Histology

ENDOCRINE SYSTEM ***dr. Ahmed Alhuchami***

Endocrine system is the system that regulates the tissue activities by a secretory product

(hormone)

**Tissue activities include:**

1. Coordination of growth and development

2. Adaptation to external and internal environmental stresses

3. Processes of sexual reproduction

Hormones are chemicals that are released ( from an endocrine cell ) in a small amount ,

directly to the blood or tissue fluids. They usually act on special cells that are called Target

cells.

Target cell is a cell that possesses a specific receptors for a certain hormone.

Receptors are special sites that are located extra- or intra-cellular (depending on the type of

hormone).

**Classification of endocrine system**

Typical endocrine glands includes:

1. Pituitary gland

2. Suprarenal gland ( adrenal gland)

3. Thyroid gland

4. Parathyroid gland

5. Pineal body

**Pituitary gland (Hypophysis)**

 Pituitary gland is a small bean-shape organ. Its dimensions are (12x10x9 mm)

 It weighs 0.5gm in male. It is slightly heavier in non-pregnant and much heavier in

pregnant women.

 It lies beneath the base of the brain (hypothalamus) to which it is linked by stalk.

 It is enclosed in the sella turcica of the sphenoid bone (sella turcica is an important

radiological land mark).

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 Pituitary gland has double embryological origin

1. From the oral ectoderm – the roof of the mouth cavity will invaginate cranially

forming a pouch called "Rathke's pouch". Later this part detaches from the oral

cavity and forms the adenohypophysis.

2. From the developing nervous system – the floor of diencephalon will evaginate

caudally. Later it will form the neurohypophysis.

Therefore pituitary gland can be divided into:

A. Adenohypophysis – subdivided into:

 Pars distalis (Anterior lobe)

 Pars tuberalis ( Cranial part)

 Pars intermedia (Intermediate lobe)

B. Neurohypophysis – subdivided into:

 Pars nervosa (Posterior lobe)

 Stalk (Infundibulum) – composed of median eminence and stem.

Pars distalis (Ant. Lobe): composed of two types of cells:

a) Chromophobes (50%)

b) Chromophils – subdivided into

i. Acidophils (40%)

ii. Basophils (10%)

Chromophobes:

Light microscopical study of Chromophobes shows:

 Small polyhedral cells with pale cytoplasm and small rounded central nucleus.

 Their cytoplasm has no affinity to dyes and has no granules

 Cells are usually found in clusters

 Their function is unknown, they are thought to be:

i. Either exhausted degranulated chromophils

ii. Or represent immature chromophils

Chromophils:

Light microscopical study of chromophils manifests:

 Large polyhedral cells with large acidophilic (in acidophils) or basophilic (in

basophils) granules.

 They have large central rounded nucleus.

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Electron microscopic study of chromophils:

 Acidophils and basophils are sub-grouped according to the size of granules (in the

cytoplasm) seen in the electron microscope.

Acidophils – subgrouped into:

1. Somatotrophs – (secretory granules = 300 – 400 nm), they are responsible for growth

hormone (GH) secretion. GH influences the general body growth and bone elongation

(by its effect on the epiphyseal cartilage of long bones).

Note: the increase of GH in childhood and adolescent leads to gigantism, while the

increase of GH, in adults, leads to acromegaly. The reduction in GH in childhood

leads to dwarfism.

2. Mammotrophs – (secretory granules = 200 nm)

They are responsible for prolactin secretion. This hormone stimulates milk synthesis

and secretion from mammary gland during lactation in female. In male, its role is not

well understood.

Recently, it has been found that these cells secret luteotrophic hormone (LTH), which

stimulates corpus luteum of the ovary to secret progesterone.

Basophils – are subdivided according to their electron microscopical features into:

1) Gonadotrophs – (secretory granules = 250 – 400 nm). The secret the following

hormones:

 Follicular – stimulating hormone (FSH) – stimulates folliculogenesis in female and

spermatogenesis in male.

 Leuteinizing hormone (LH) – in female, it is responsible for maturation of follicles in

ovary, ovulation and corpus luteum formation.

 Interstitial cell – stimulating hormone (ICSH) – in male, it maintains interstitial cells

of Leydig in testis and stimulates them to secret androgens, particularly, testosterone

which is essential for sperm maturation and development of secondary sex organs.

2) Thyrotrophs – (secretory granules = 120 – 200 nm)

They are responsible for secretion of thyroid – stimulating hormone (TSH) which

stimulates thyroid gland to secret tetraiodothyronin (Thyroxine) (T4) and

triiodothyronin (T3).

3) Corticotrophs – (secretory granules = 400 – 550)

They secret adreno-cortico-trophic hormone (ACTH). This hormone acts on the

adrenal gland cortex, leading to secretion of corticosteroid hormones (aldosterone and

cortisol) and sex hormones (estrogen, progesterone and androgen).

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Recently, it has been found that these cells are responsible for the secretion of β-

lipotropin hormone (β-LPH), α-melanocyte-stimulating hormone (α-MSH) and β-

endorphins.

**Pars Intermedia:**

In human, it is a rudimentary region made up of cords and follicles of weakly

basophilic cells that contains secretory granules. It might be responsible for the

secretion of α-melanocyte-stimulating hormone (α-MSH)

**Pars Tuberalis:**

It is a sleeve like that surround the infundibulum. Its cells are arranged in cords alongside the

blood vessels. Most of them secret gonadotropins (FSH & LH).

Neurohypophysis: composed of:

** Pars nervosa (posterior lobe)**

 **Infundibulum:** with its stalk attached to the hypothalamus at the median eminence

All parts of neurohypophysis contain Pituicytes and axonal processes of unmyelinated nerve

fibers whose cell bodies are located in the paraventricular and supraoptic nuclei of the

hypothalamus. The axonal processes converge at the median eminence forming a bundle

called "hypothalamo-hypophyseal tract" and pass through the infundibulum to reach pars

nervosa.The terminal portions of these axonal processes are commonly expanded and contain

secretory granules called Herring bodies or called neurosecretory bodies. The neurosecretory

bodies contain numerous membrane-enclosed granules with either oxytocin or vasopressin

bound to carrier proteins called neurophysin I and II respectively. Oxytocin and vasopressin

are believed to be synthesized in the cell bodies and then transported through the axons to the

nerve terminals where they are released in response to hypothalamic nerve impulses. Axons

from the supraoptic nuclei are mainly concerned with vasopressin/ADH secretion, whereas

most of the fibers from the paraventricular nuclei are concerned with oxytocin secretion.

Oxytocin stimulates the contraction of the uterine smooth muscles during child birth. It also

stimulates the contraction of Myoepithelial cells of the acini of mammary gland leading to

milk ejection.

Vasopressin increases water permeability of renal collecting ducts leading to more water

reabsorption which cause increase in blood volume. It stimulates the contraction of smooth

muscles of the small-size arteries and arterioles leading to increase of blood pressure.

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**Pituicytes** are

 Star-shaped glial cells

 Supporting

 Have cytoplasmic processes that surround the axons.