Endocrine System
(Part 1)

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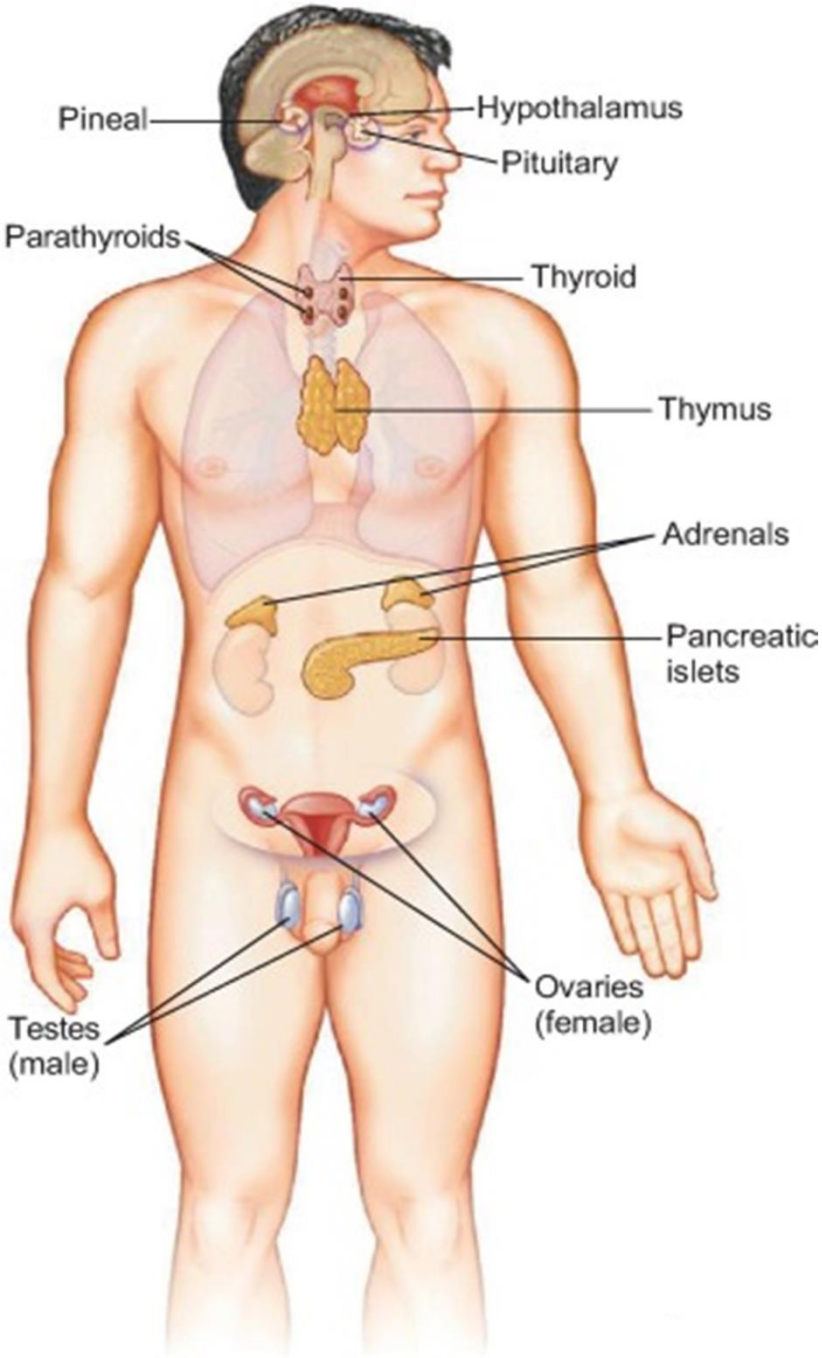
Endocrine System

- Endocrine tissue is made up of cells that release chemicals directly into bloodstream.
- Some organs are entirely endocrine in function. They are referred to as endocrine glands like pituitary glands, pineal body, thyroid gland, parathyroid glands, and adrenal glands.

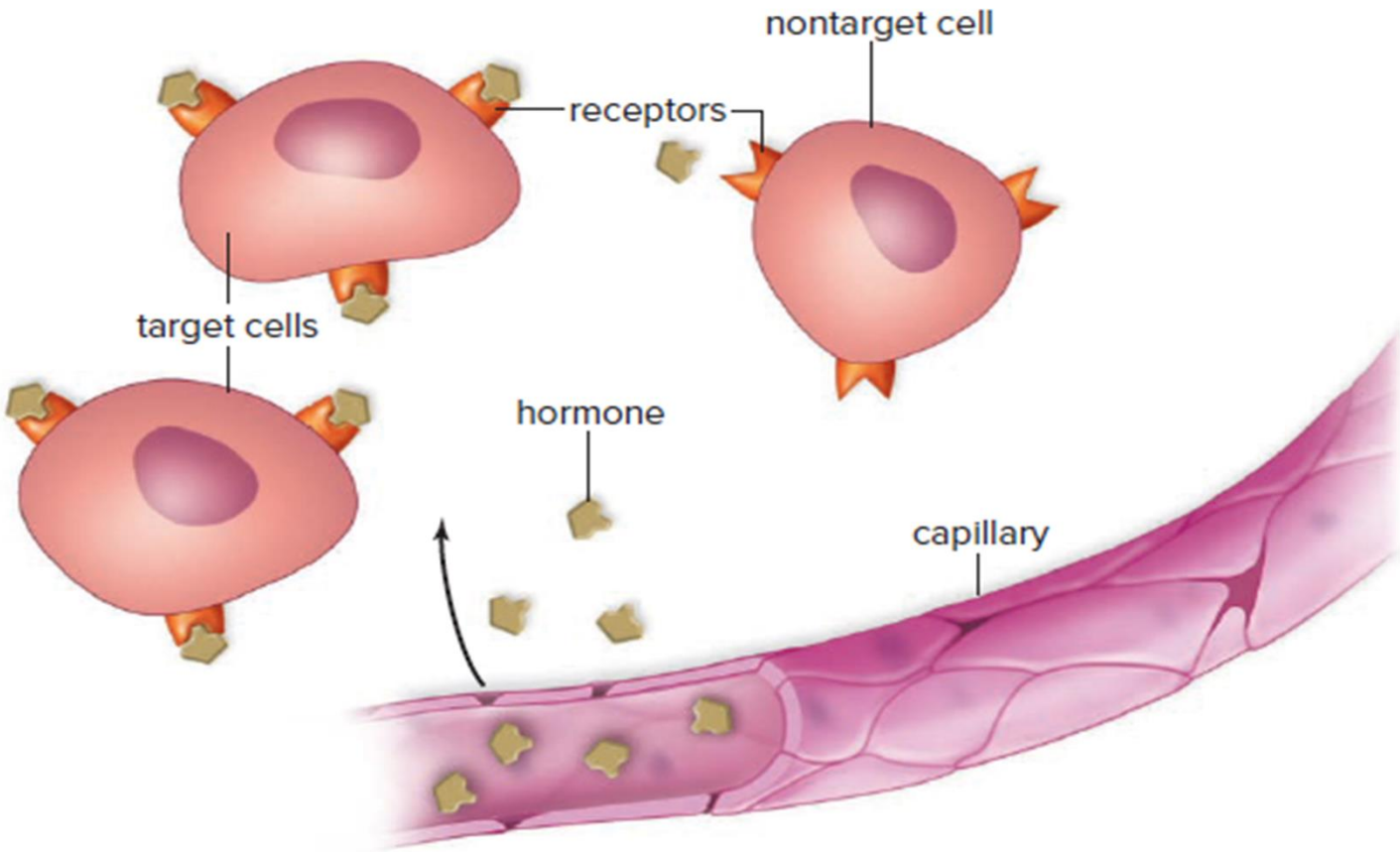
- Groups of endocrine cells may be present in organs that have other functions like islets of pancreas, the interstitial cells of the testes, the kidneys, and the follicles and corpora lutea of ovaries.



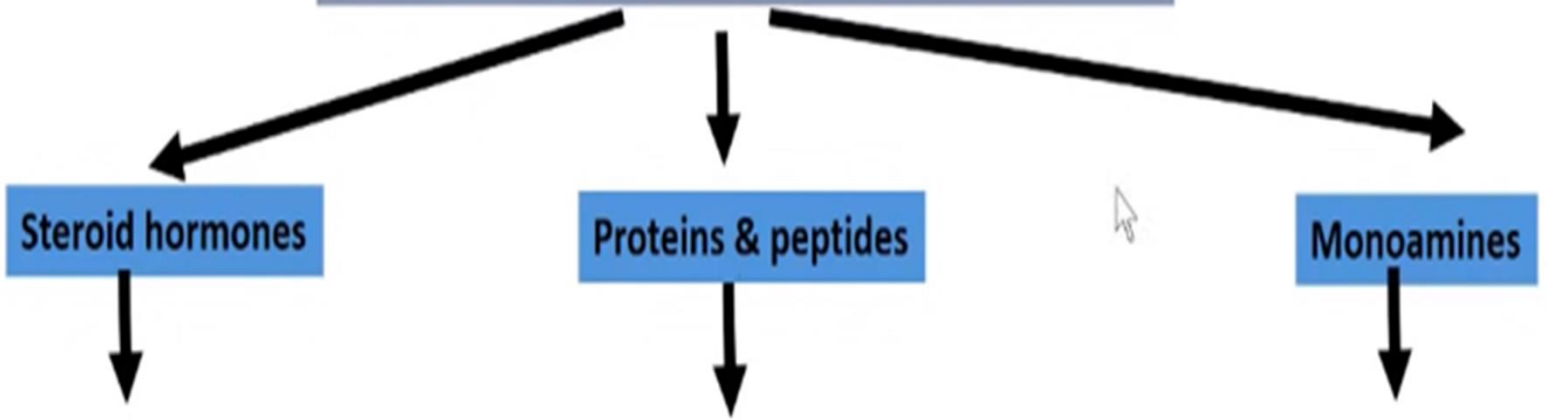
Endocrine glands

- The chemicals release by endocrine cells are called hormones.
- Hormones travel through blood to target cells.
- Some hormones act only on one organ or on one type of cell, while other hormones may have widespread effects.

- The endocrine organs co-ordinate and control the metabolic activities and the internal environment of the body.


nontarget cell
receptors
target cells
hormone
capillary

Types of hormones



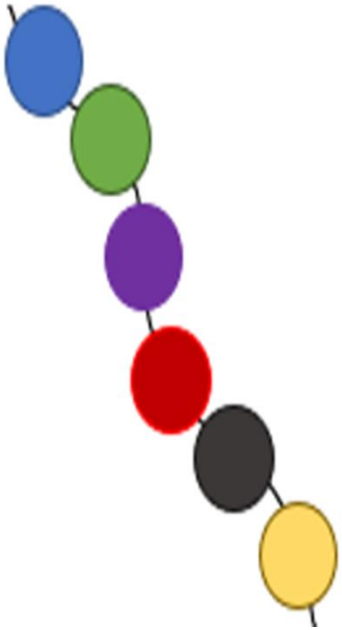
1- Adrenal cortex (cortisol , androgen& aldosterone)
2- Ovary (estrogen & progesterone)
3- Testes (testosterone)
4- Placenta (estrogen & progesterone).

1- Pituitary hormones
2- Parathyroid hormones
3- Hormones of the pancreas

1- Thyroid hormones
2-Adrenal medullary hormones (catecholamine)

Amino acids

Peptide



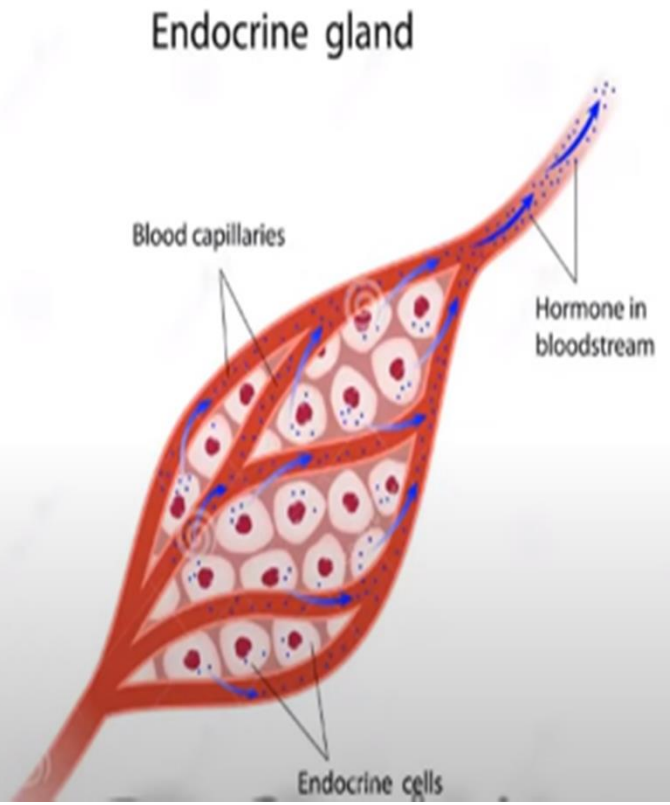
Protein

General structure of endocrine glands

- They are composed of:

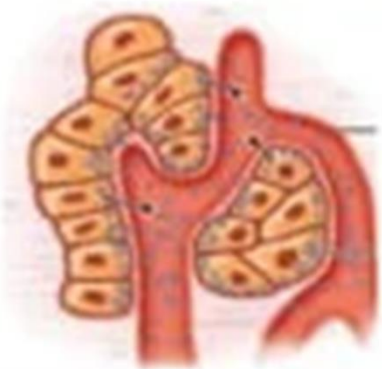
1- A group of secretory cells.

2- Fenestrated blood capillaries(sinusoidal capillaries).



Endocrine Glands

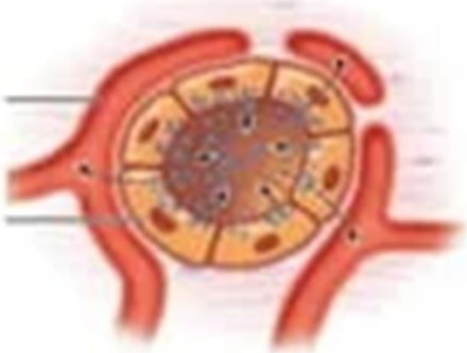
Cord & Clump Type



Cells arranged in irregular **Cords / clumps** permeated by capillaries

Secretions directly delivered **outward** in capillaries

Follicular Type



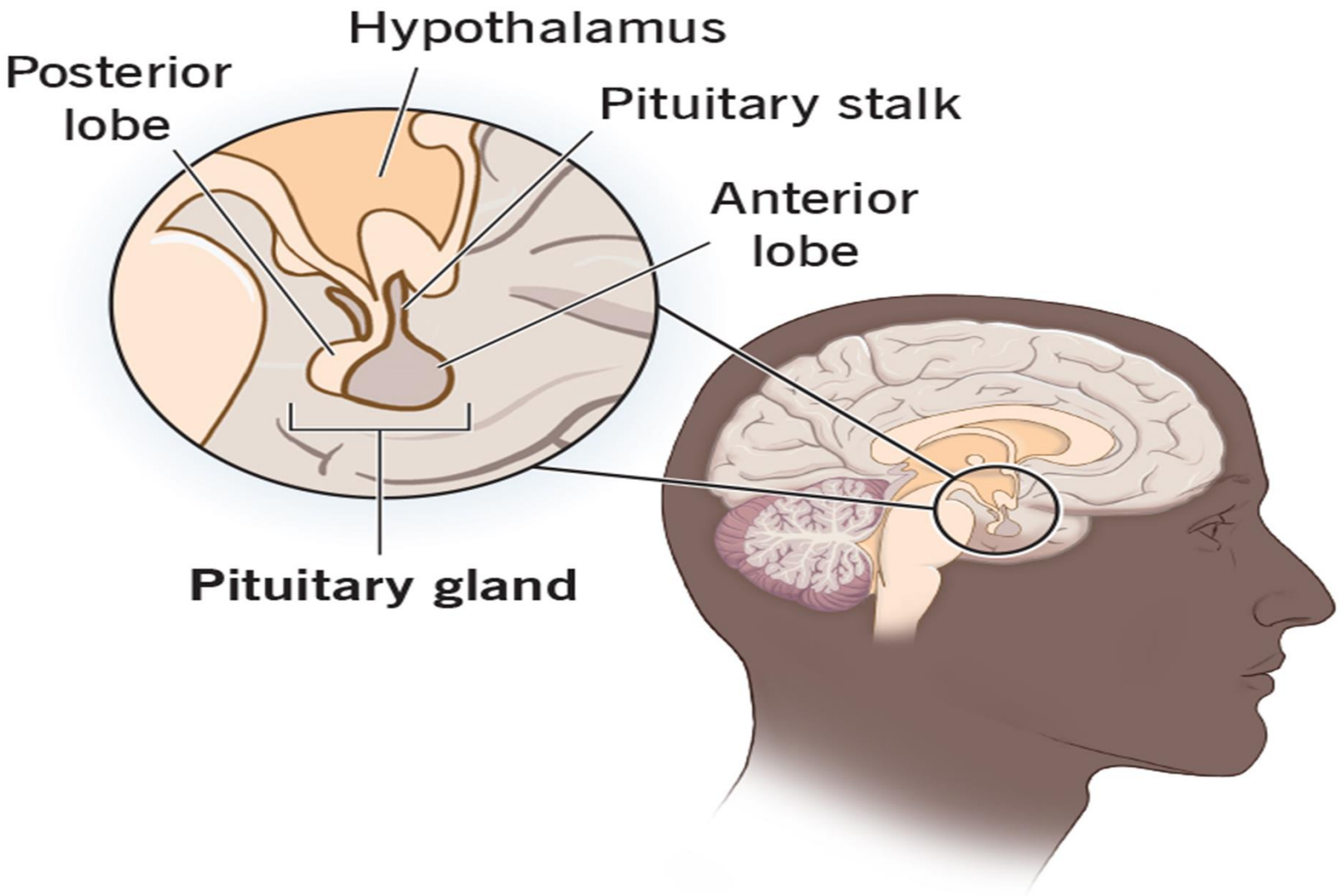
Cells arranged in **follicles** surrounded by capillaries

Secretions delivered **inward** inside the follicles

Pituitary Gland

- The pituitary gland is located in the base of the brain.
- It controls many body functions and as well as other endocrine glands.
- Pituitary gland is divided into two major lobes:
  a) Anterior lobe (Adenohypophysis)
  b) Posterior lobe (Neurohypophysis)

Pituitary Gland



Adenohypophysis
(Anterior Pituitary gland)

Anterior lobe of pituitary gland

It secrets many hormones:

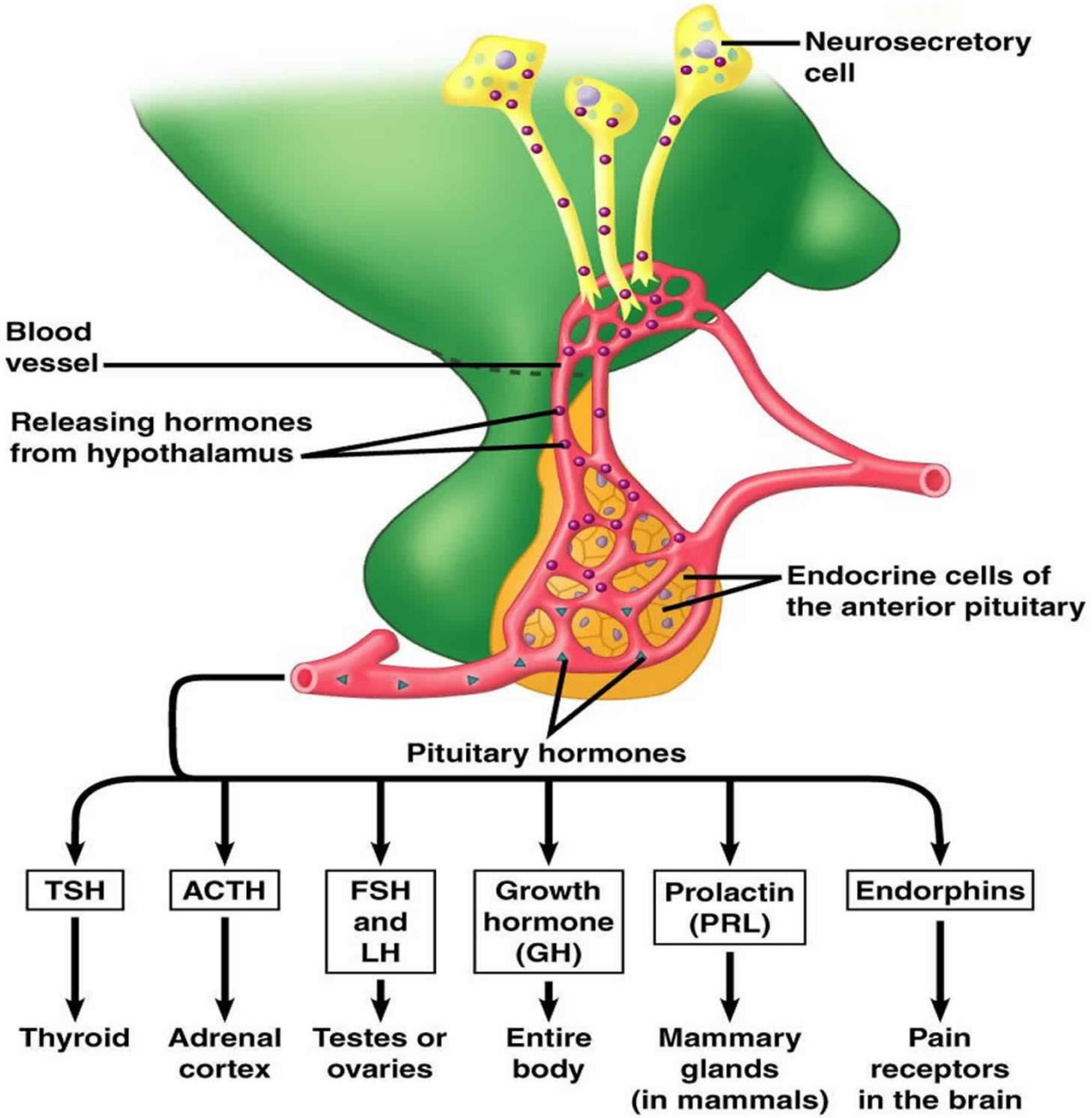
1. Growth hormone (GH) promotes bone growth specially during adolescents.
2. Thyroid stimulating hormone (TSH) stimulates thyroid gland to secret thyroid hormone (thyroxin hormone).

3. Adenocorticotropic hormone (ACTH) acts on adrenal cortex to secret its hormones.
4. Follicle stimulating hormone (FSH) promotes ovarian follicle development and estrogen secretion in women and stimulates spermatogenesis in men.

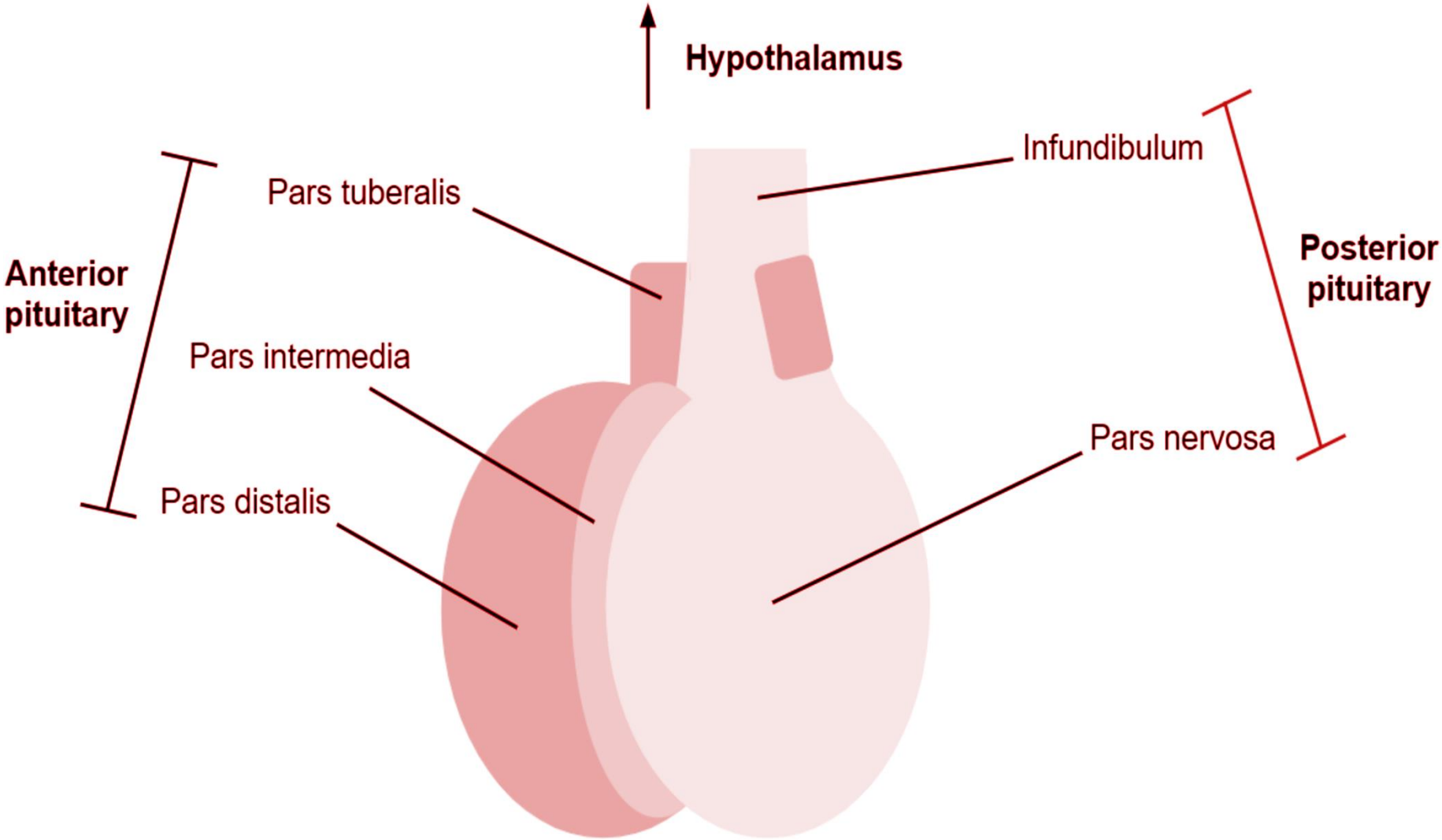
5. Luteinizing hormone (LH)

- It stimulates the maturation of corpus luteum and progesterone secretion in women.
- Leyding cell stimulation and androgen secretion in men.

6. Prolactin hormone promotes milk secretion.

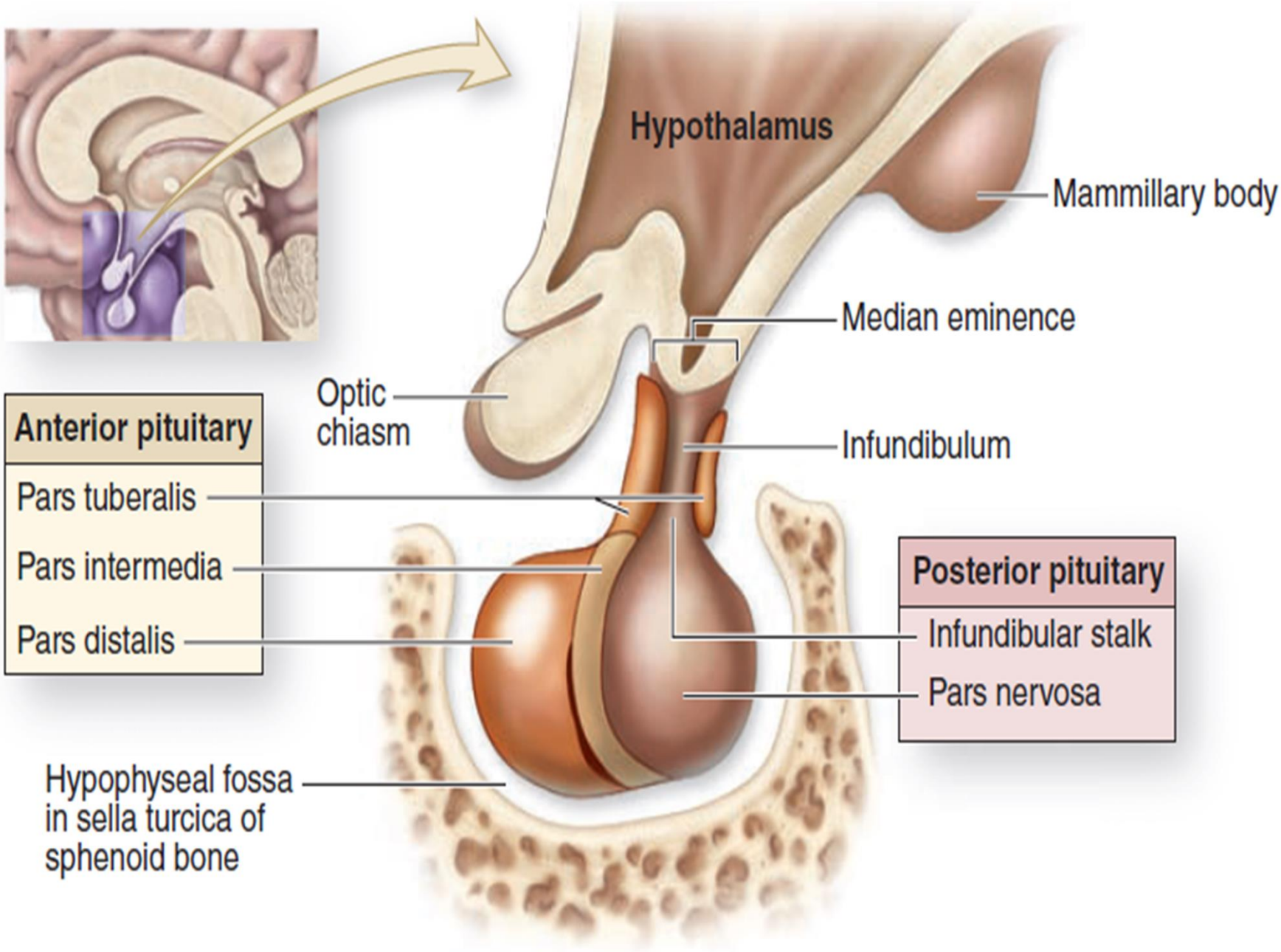

Neurosecretory cell
Blood vessel
Releasing hormones from hypothalamus
Endocrine cells of the anterior pituitary
Pituitary hormones
TSH
ACTH
FSH and LH
Growth hormone (GH)
Prolactin (PRL)
Endorphins
Thyroid
Adrenal cortex
Testes or ovaries
Entire body
Mammary glands (in mammals)
Pain receptors in the brain

Pituitary gland Histology



Pars Distalis

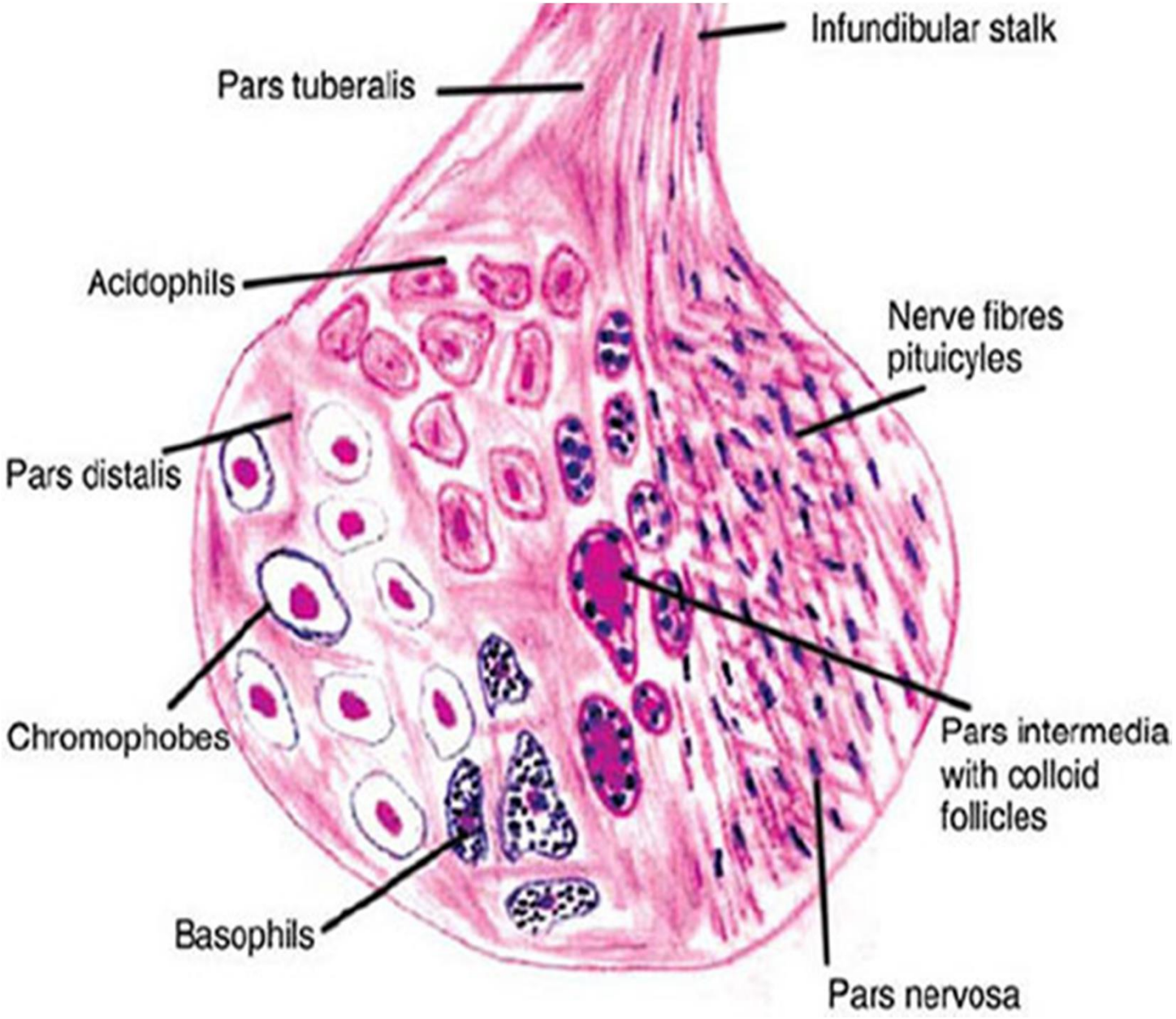
The pars distalis accounts for 75% of the adenohypophysis and has a thin fibrous capsule. The main components are cords of well-stained endocrine cells interspersed with fenestrated capillaries and supporting reticular connective tissue.


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

Common stains suggest two broad groups of cells in the pars distalis with different staining affinities: chromophils and chromophobes.

Types of cells in pars distalis	Chromophils	Chromophobes
Percentage	48%	52%
Size	Larger	Smaller
Cytoplasm	Granular	Non-granular
Function	Hormone production	Act as a reserve

Chromophils are secretory cells in which hormone is stored in cytoplasmic granules. They are also called basophils or acidophils, based on their affinities for basic and acidic dyes, respectively.


Infundibular stalk
Pars tuberalis
Acidophils
Nerve fibres
pituicyles
Pars distalis
Chromophobes
Pars intermedia
with colloid
follicles
Basophils
Pars nervosa

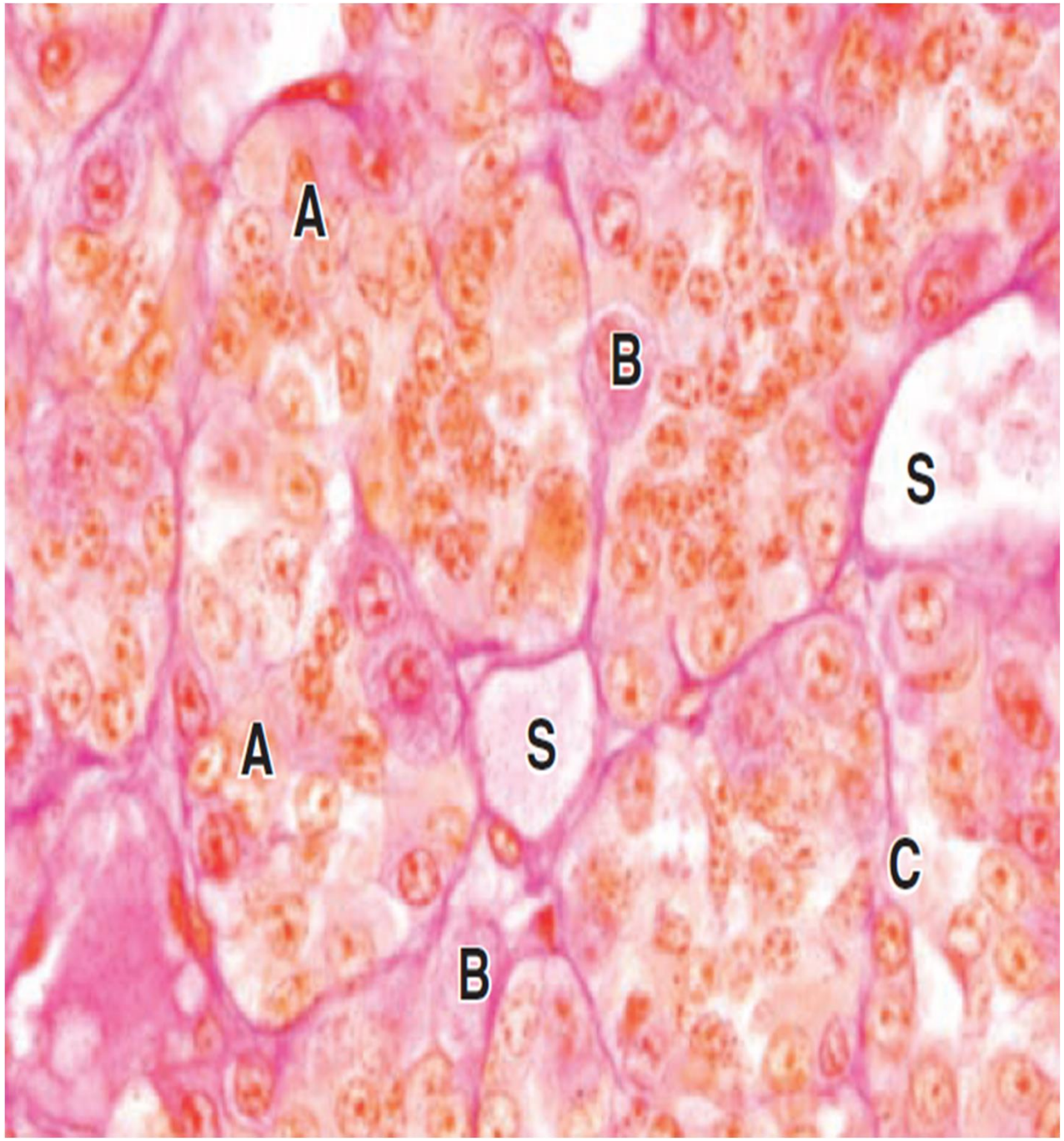
- Acidophils secrete either growth hormone (somatotropin) or prolactin.
- The basophilic cells are the corticotrophs, gonadotrophs, and thyrotrophs, with target cells in the adrenal cortex, gonads, and thyroid gland, respectively.

Basophils are three types:

1. Thyotrophs secret thyroid stimulating hormone (TSH)
2. Gonadotrophs secret two hormones:
   a. Follicle stimulating hormone (FSH)
   b. Luteinizing hormones (LH)
3. Corticotrophs which secret adenocoticotrophic hormone (ACTH)

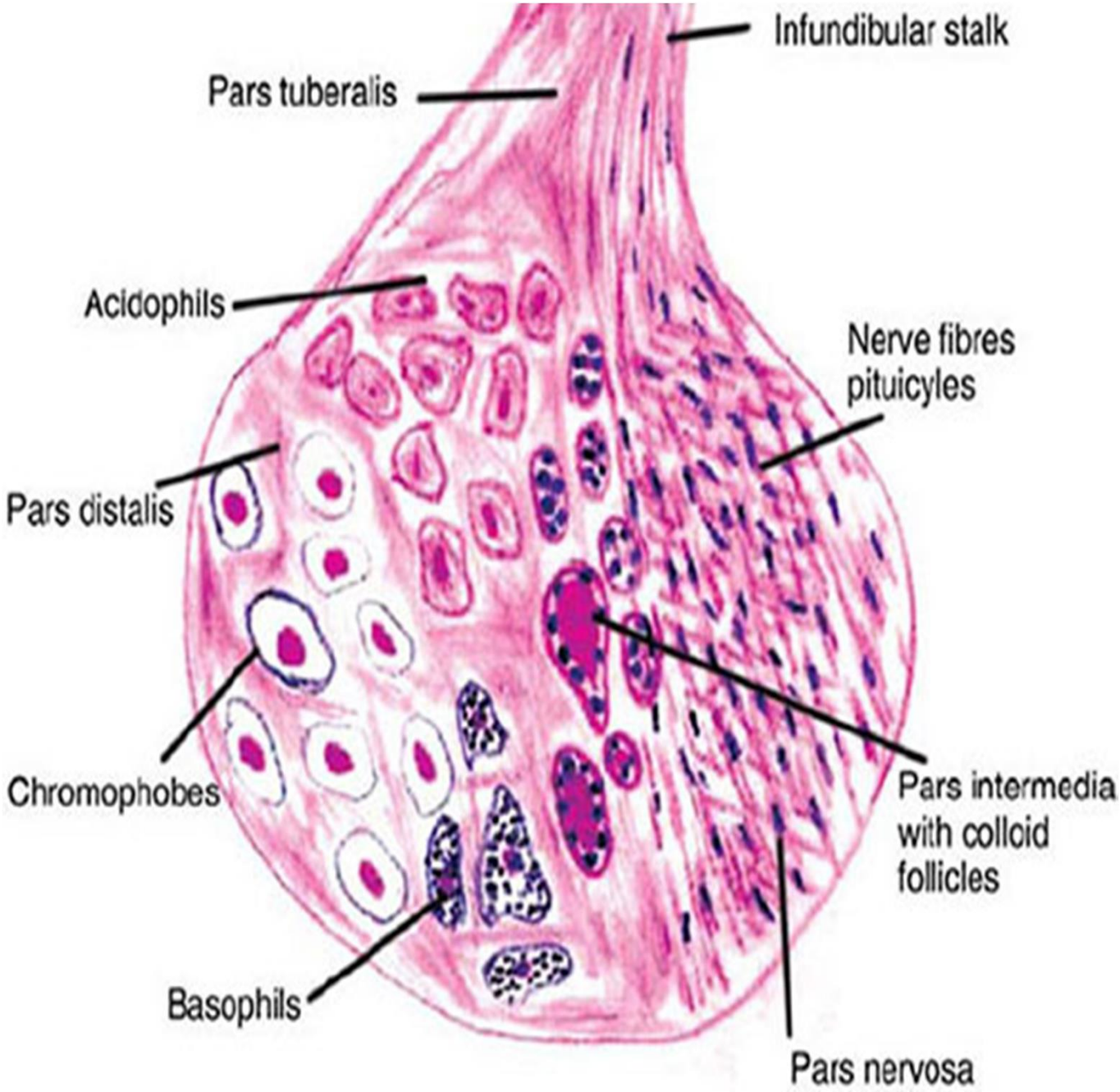
Types of chromophils	Acidophils	Basophils
Percentage	37%	11%
Hormone Nature	Protein	Glycoprotein
PAS (periodic acid schiff)	Negative	Positive
Size	Smaller	Larger
Granules	Larger	Smaller
Secretion	• Somatotrophs (Growth hormones • Mammotrophs (Prolactin)	

A: acidophils
B: basophils
C: chromophobes



Pars Tuberalis

- The pars tuberalis is a smaller funnel-shaped region surrounding the infundibulum of the neurohypophysis.
- Most of the cells of the pars tuberalis are gonadotrophs.


Infundibular stalk
Pars tuberalis
Acidophils
Nerve fibres
pituicyles
Pars distalis
Chromophobes
Pars intermedia
with colloid
follicles
Basophils
Pars nervosa

Pars Intermedia

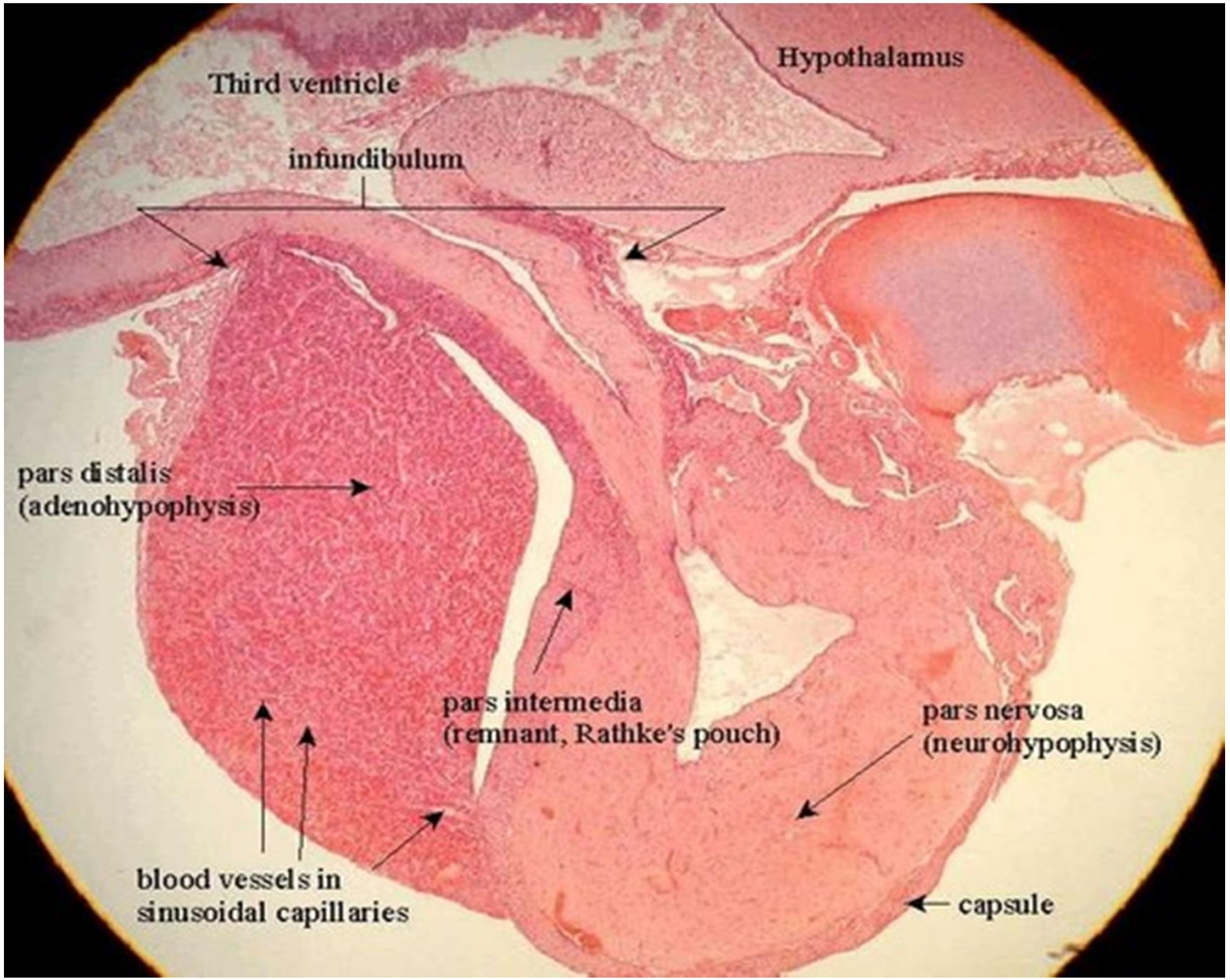
- The pars intermedia is a thin zone of basophilic cells between the pars distalis and the pars nervosa of the neurohypophysis.
- The pars intermedia usually contains colloid-filled cysts of various sizes that represent remnants of that structure's lumen.

Neurohypophysis
(Posterior Pituitary gland)

Posterior Lob of pituitary gland

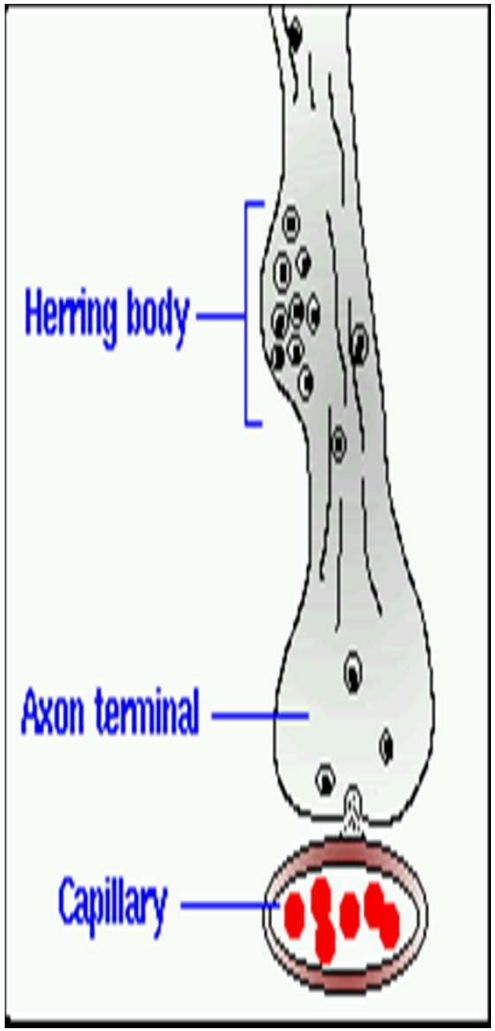
- It lies posterior to the hypophyseal cleft
- It consists of three parts:

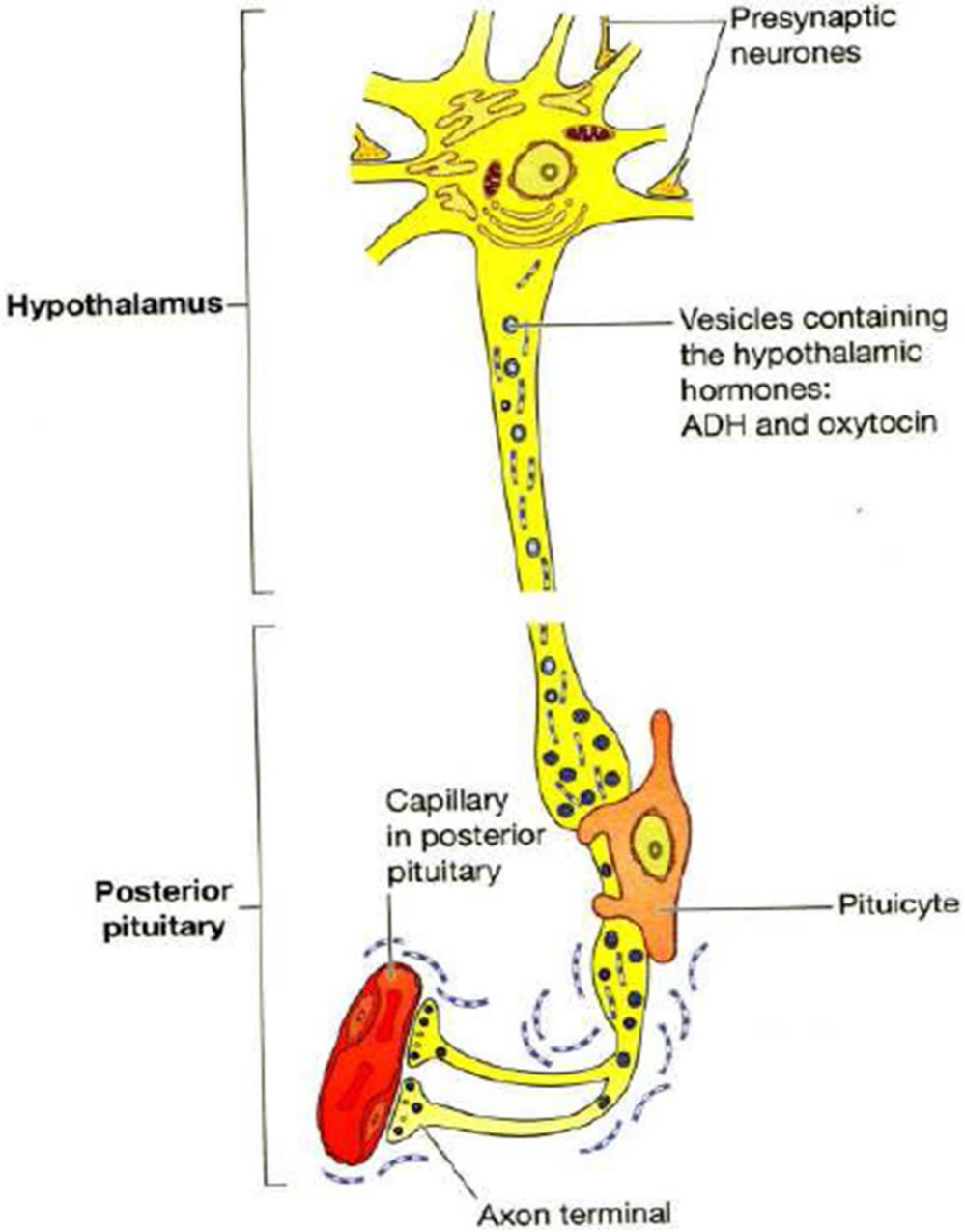
1. The median eminence: a funnel shaped downward extension of the hypothalamus
2. The infundibular stalk
3. The pars nervosa: It is connected to the base of the brain by the infundibular stalk and the median eminence


Hypothalamus
Third ventricle
infundibulum
pars distalis
(adenohypophysis)
pars intermedia
(remnant, Rathke's pouch)
pars nervosa
(neurohypophysis)
blood vessels in
sinusoidal capillaries
capsule

Pars Nervosa

- It consists of the following:
  1. Unmyelinated axon of neurosecretory cells.
  2. Herring bodies
  3. Pituicytes
  4. Fenestrated blood capillaries


Herring body
Axon terminal
Capillary

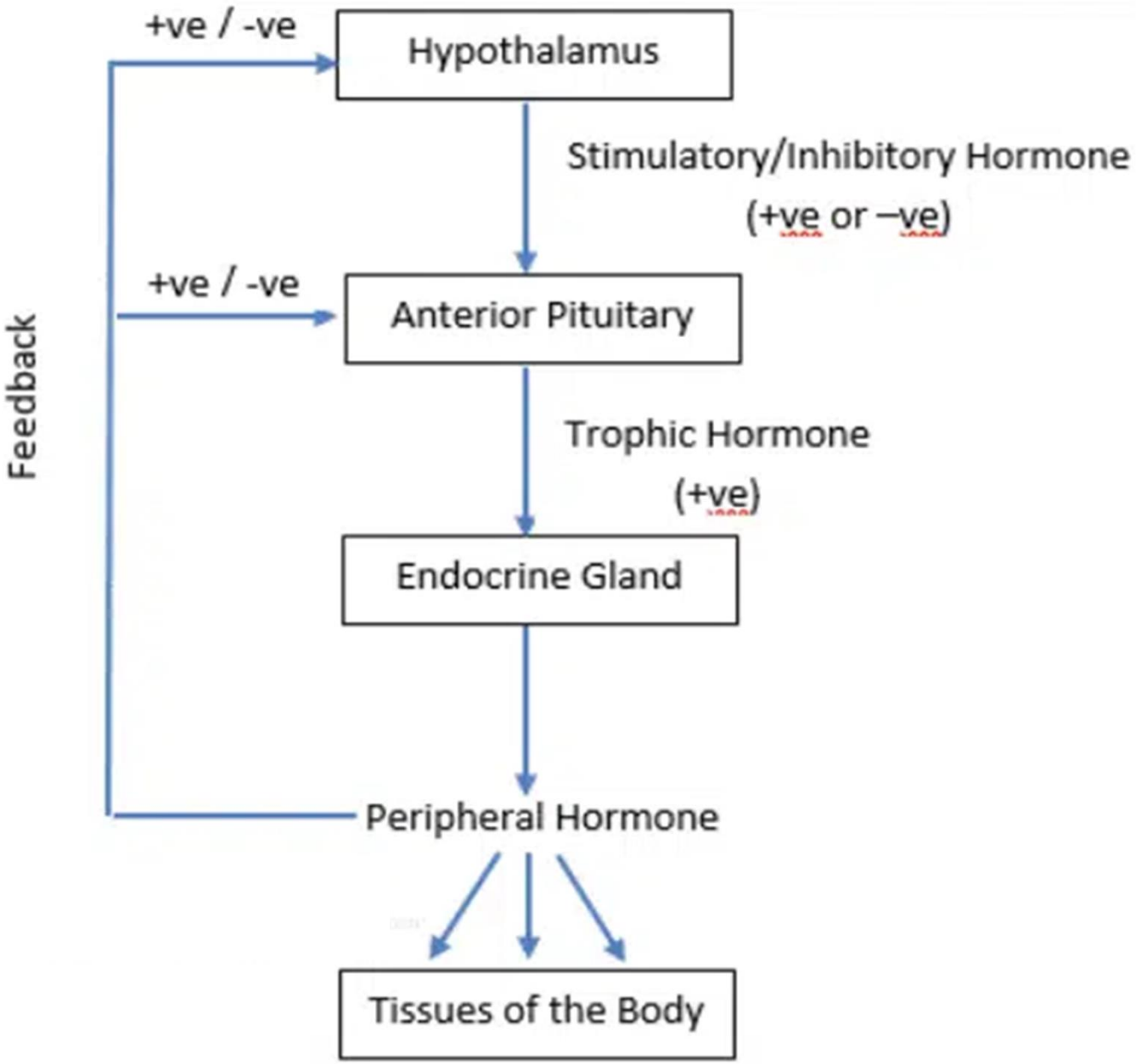

Presynaptic neurones
Hypothalamus
Vesicles containing the hypothalamic hormones: ADH and oxytocin
Capillary in posterior pituitary
Posterior pituitary
Pituicyte
Axon terminal

Posterior lobe of Pituitary gland

It secrets of two hormones:

1. Vasopressin = Antidiuretic hormone (ADH) it controls reabsorption of water by kidney tubules.
2. Oxytocin hormone it controls the contraction of the smooth muscles of uterus and also of the mammary glands.

Control the secretion of pituitary gland



Thank You