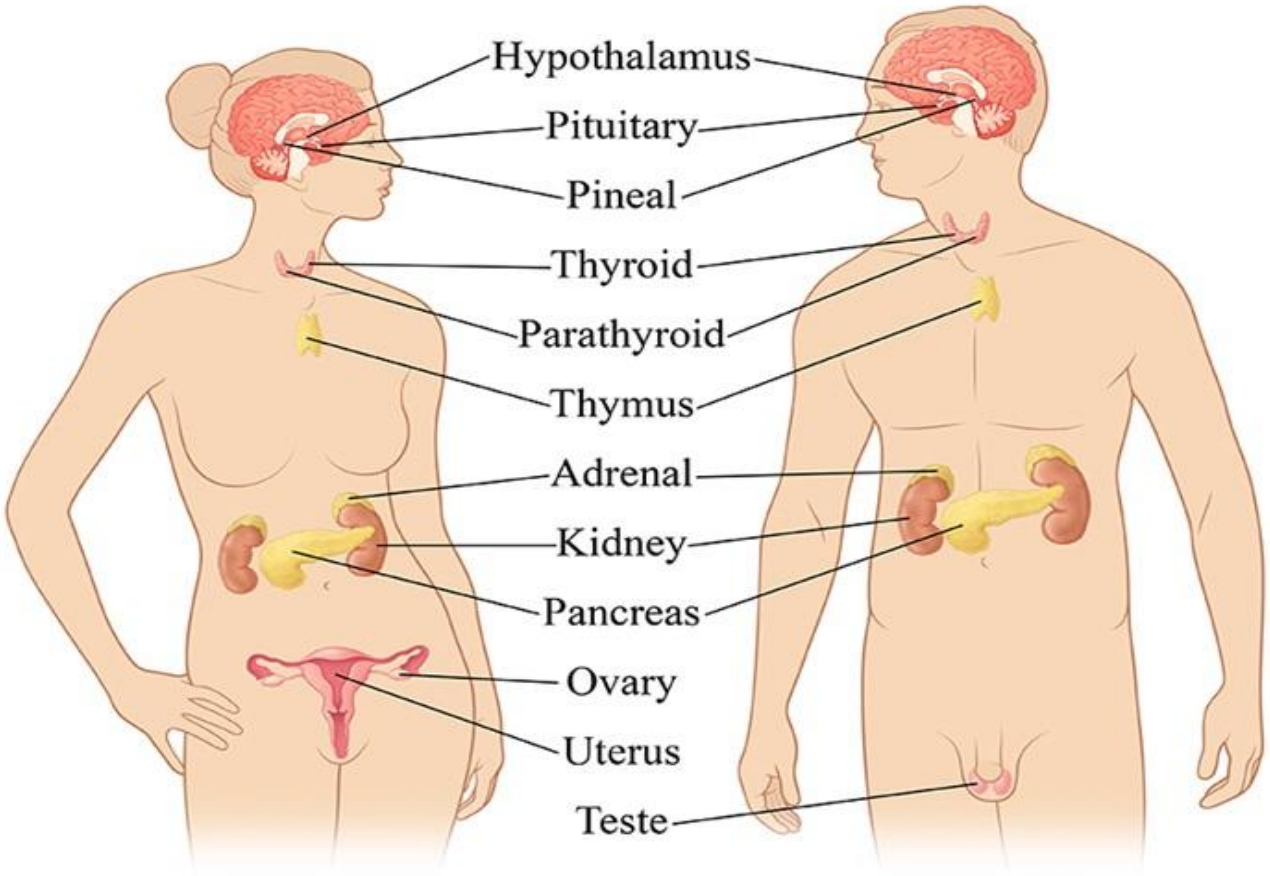
Endocrine system

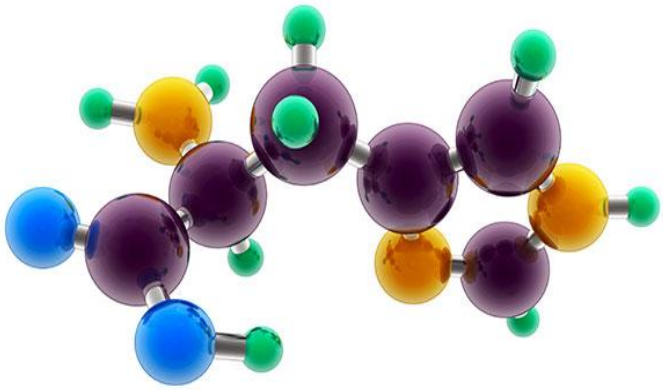


Hormones –

are chemical messengers used by endocrine system

- Control body growth and development
- metabolism
- sexual function
- reproduction

Classification of hormones

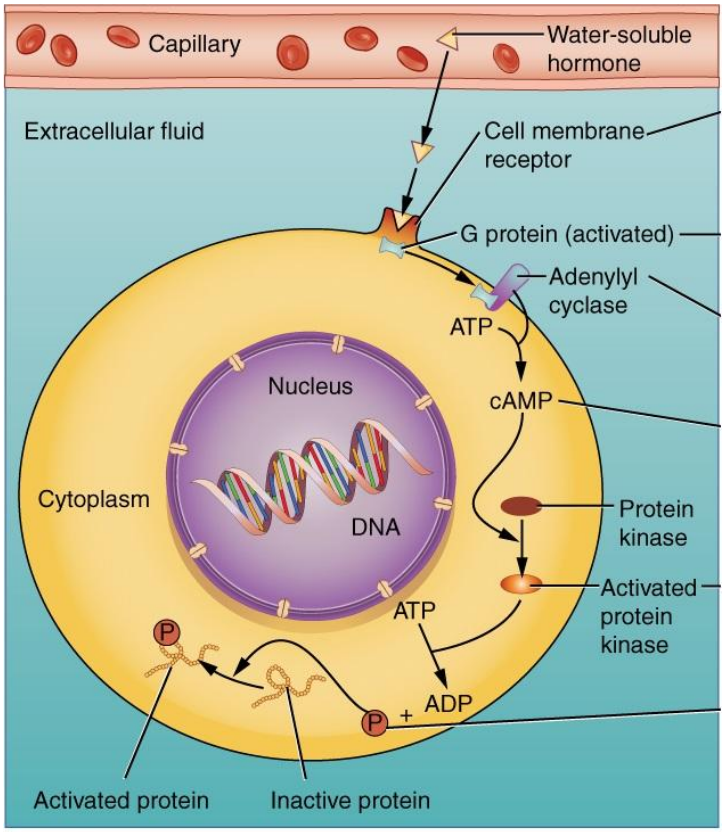


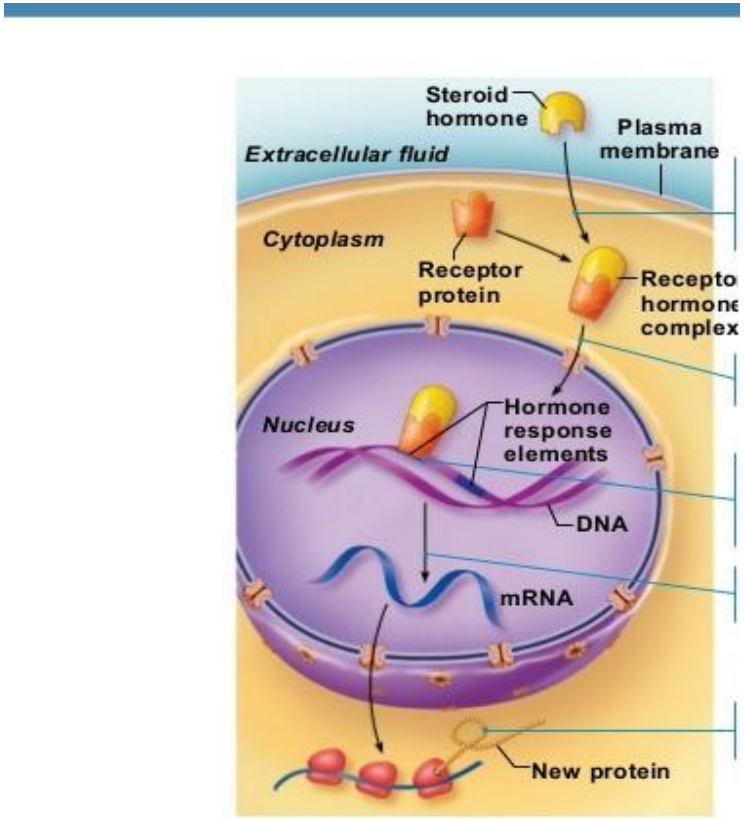
- Steroids, cholesterol-derived (ovaries, testes, adrenal cortex)
- Polypeptides (hypothalamus, hypophysis, parathyroid gland, DNES)
- Amino acids derivates (adrenal medulla, thyroid gland)

Interaction with receptors

Polypeptides and most of amino acids- are not dissolved

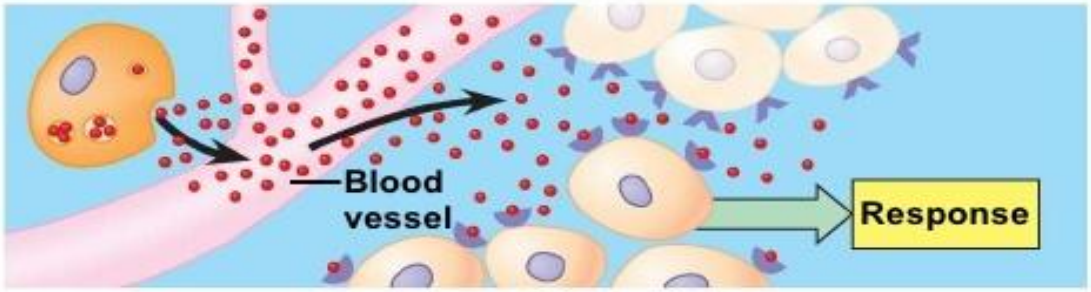
Steroids (ovaries, testes, adrenal gland)



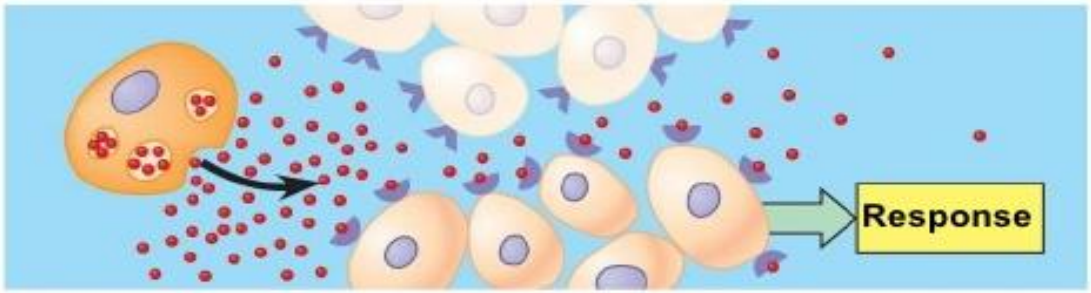


Types of signaling

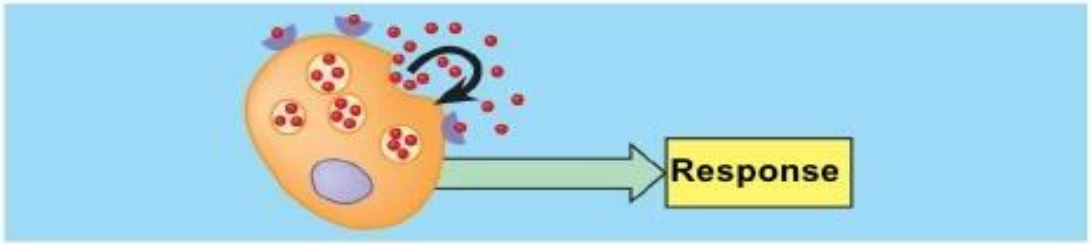
Fig. 45-2a



(a) Endocrine signaling

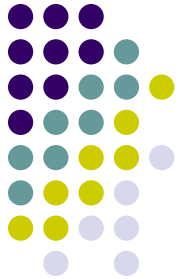


(b) Paracrine signaling



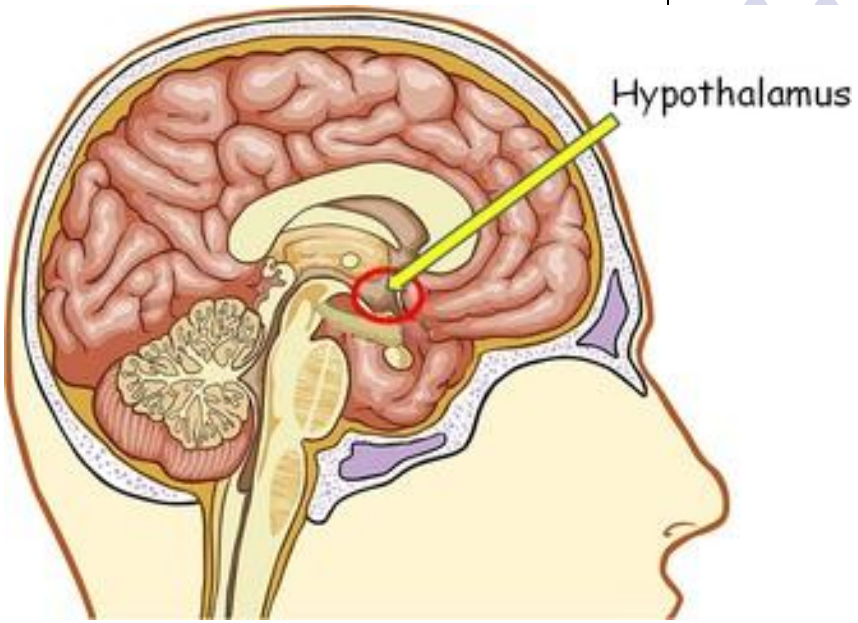
(c) Autocrine signaling

Endocrine system



- **Central endocrine organs** – hypothalamus, pituitary gland, epiphysis
- **Peripheral endocrine glands** – thyroid gland, parathyroid glands, suprarenal glands
- **Organs, which combine endocrine and non-endocrine functions** – ovaries, testes, pancreas, kidneys, placenta
- **DNES (diffuse neuroendocrine system)**

Hypothalamus



- Coordinates most endocrine functions of the body
- Regulates the activity of pituitary gland
- Regulates blood pressure, body temperature, fluid and electrolyte balance, body weight, appetite

Hypothalamus

Anterior

Supraoptic nucleus

Paraventricular nucleus

Oxytocin
Vasopressin (ADH)

Middle

arcuate, dorsomedial, ventromedial, suprachiasmatic nuclei and preoptic area

Releasing-factors:

-statins

- liberins

Posterior

Releasing factors

regulate activity of the cells of the anterior lobe of the pituitary gland

Liberins – stimulate secretion of pituitary hormones

1.Somatoliberin (growth hormone-releasing hormone - GHRH)

2.Thyroliberin (TRH)

3.Gonadoliberin (GnRH)

4. Corticoloiberin (CRH)

5. Prolactoliberin

6. Melanoliberin

Statins – inhibit secretion of pituitary hormones

1.Somatostatin

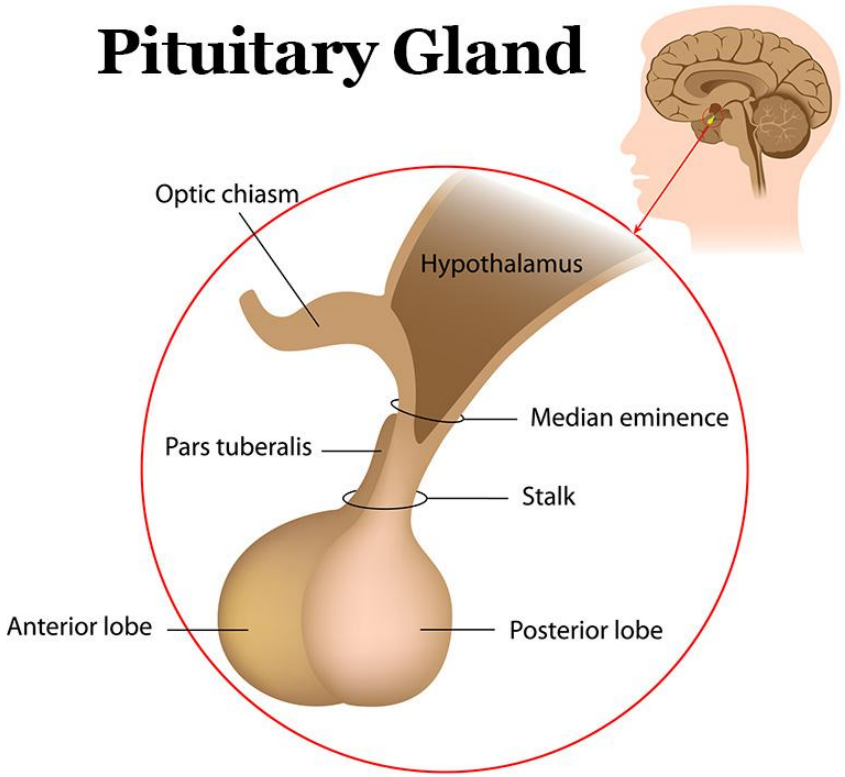
2. Prolactostatin

3. Melanostatin

Pituitary gland (hypophysis)

- Morphologically and functionally linked with hypothalamus

- Provides the control of all other endocrine organs



Pituitary gland

Anterior lobe (adenohypophysis)

has a typical organisation of endocrine tissue

Pars distalis

- Chromophilic cells

- Chromophobe cells

Pars intermedia

- **Melanotropes-** melanocytes-stimulating hormone (MSH)

- **Lipotropes -** lipotropin

Pars tuberalis

Function unclear

Posterior lobe (neurohypophysis)

Contains Herring bodies, in which oxytocin and vasopressin are stored

Pars distalis
Chromophilic cells

Basophilic endocrinocytes:

-**Gonadotropes** – follicle-stimulating hormone (FSH), luteinizing hormone (LH)

- **Thyrotropes** – thyroid-stimulating hormone (TSH)

Acidophilic endocrinocytes

- **Mammotropes** – prolactin (PRL)

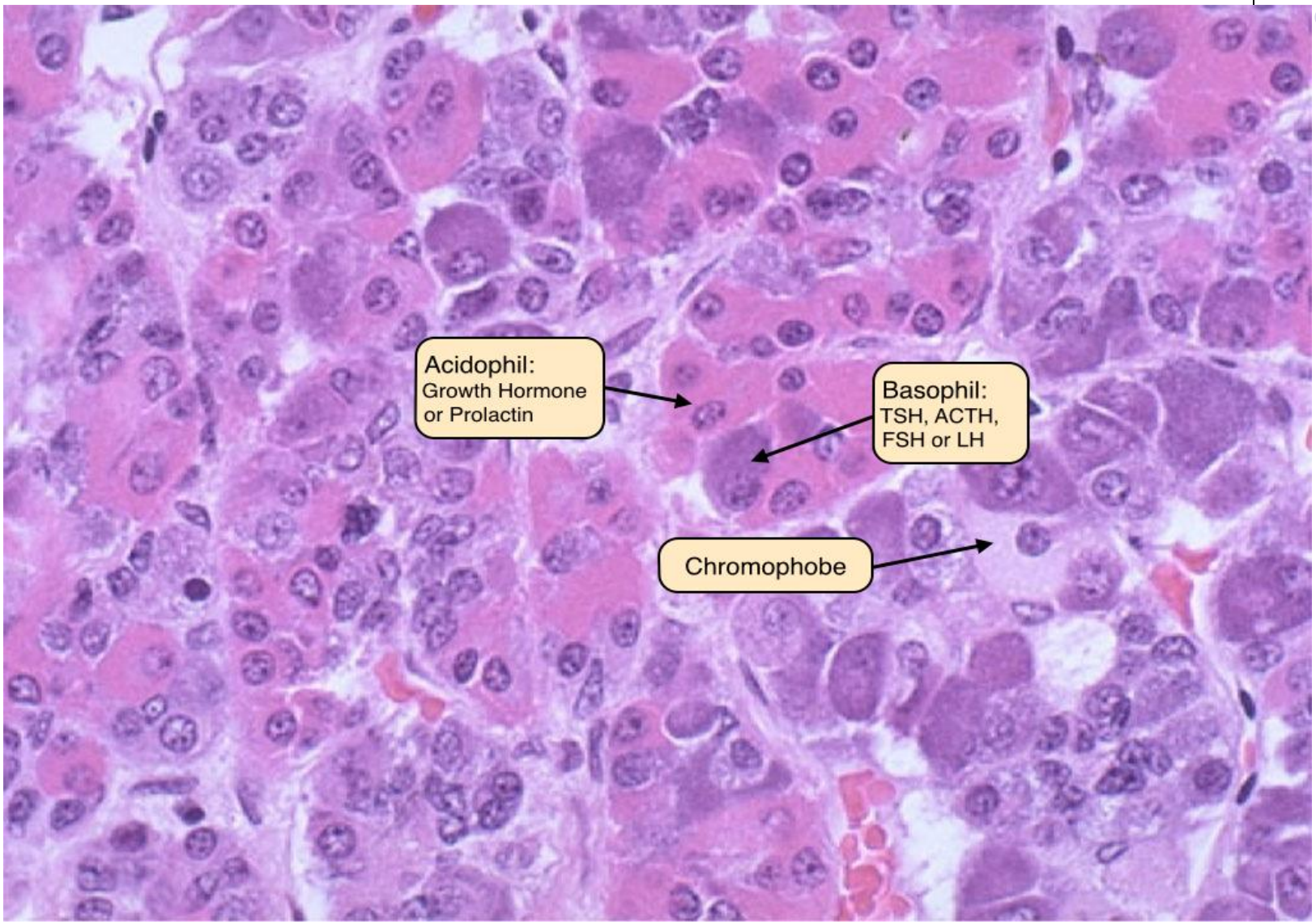
- **Somatotropes** (GH-cells) – somatotropin

Corticotropes –

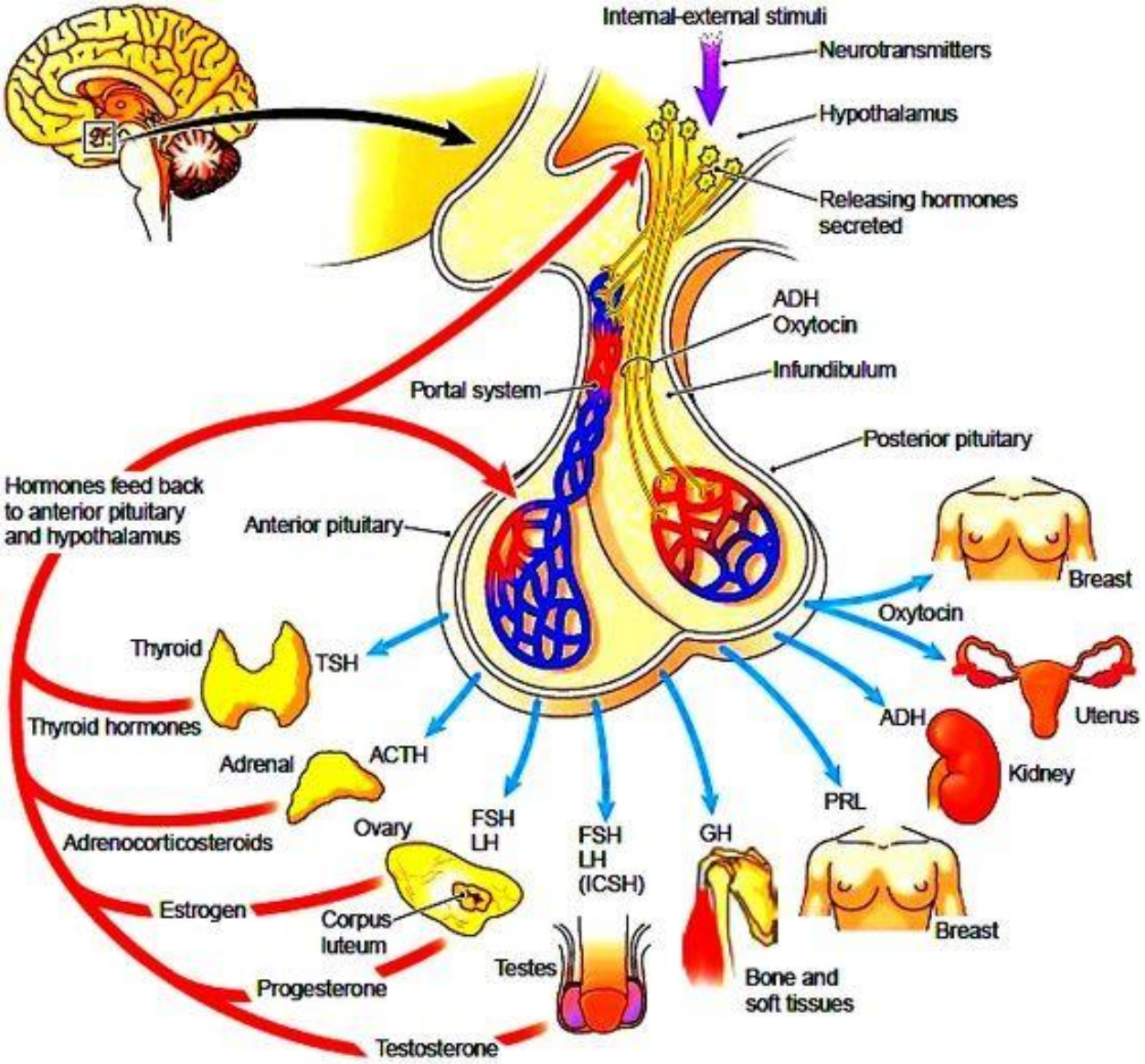
adrenocorticotropic hormone (ACTH)

Chromophobe cells (60%) – low-differentiated cambial cells, do not have endocrine activity

Anterior pituitary
Pars distalis

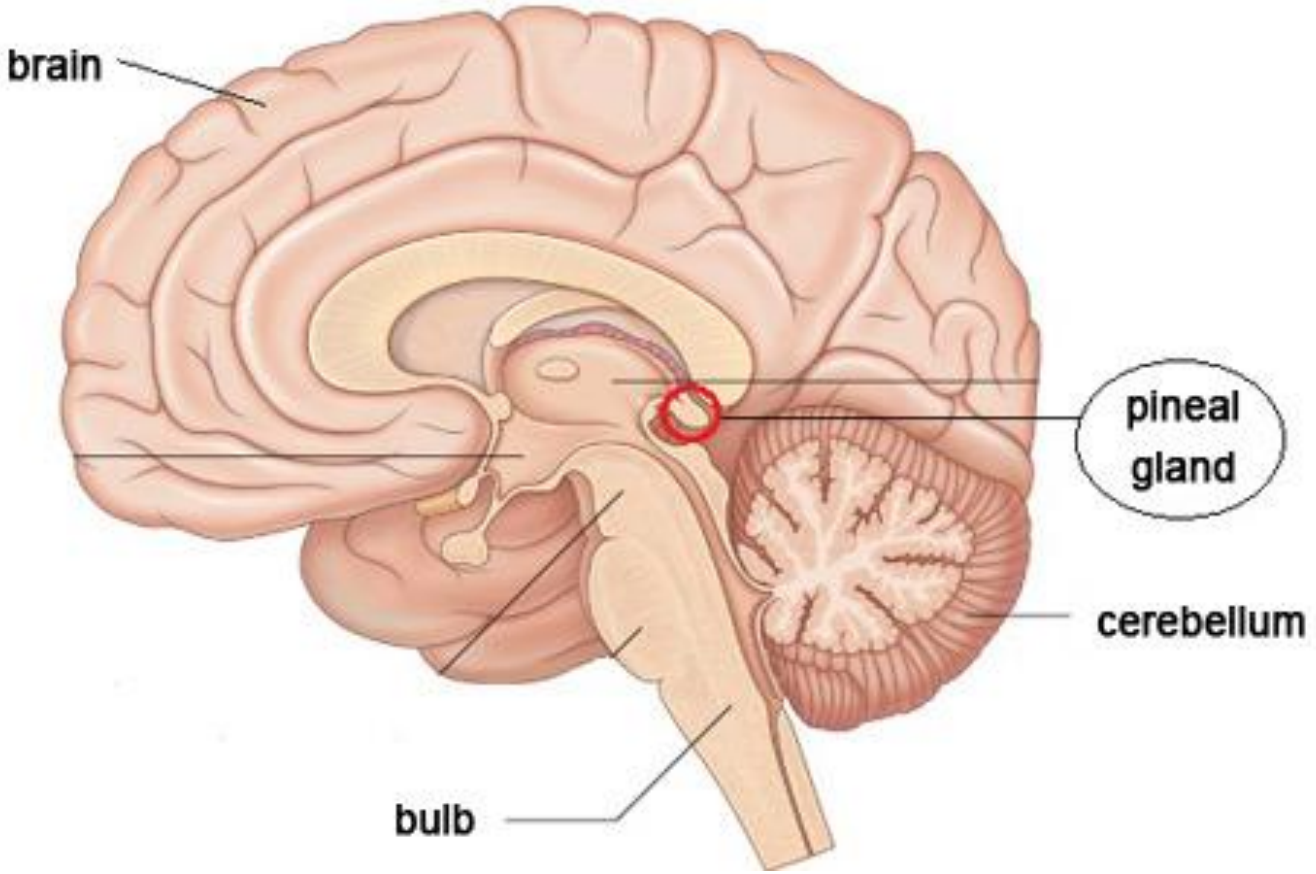


Hypothalamohypophyseal system



Epiphysis (pineal gland)

a central endocrine gland, which regulates daily body rhythm



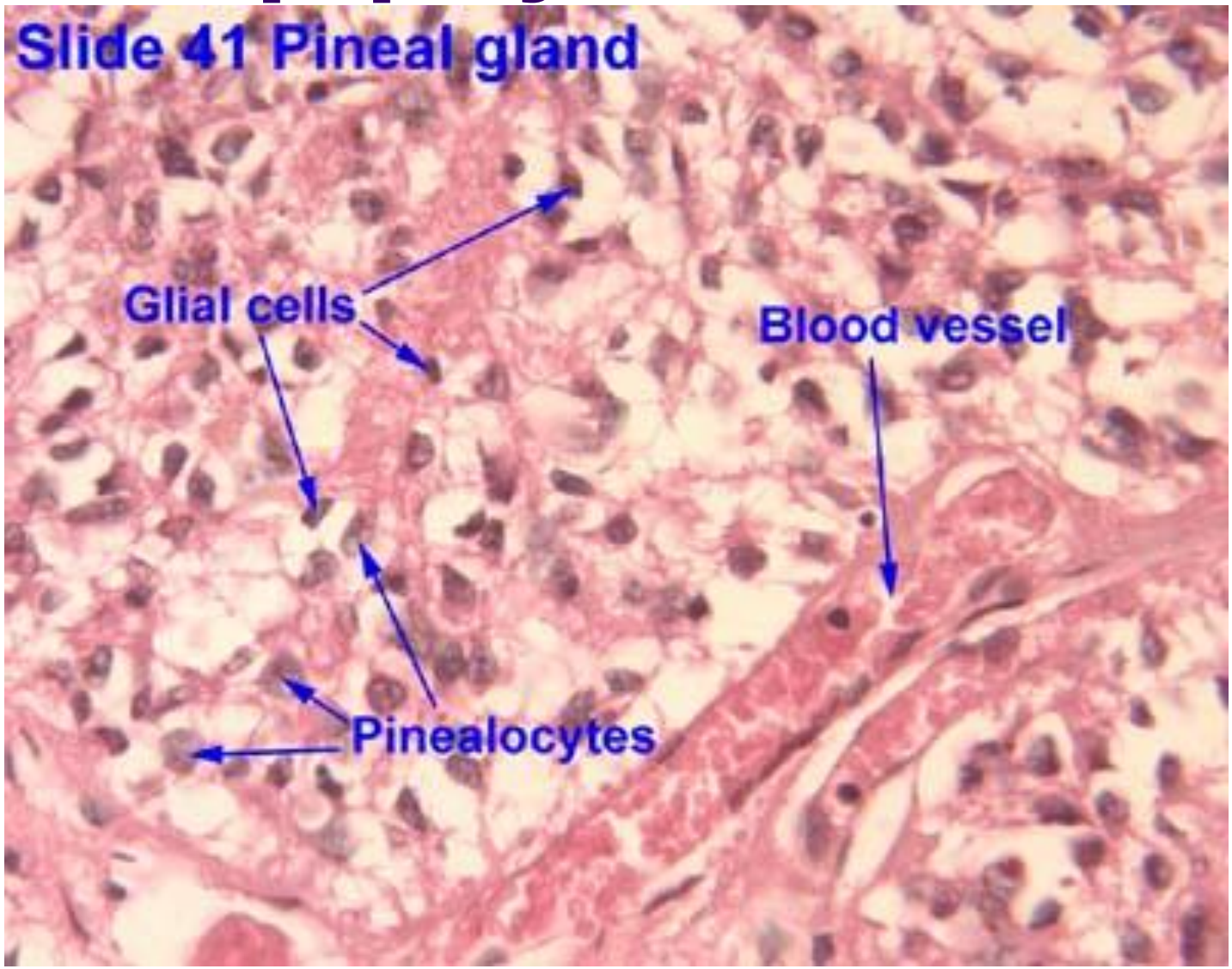
Cells of epiphysis

- Pinealocytes

  produce about 40 types of regulatory peptides and biologically active amins – **serotonin and melatonin**

- Glial (interstitial) cells

Epiphysis

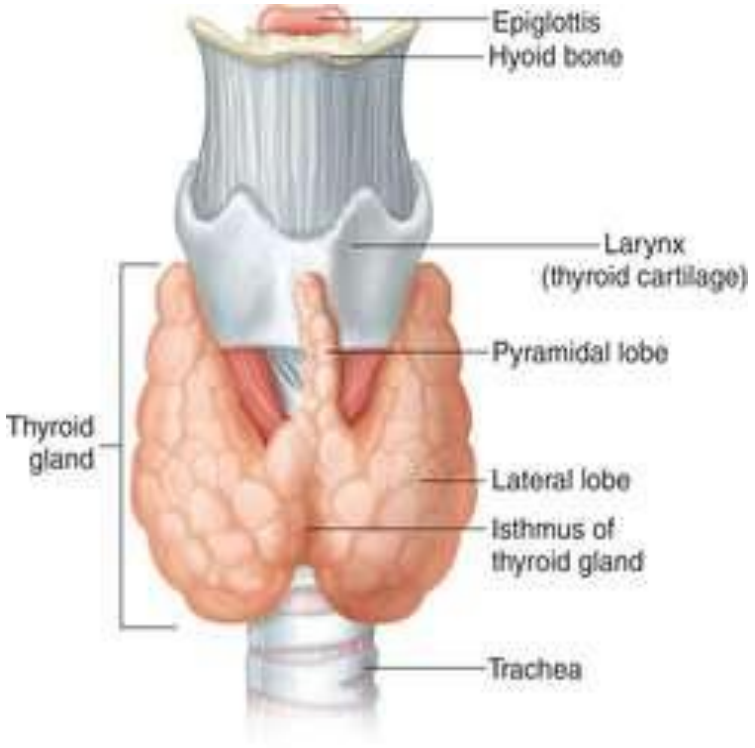

Slide 41 Pineal gland
Glial cells
Blood vessel
Pinealocytes

Peripheral endocrine organs
Thyroid gland

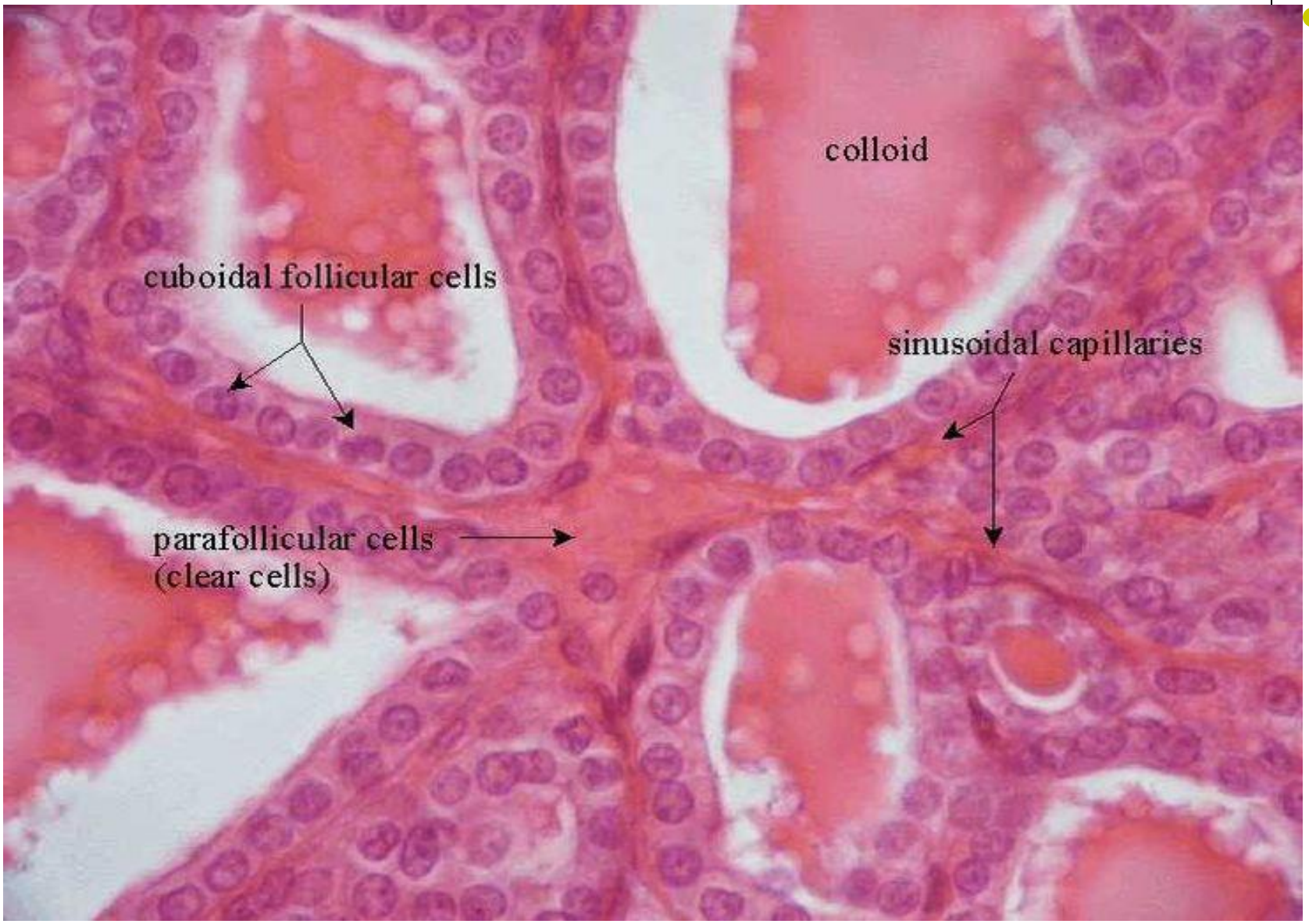
- **Hormones**:
  - Thyroxin (T4)
  - Triiodothyronine (T3)
  - Calcitonine

  Thyroid hormones
- **Structural unit** – thyroid follicle
- **Cells**: follicular – thyroid hormones;

  parafolicular - calcitonin

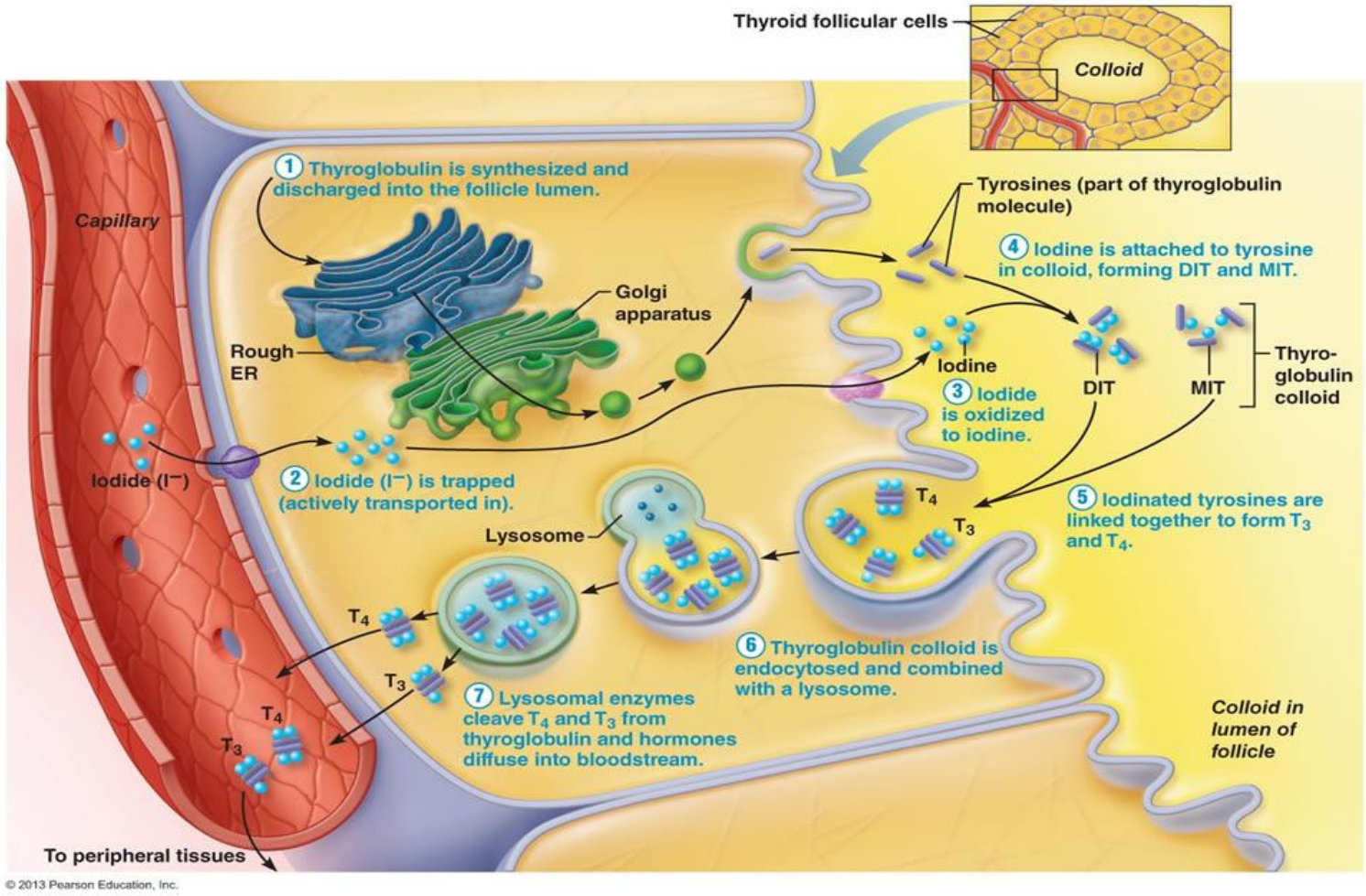


Thyroid gland



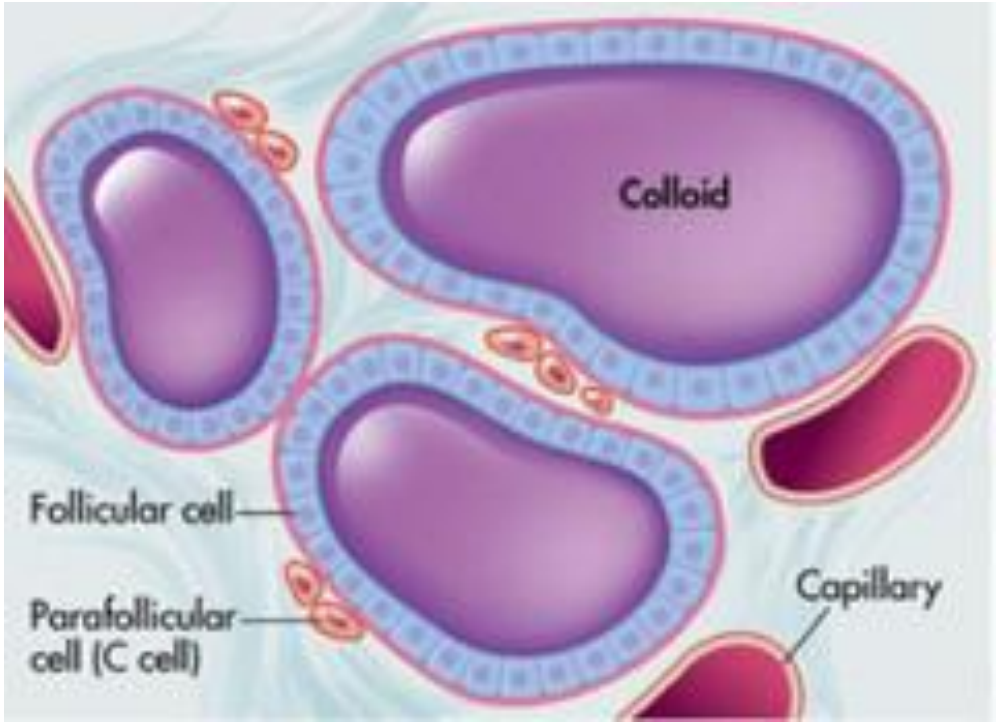
Synthesis of thyroid hormones

- Production phase
- Secretion phase



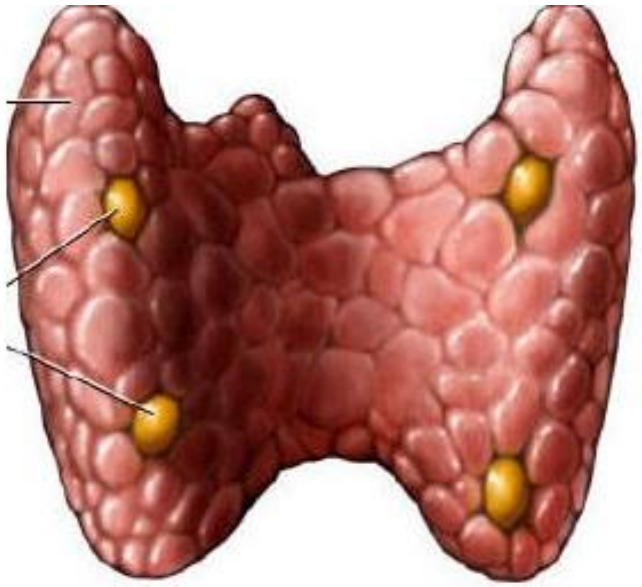
Parafollicular cells (C-cells)

- First type – produce **calcitonin**, which decreases Calcium serum level
- Second type – produce **somatostatin**

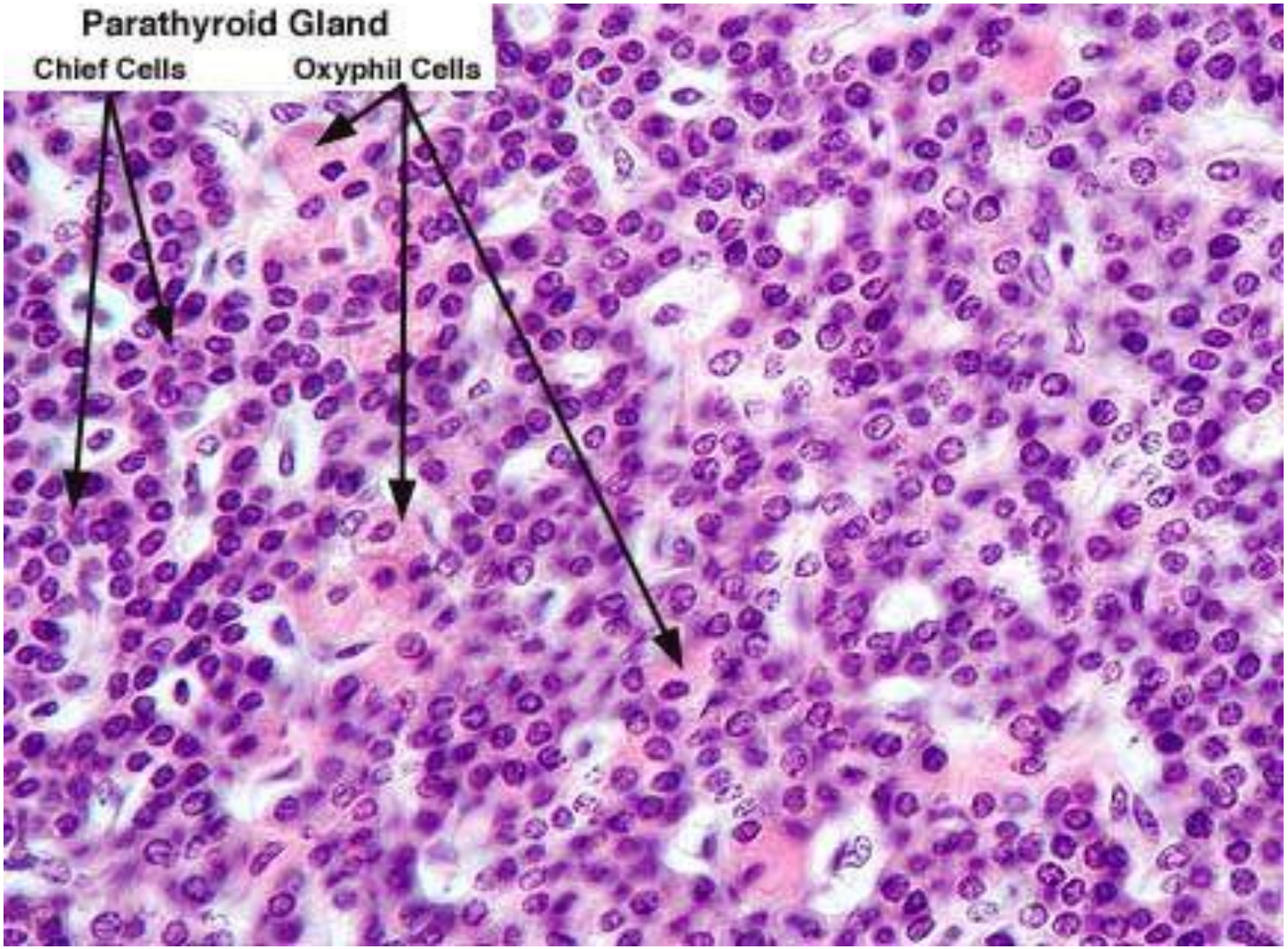


Parathyroid gland

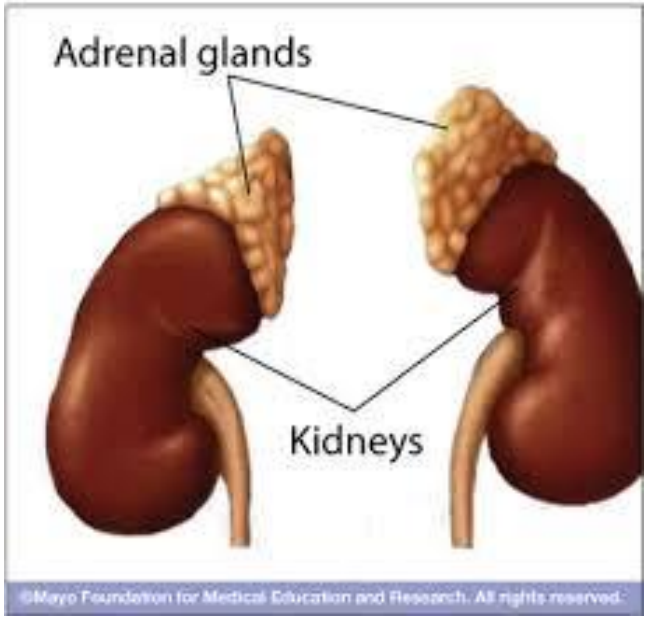
- Hormone – parathyroid hormone
- Biological effect – increase of Calcium serum level (antagonist of calcitonin)
- Cells: - chief cells (secrete PTH)
  - oxyphil cells (do not have secretory role)



Parathyroid gland



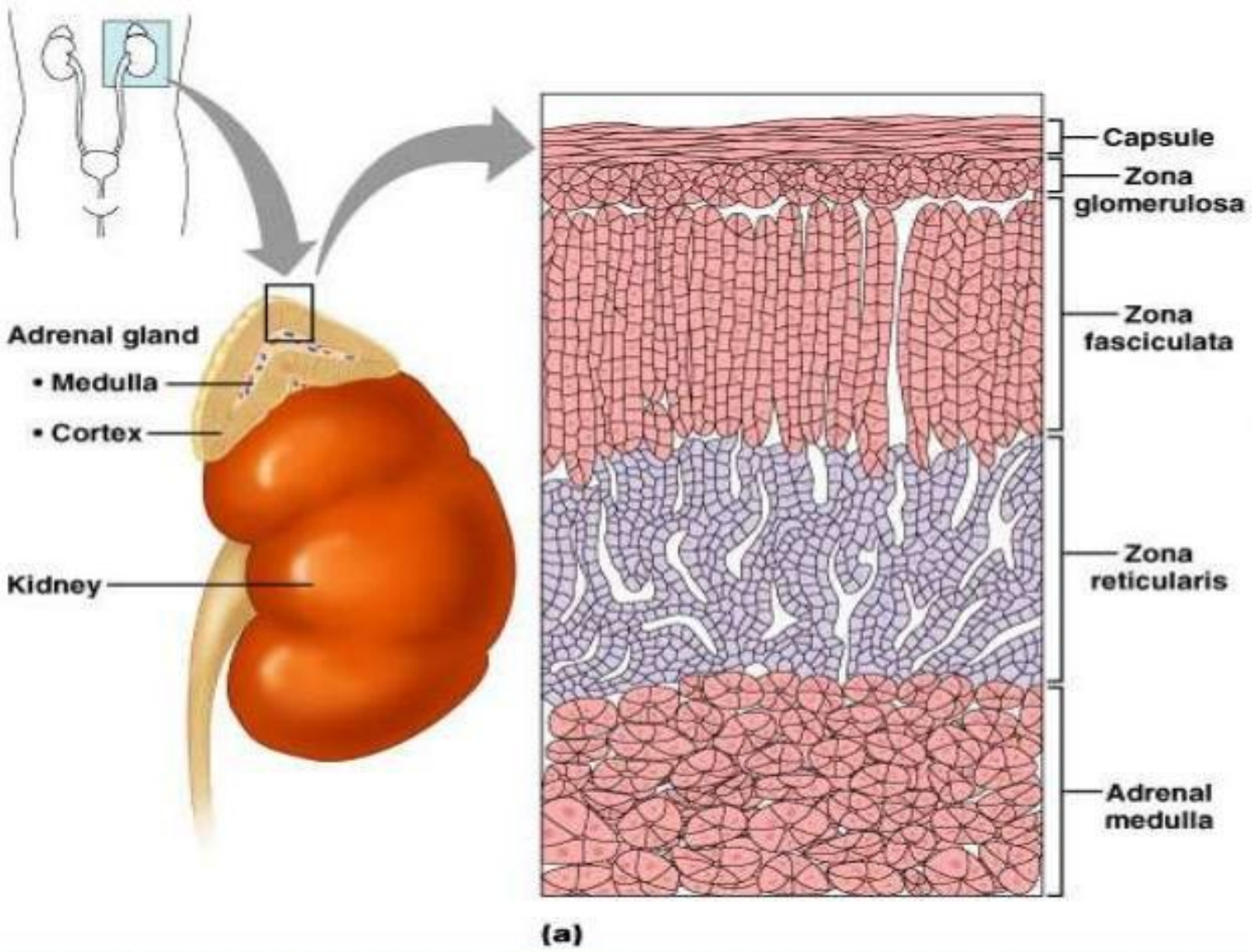
Adrenal glands



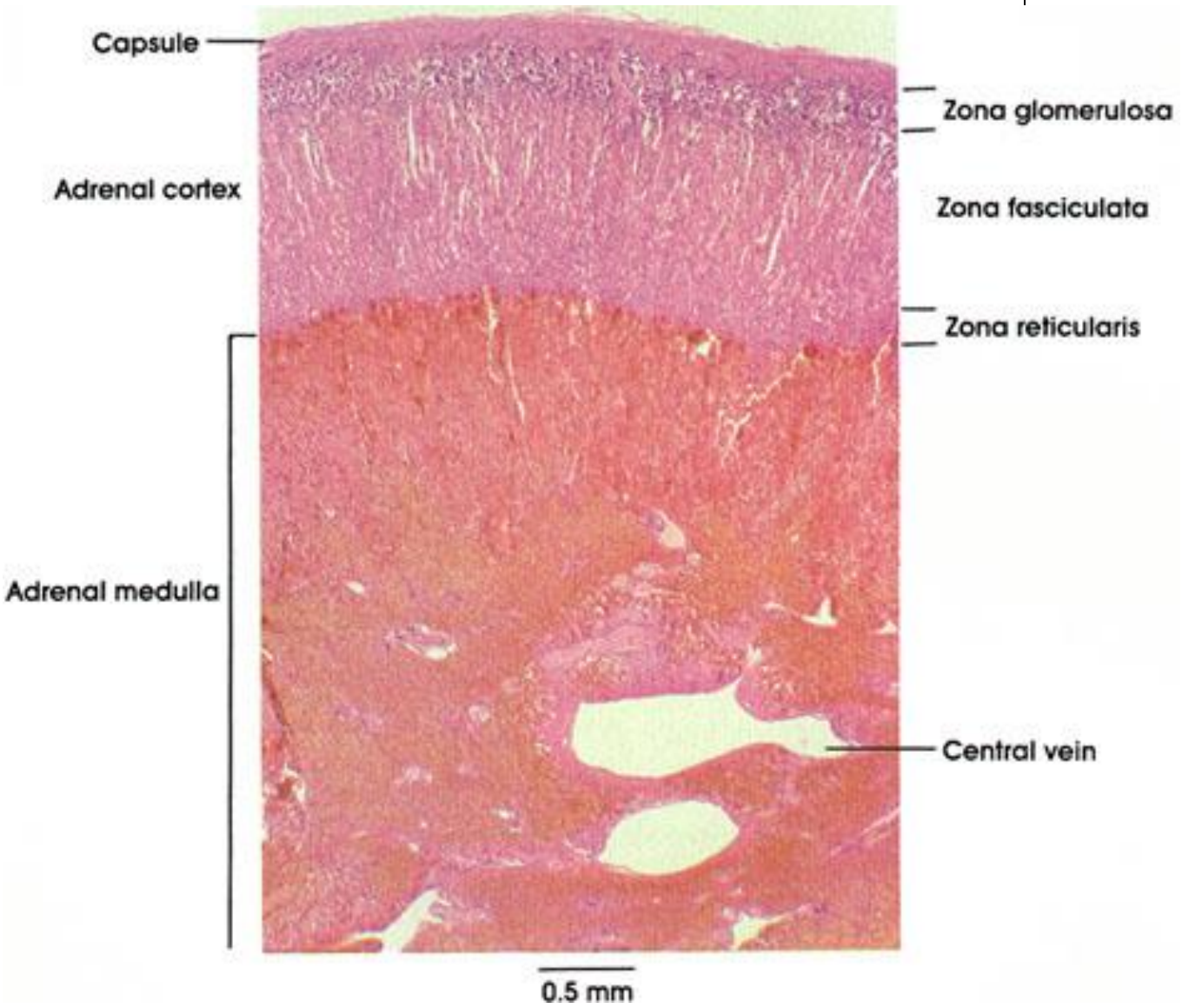
- **Adrenal cortex**
- Zona glomerulosa - aldosterone
- Zona fasciculata - glucocorticoids
- Zona reticularis – sex steroid hormones

- **Adrenal medulla**:
  - epinephrocytes - adrenalin
  - norepinephrocytes - noradrenalin

Adrenal glands



Adrenal glands




Hormones