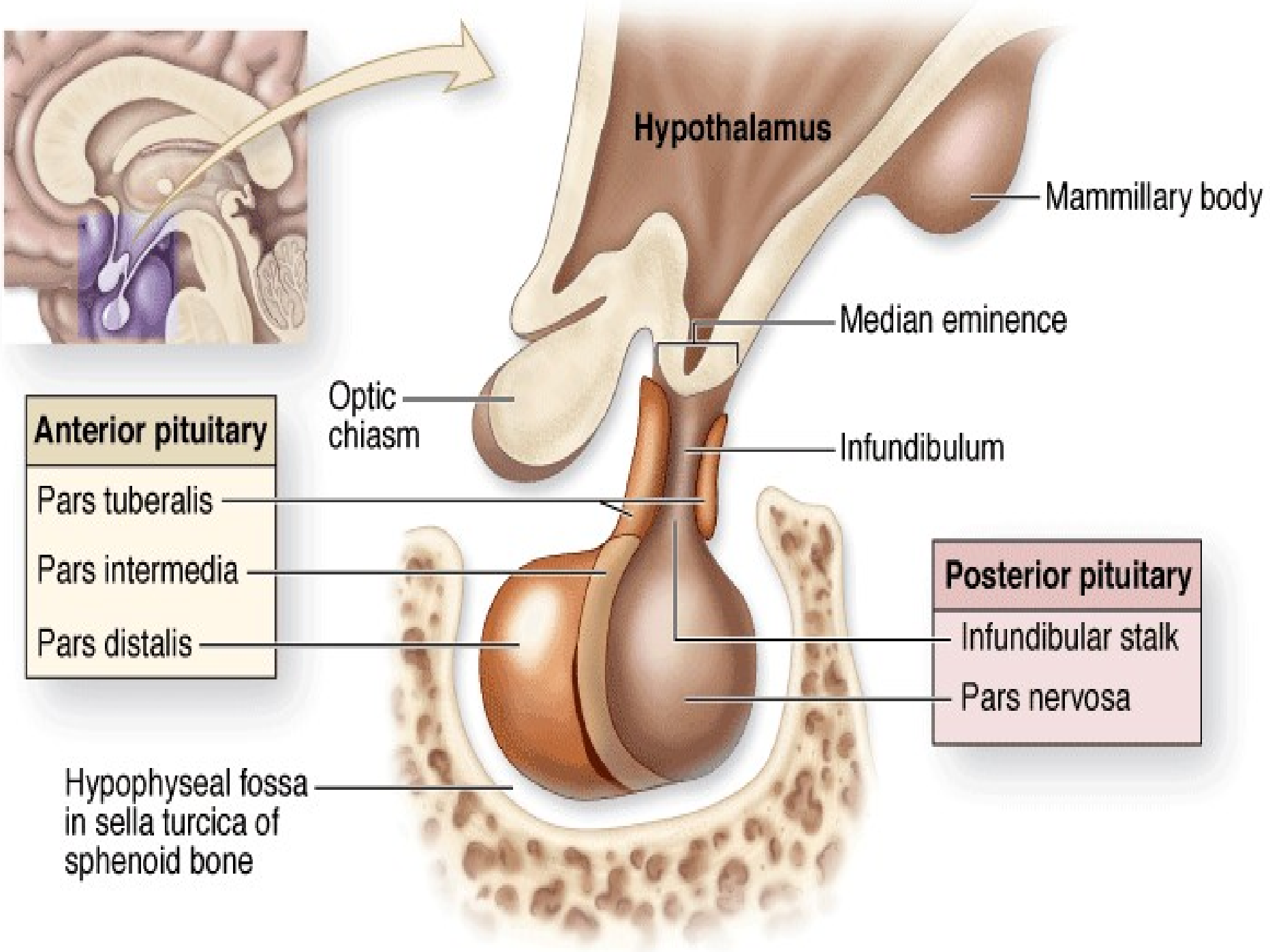
(Testes)

Androgens

Inhibin

1. Pituitary gland (Hypophysis)

- 0.5 g; 10 x 13 x 6 mm
- Lies below the brain in a cavity of the sphenoid bone, the **sella turcica**
- consists of two glands, the posterior **neurohypophysis** and the anterior **adenohypophysis**, united anatomically but with different functions



Hypothalamus

Mammillary body

Median eminence

Optic chiasm

Infundibulum

Anterior pituitary

Pars tuberalis

Pars intermedia

Pars distalis

Posterior pituitary

Infundibular stalk

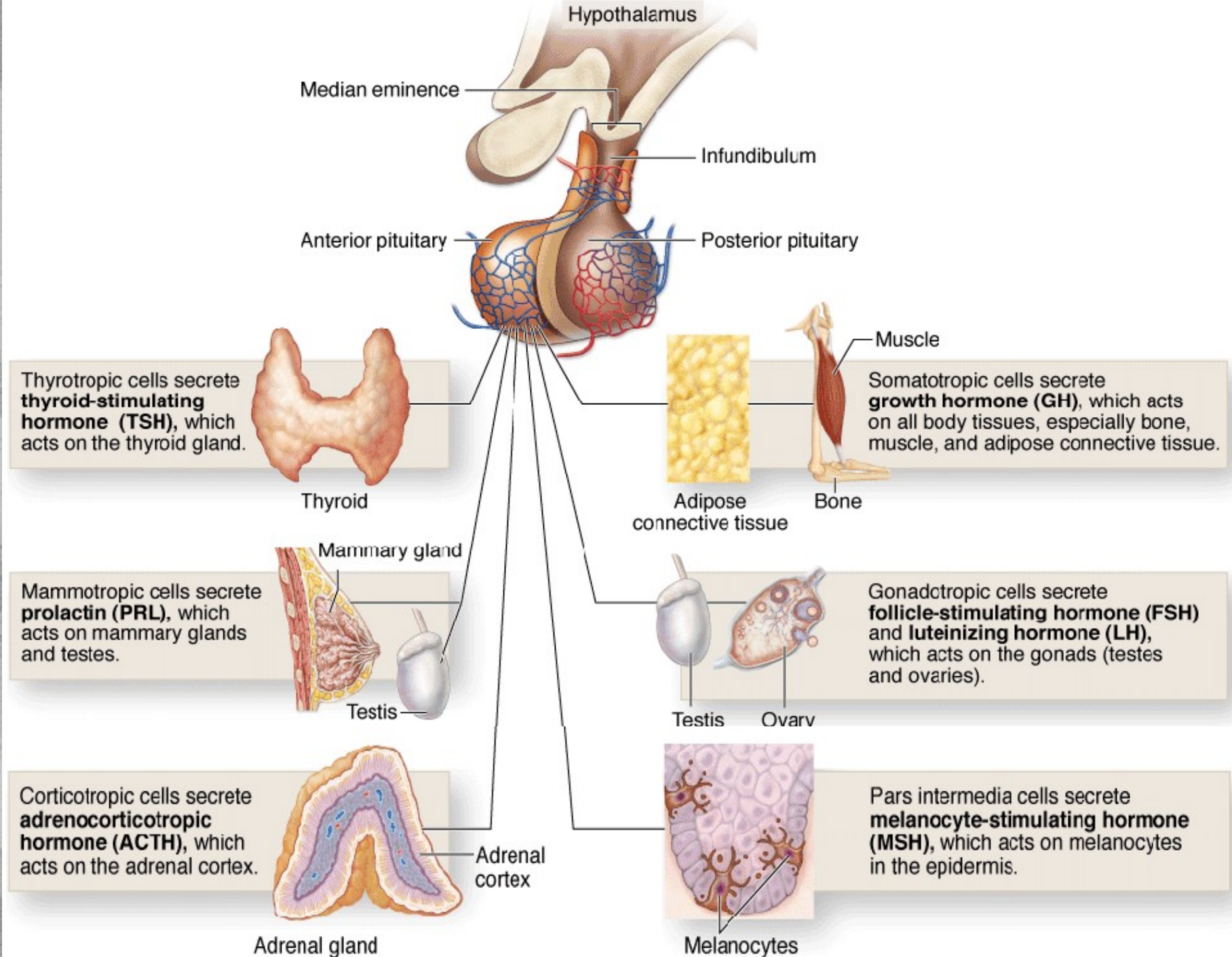
Pars nervosa

Hypophyseal fossa
in sella turcica of
sphenoid bone

Adenohypophysis (Anterior Pituitary)

has three parts

- **Pars Distalis:** 75% of the adenohypophysis
- regulate almost all other endocrine glands
- **Pars Tuberalis:** secrete **follicle-stimulating hormone (FSH)** and **luteinizing hormone (LH)**
- **Pars Intermedia:** between the pars distalis and the pars nervosa



Neurohypophysis (Posterior Pituitary)

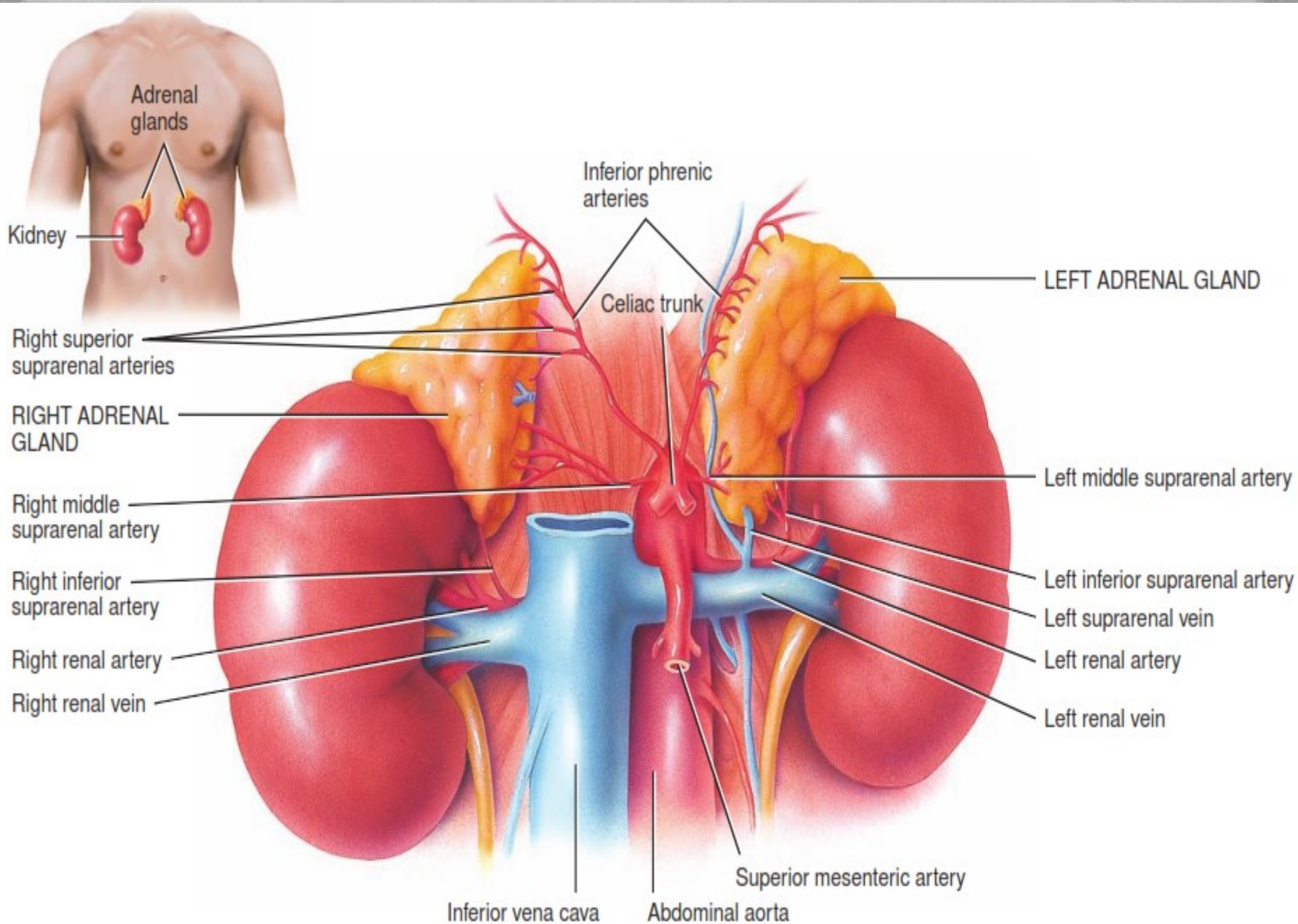
- Retains features of CNS tissue from which it developed,
consists 2 parts
- **Pars nervosa:** produce and send **vasopressin**, also called **antidiuretic hormone (ADH)** and **oxytocin** into the pars nervosa
- **infundibulum:** attached to the hypothalamus

Blood supply

- Hypothalamo-Hypophyseal Portal System from internal carotid artery
- **Superior hypophyseal arteries** and **Inferior hypophyseal arteries**

2. Adrenal (suprarenal) Glands

- **Paired** organs that lie near the superior poles of the kidneys
- Flattened structures with a half-moon shape
- Together they weigh about 8 g
- consists of two concentric layers, with distinct origins, functions, and morphologic characteristics



Adrenal layers

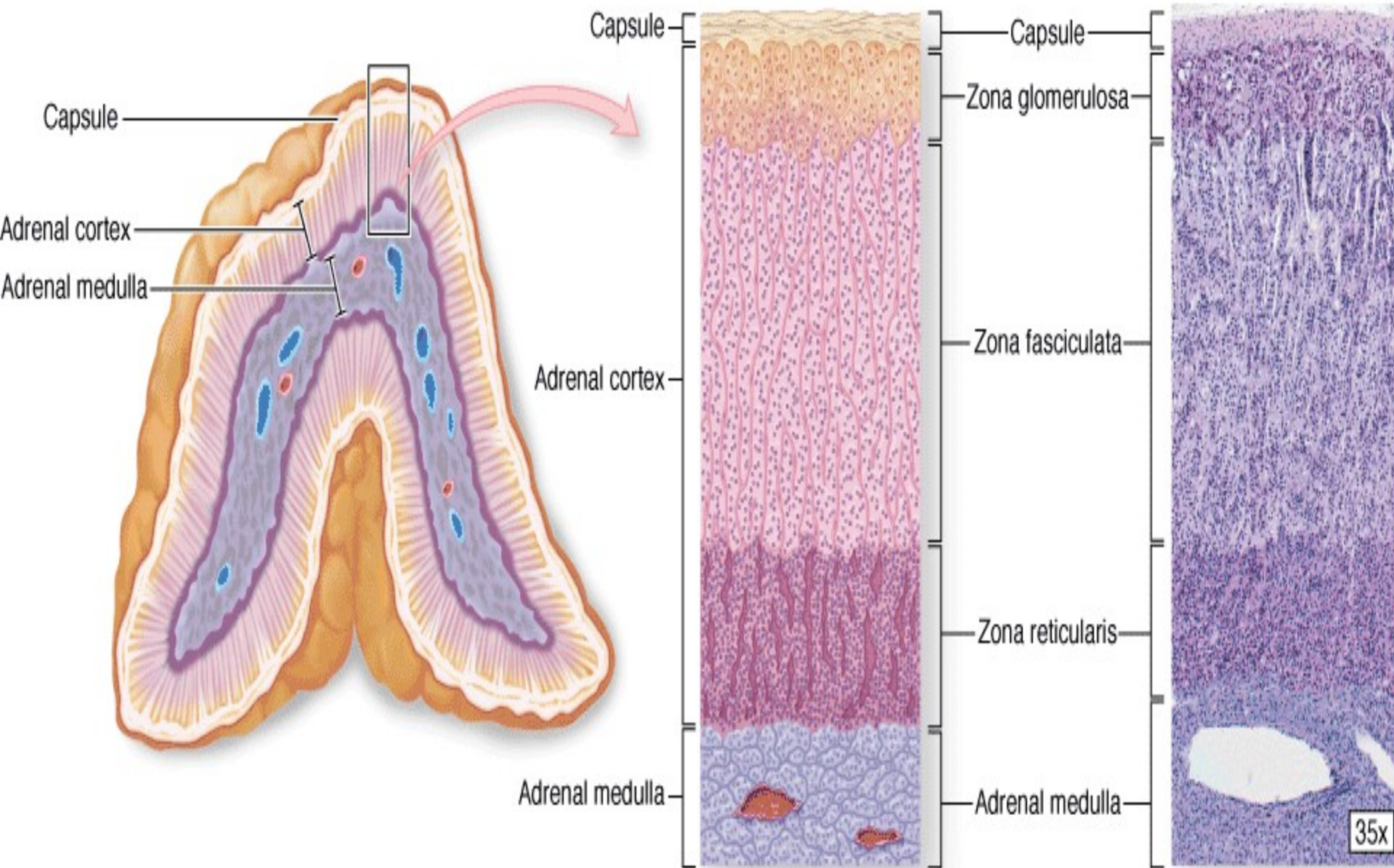
1. Adrenal cortex

- yellowish peripheral layer
- **steroid-secreting** cells

has three concentric zones

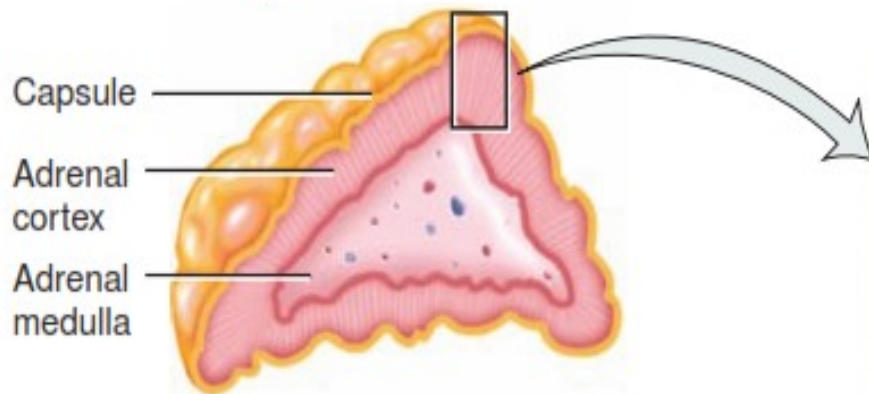
- **Zona glomerulosa:** outer zone
- Made steroids, **mineralcorticoids**, principally **aldosterone**

- **Zona fasciculata:** middle zone
- secrete **glucocorticoids**, especially **cortisol**
- **Zona reticularis:** innermost zone
- secrete the weak androgen **dehydroepiandrosterone** (DHEA) which is converted to **testosterone** in several other tissues

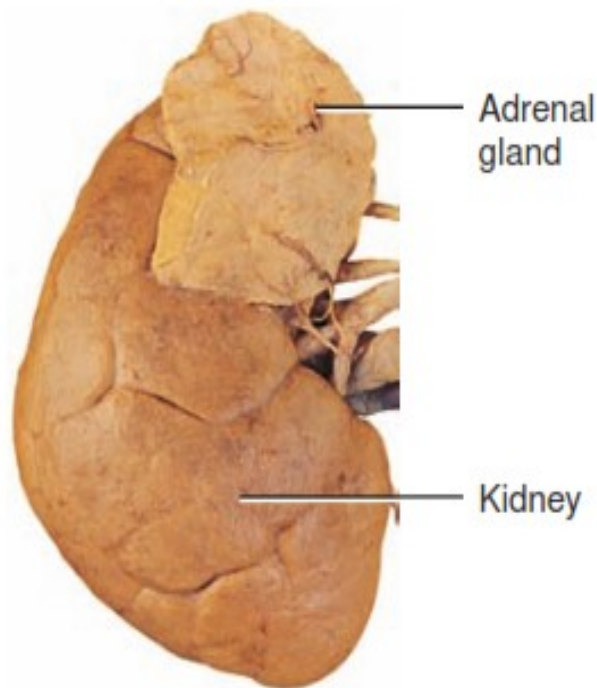


2. Adrenal medulla

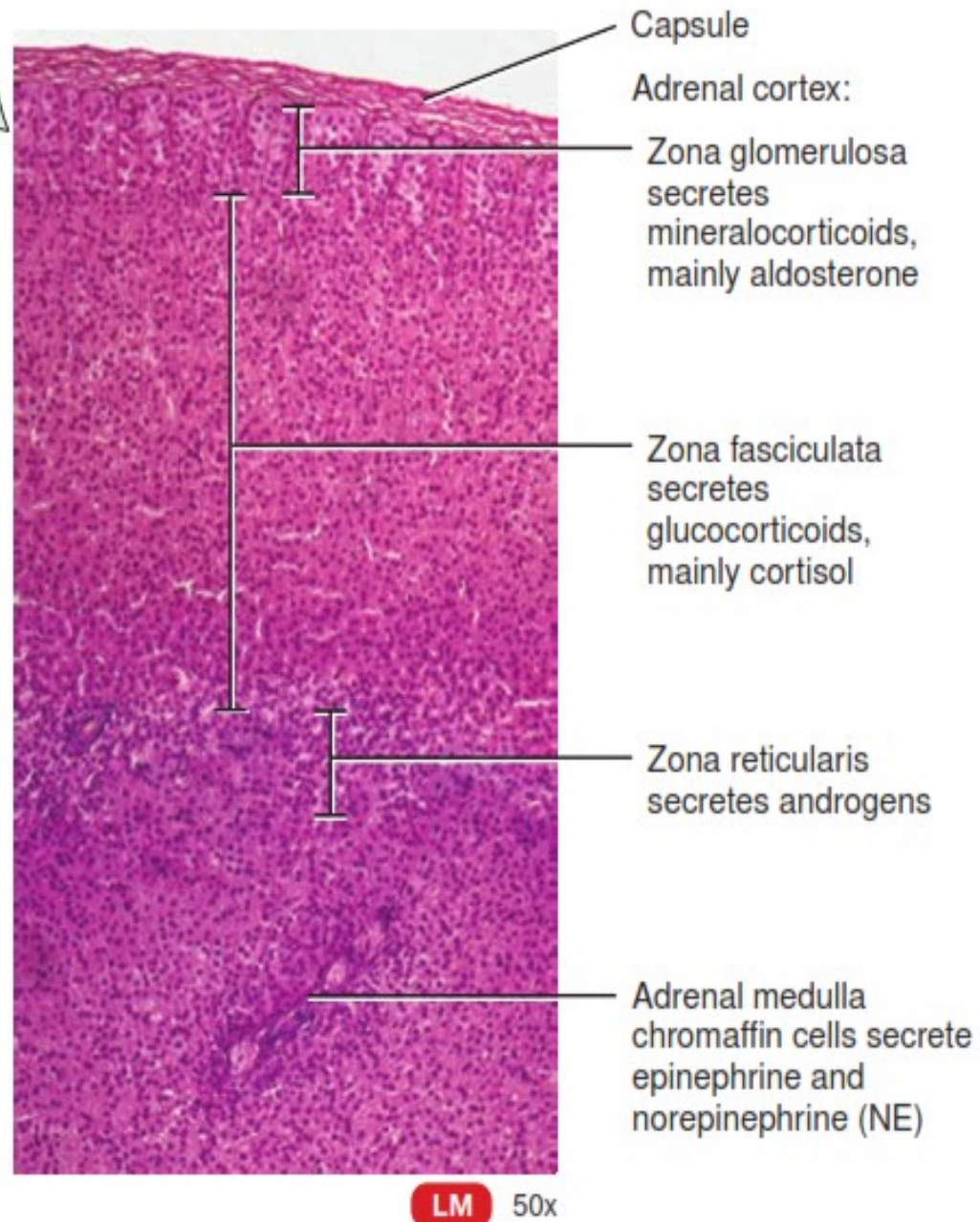
- reddish-brown central layer
- **Chromaffin cells:** can be considered **modified sympathetic** postganglionic neurons
- contain catecholamines, **epinephrine** or **norepinephrine**



(b) Section through left adrenal gland



(c) Anterior view of adrenal gland and kidney



(d) Subdivisions of the adrenal gland

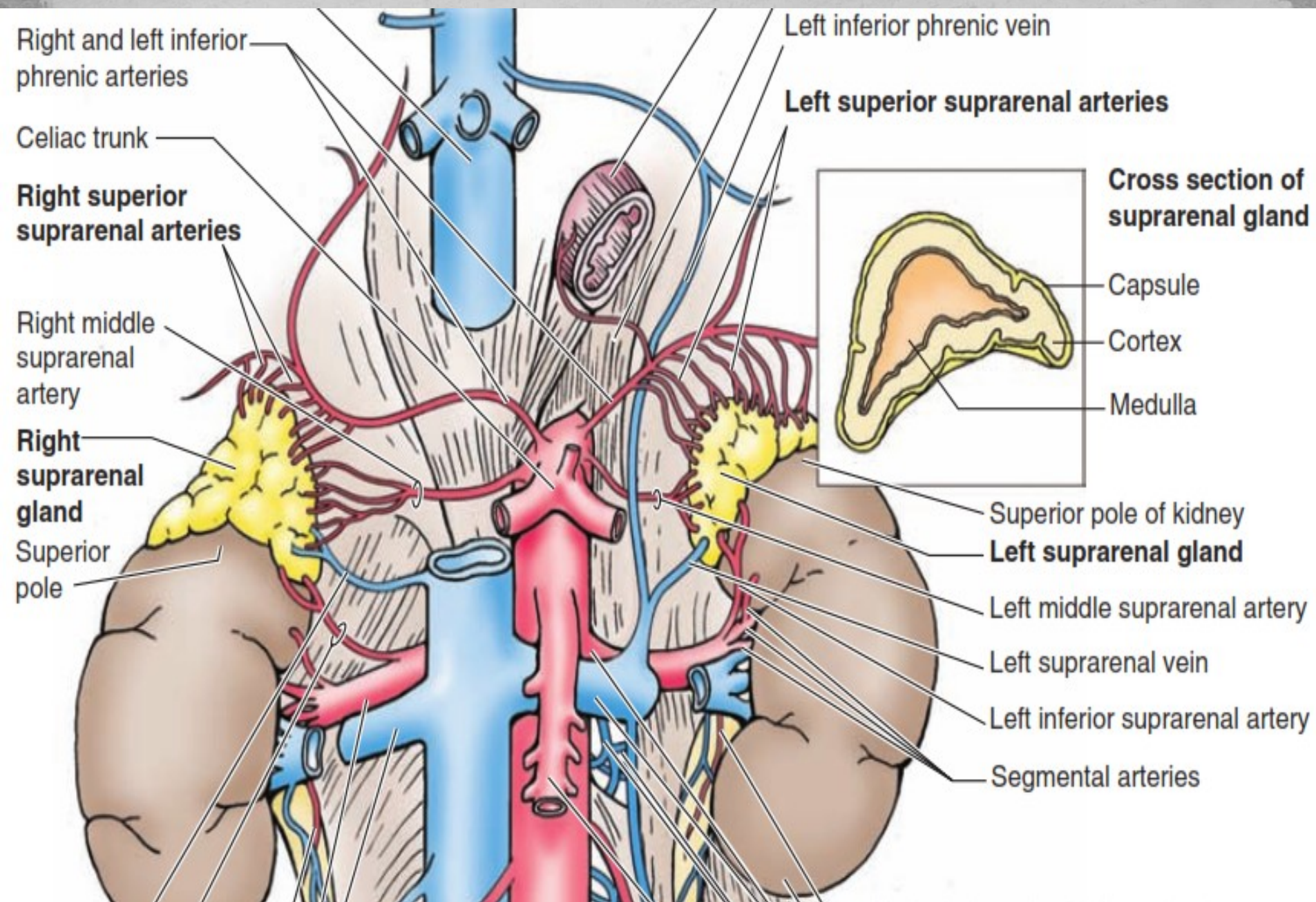
Blood Supply

Artery

- Cortical arterioles and Medullary arterioles from **suprarenal artery**

Veins

- Capillaries of both the cortex and the medulla form the central **medullary veins**
- leave the gland as the **adrenal or suprarenal vein**



Pancreatic Islets

- compact spherical or egg-shaped masses of endocrine tissue
- embedded within the **acinar** exocrine tissue of the pancreas
- Rich in **tail region**

- **α or A** cells secrete primarily **glucagon** and are usually located near the periphery of islets
- **β or B** cells produce **insulin**, are located centrally in islets and are the most numerous cell type
- **δ or D** cells, secreting **somatostatin**, are scattered and much less abundant
- **F or PP** cells secrete **pancreatic polypeptide**, minor cell type, more common in islets located within the head of the pancreas

Pancreatic islet cells



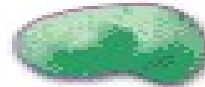
Alpha cell



Beta cell



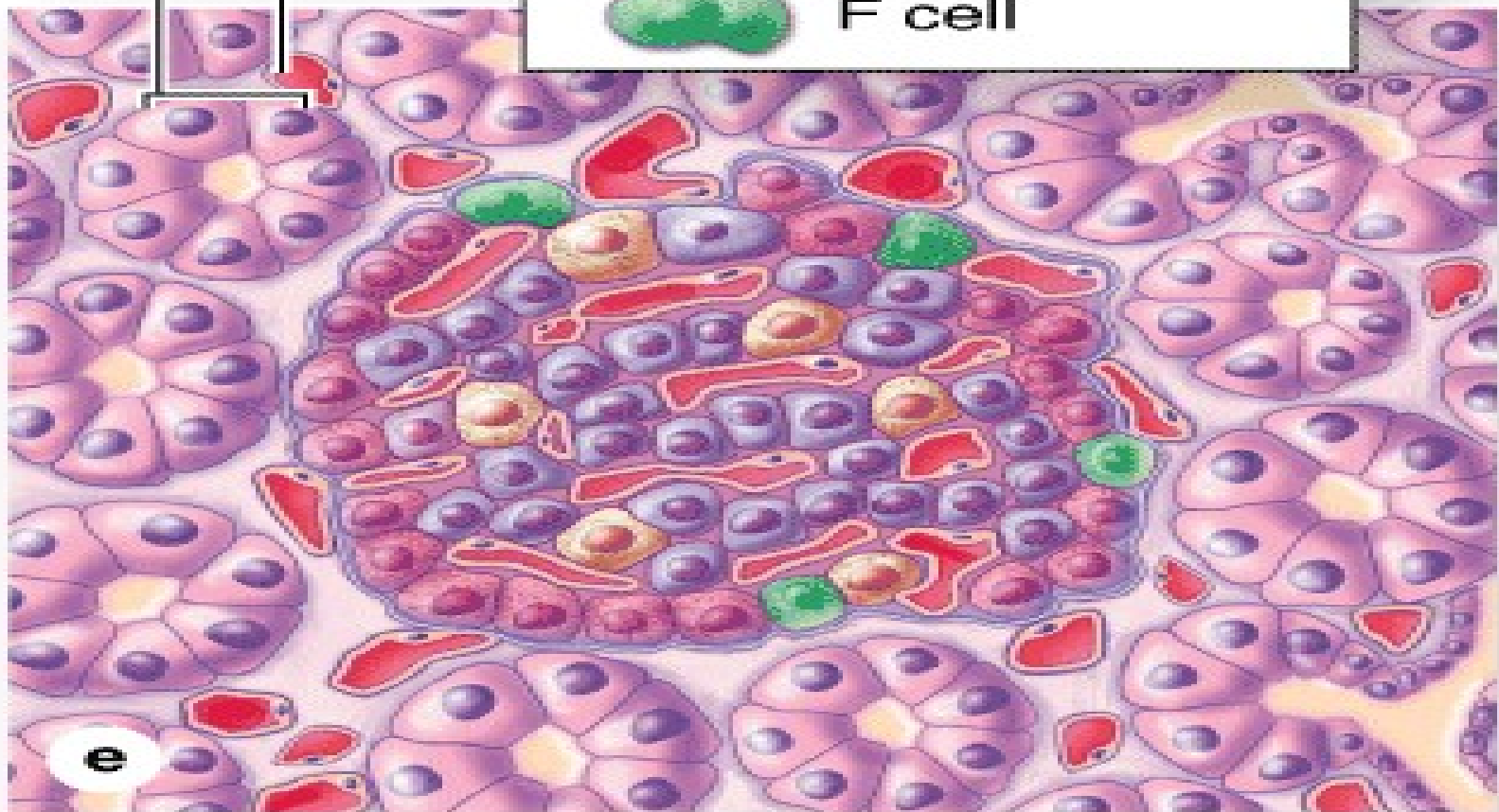
Delta cell



F cell

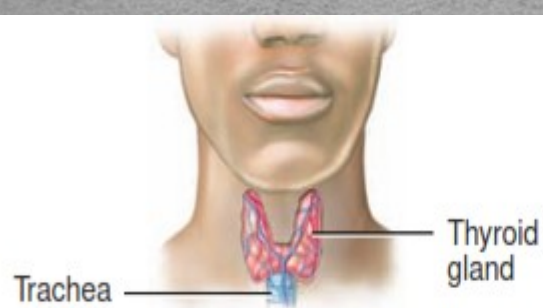
Pancreatic
acinus

Blood
capillary



Thyroid Gland

- Butterfly-shaped gland
- approximately 5 cm x 5 cm
- weighing 20–30 g in adults
- surrounding the anterior surface of the trachea just below the larynx
- Consists of two lobes united by an isthmus
- Thyroid hormones control, Growth, cell differentiation, basal metabolic rate and oxygen consumption and protein, lipid, and carbohydrate metabolism



Thyroid gland

Trachea

RIGHT LATERAL LOBE OF THYROID GLAND

Middle thyroid vein

Inferior thyroid artery

Subclavian artery

Hyoid bone

Superior thyroid artery

Superior thyroid vein

Thyroid cartilage of larynx

Internal jugular vein

LEFT LATERAL LOBE OF THYROID GLAND

Common carotid artery

ISTHMUS OF THYROID GLAND

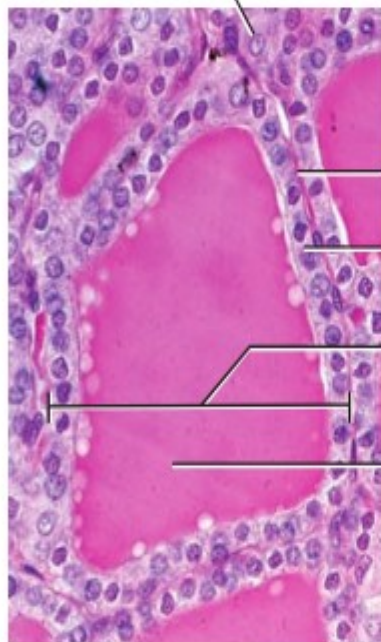
Vagus (X) nerve

Trachea

Inferior thyroid veins

Sternum

Parafollicular (C) cell



Basement membrane (a) Anterior view of thyroid gland

Follicular cell

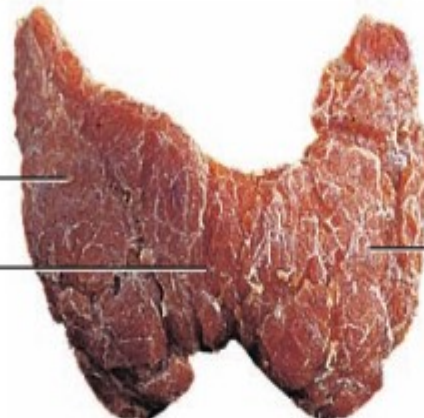
Thyroid follicle

Thyroglobulin (TGB)

Right lateral lobe

Isthmus

Left lateral lobe



- Composed **thyroid follicles**, consists of a **simple epithelium** and a central lumen filled with a gelatinous substance called **colloid(store hormones)**
- **Follicular cells:** Synthesize thyroid hormones: **thyroxine** (tetra-iodothyronine or **T4**) and **tri-iodothyronine (T3)**
- **Parafollicular or C cells:** Synthesize and secrete **calcitonin**, a **polypeptide** involved with calcium metabolism

Parathyroid Glands

- **Four** small oval masses
- each 3 x 6 mm
- with a total weight of about 0.4 g
- Located on the back of the thyroid gland
- one at each end of the upper and lower poles, usually embedded in the gland's capsule

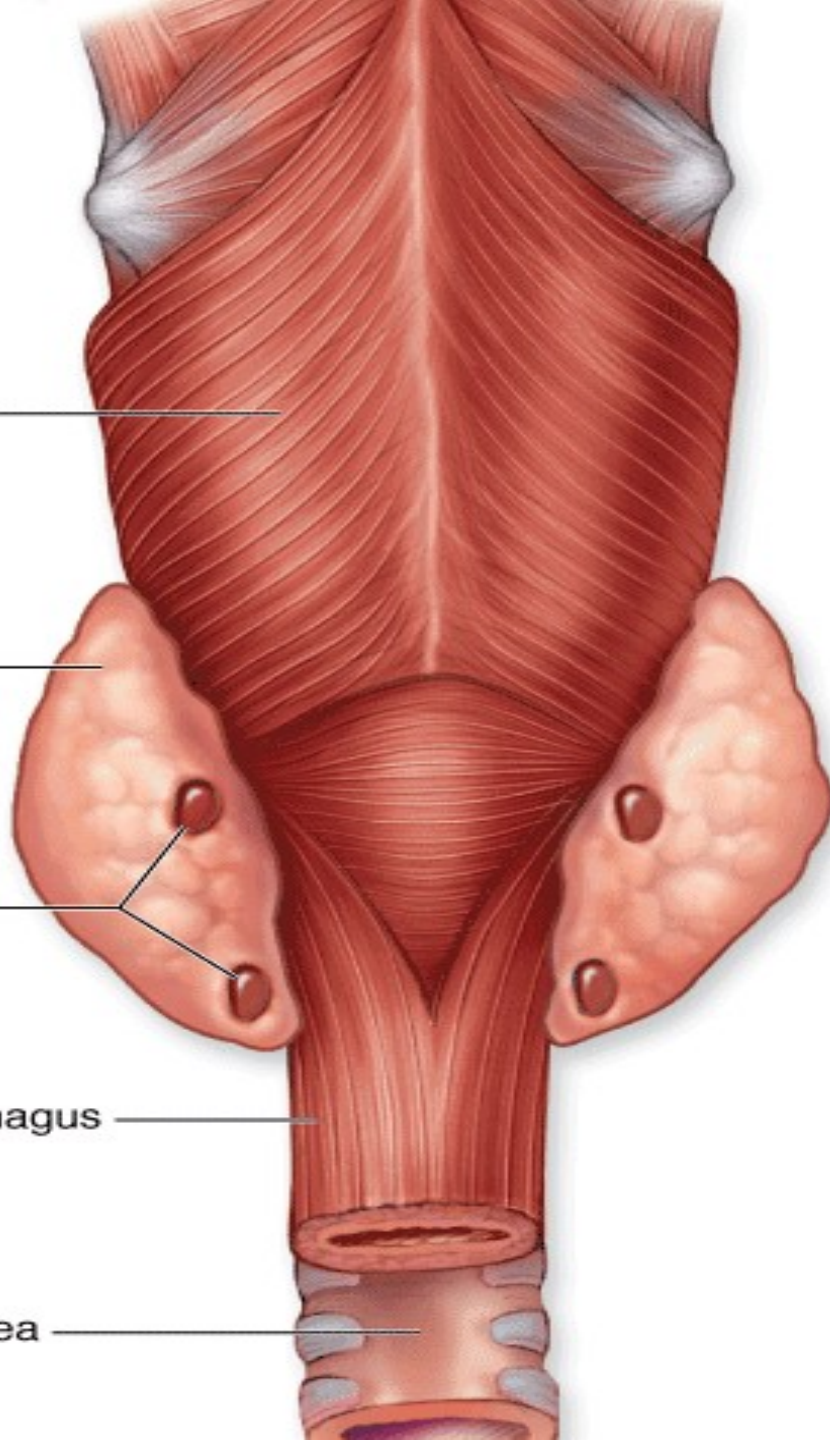
Muscles on posterior
side of pharynx

Thyroid gland
(posterior aspect)

Parathyroid glands

Esophagus

Trachea



Two types of cells are present in parathyroid glands:

Chief cells

- containing the polypeptide **parathyroid hormone (PTH)**, a major regulator of blood **calcium** levels

Oxyphil cells

- more commonly in **older individuals**
- Have **no** known function

Pineal Gland

- Also known as the pineal body or epiphysis cerebri
- measuring approximately 5–8 mm in length and 3–5 mm at its greatest width
- weighing about 150 mg
- Found in the posterior of the **third ventricle**
- Regulates the daily rhythms of **bodily activities**

Thank You!