

The Endocrine System





Learning Objectives

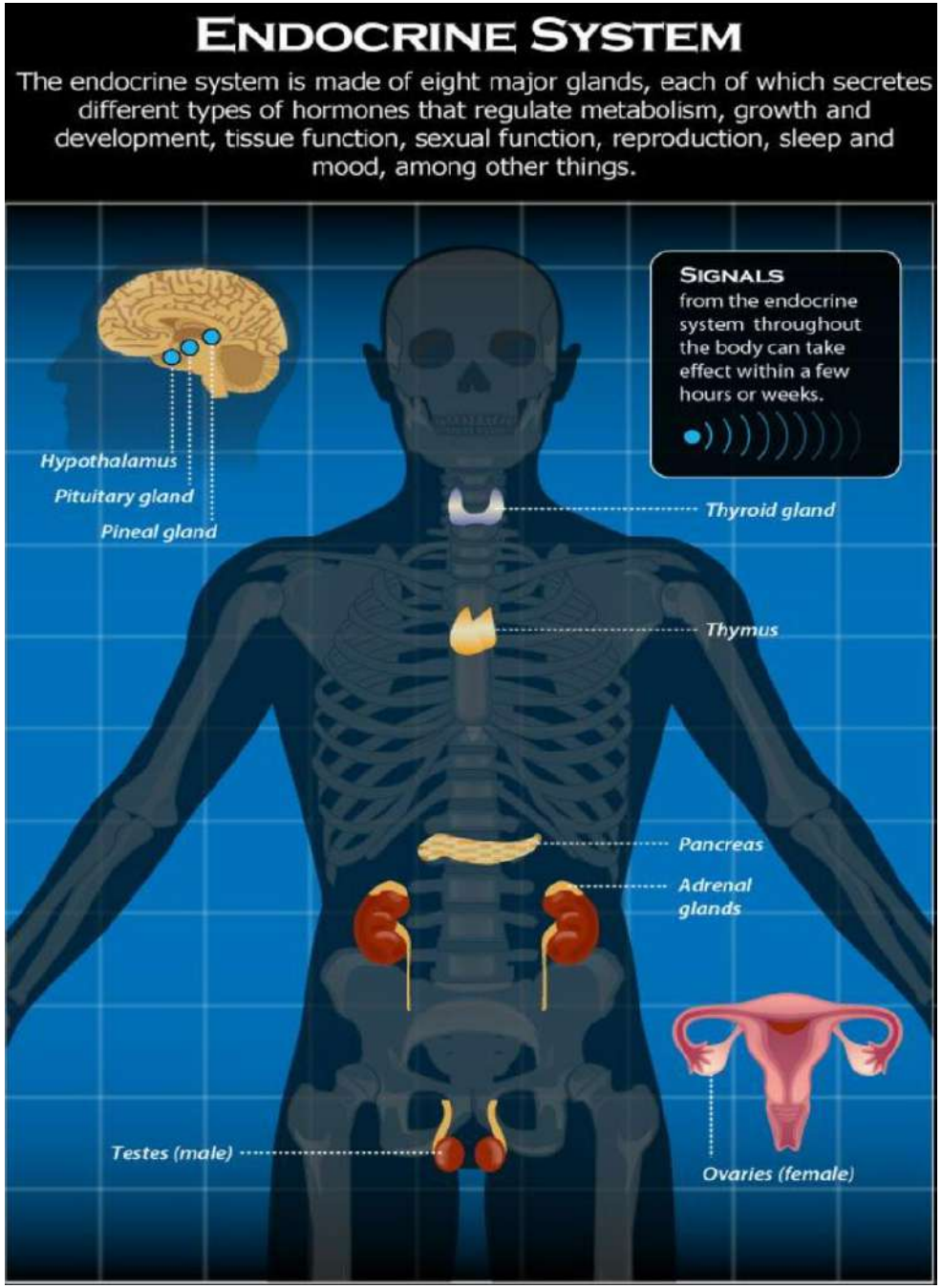
- Structure of the endocrine system
- Functions of the endocrine system
- Main glands & hormones
- Role of sex hormones in menstruation, pregnancy, menopause
- Diseases & disorders

Structure & function

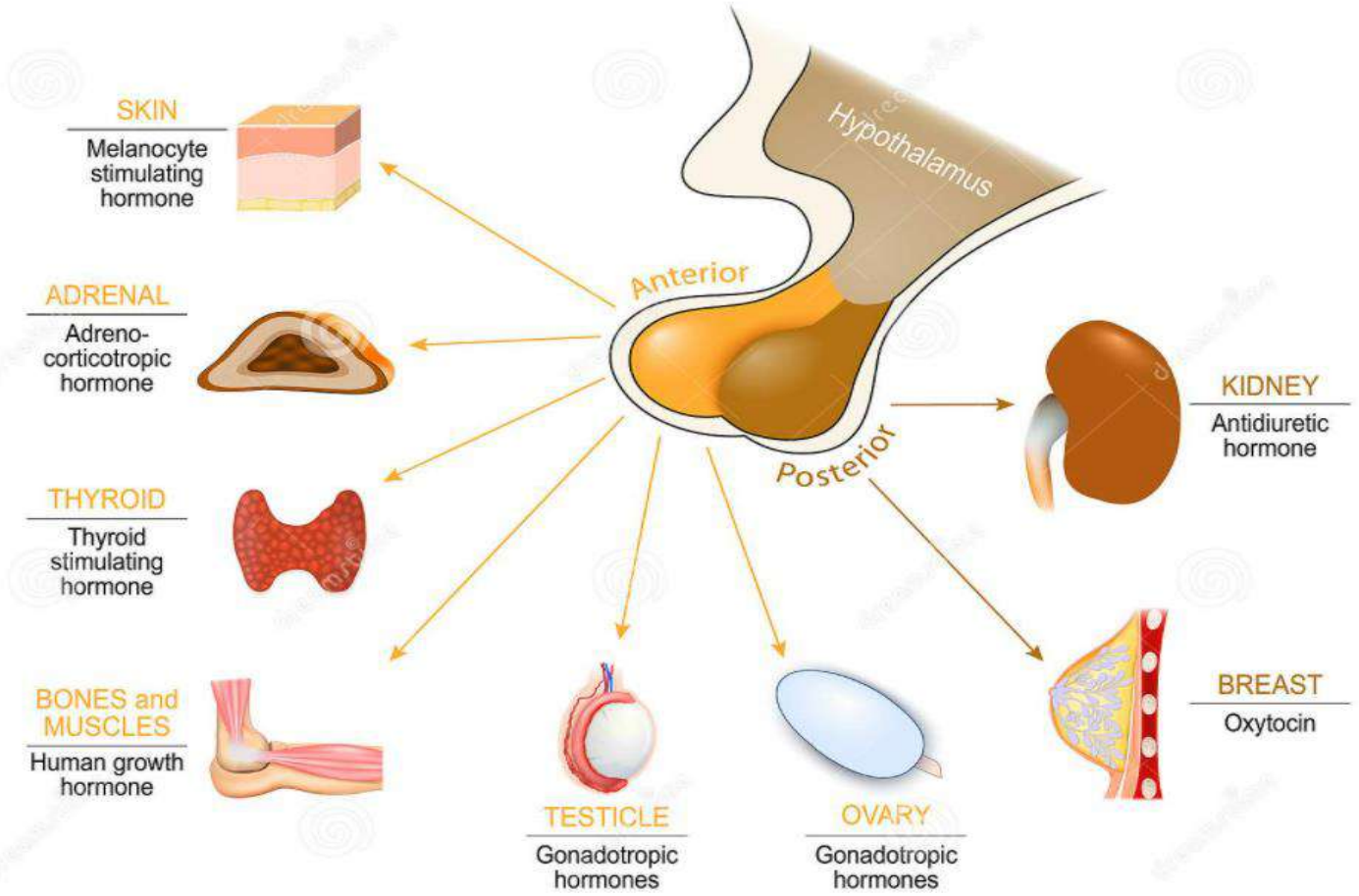
(1) Hormones
- Chemical messengers
- Secreted directly into bloodstream
- Proteins / steroids

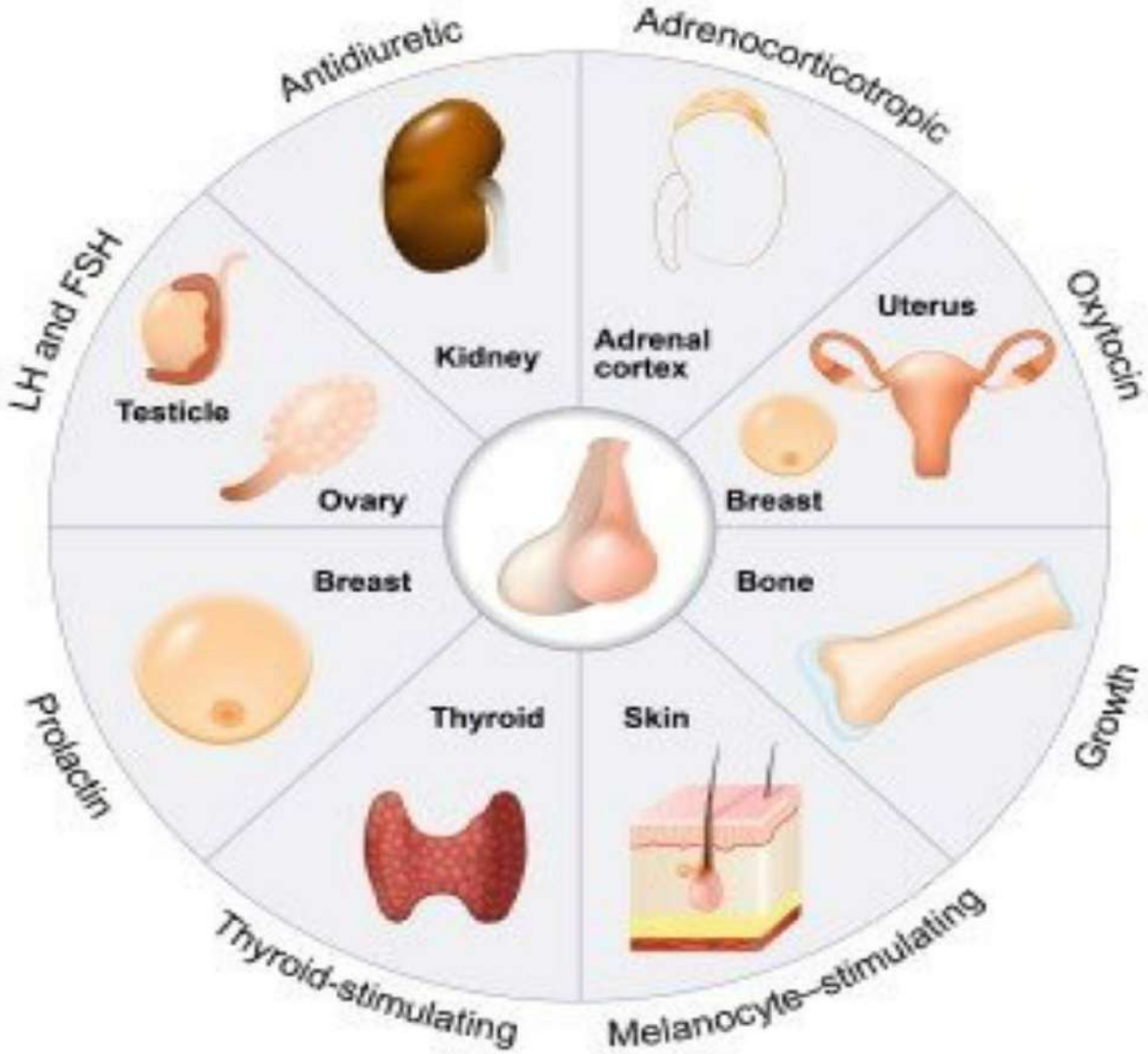
(2) Glands
- Exocrine
- Endocrine (Ductless)

Functions:
- Metabolism & body temperature
- Growth and development
- Sexual function and reproduction
- Heart rate & blood pressure
- Appetite.
- Sleeping and waking cycles



PITUITARY GLAND





Posterior lobe

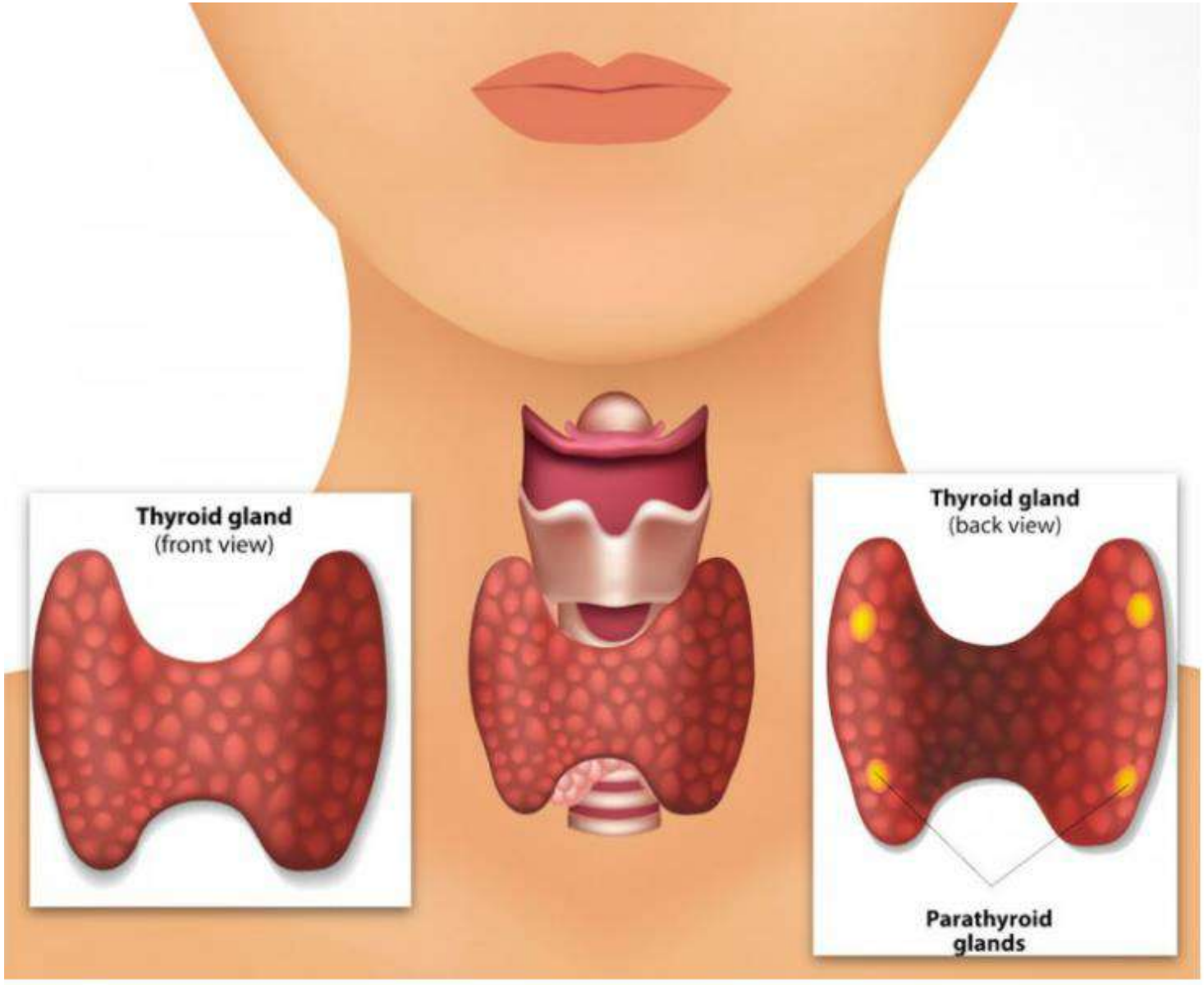
Thyroid & Parathyroid

Thyroid:

- T3 & T4
  - Stimulates metabolism
- Calcitonin
  - Regulates calcium & potassium

Parathyroid:

- Parathormone
  - Works with thyroid to maintain calcium levels



Adrenals

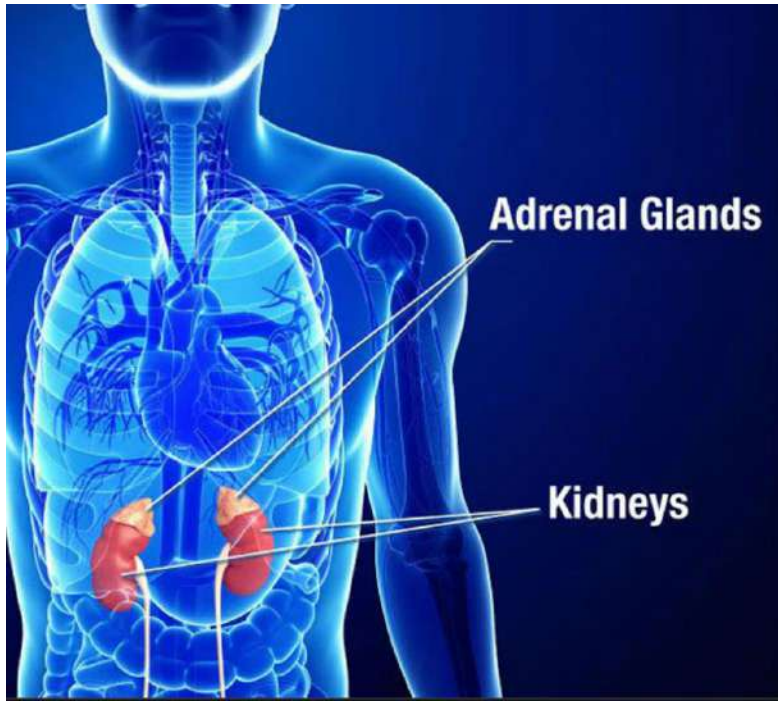
- **Location**: Top of kidney
- **Two parts**: Adrenal cortex & medulla
- **Hormones**:

(1) Aldosterone

(2) Glucocorticoids (steroids) – cortisol, cortisone

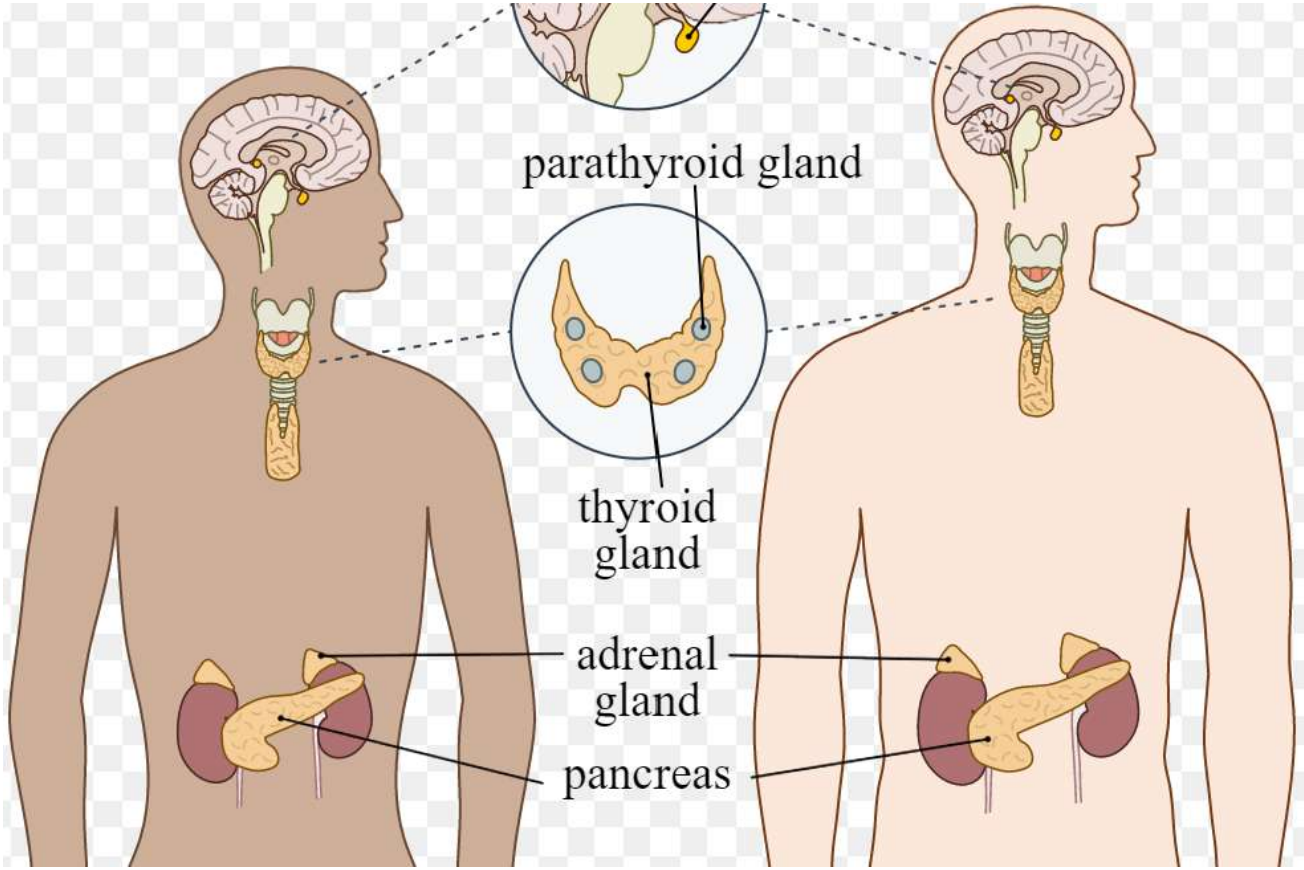
(3) Sex hormones – oestrogen, progesterone, testosterone

(4) Adrenaline / noradrenaline – 'fight or flight'



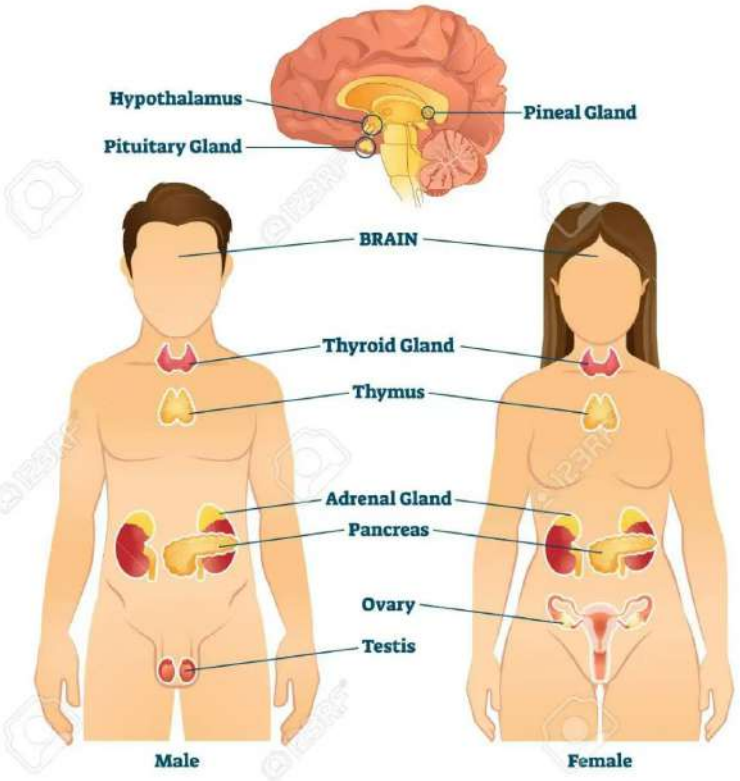
Pancreas

- Islets of Langerhans
- Insulin - lowers blood sugar
- Glucagon - raises blood sugar



Ovaries / Testes

- Oestrogen
- Progesterone
- Testosterone



Thymus / Pineal

- Thymus: T-lymphocytes
- Pineal: Melatonin

Sex hormones

- Puberty – 10-14 years girls; 13-16 years boys

- FSH / LH
  - Girls: Breast development, menstruation, pubic hair
  - Boys: Muscle growth, height increase, voice, pubic hair, sperm production

- Menstrual cycle
  1. Menstrual phase
  2. Proliferative phase
  3. Secretory phase

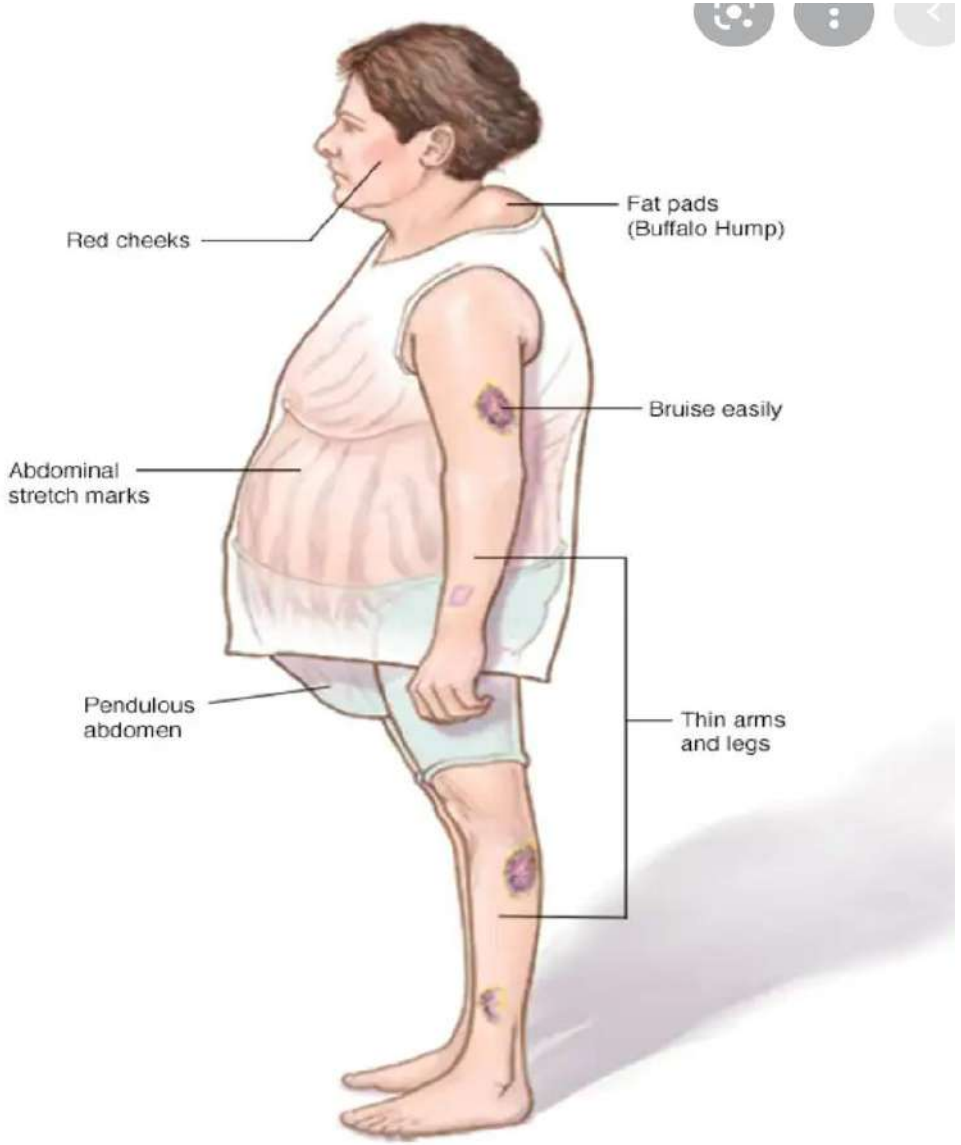
- Menopause



Pathologies



Cushing's Syndrome



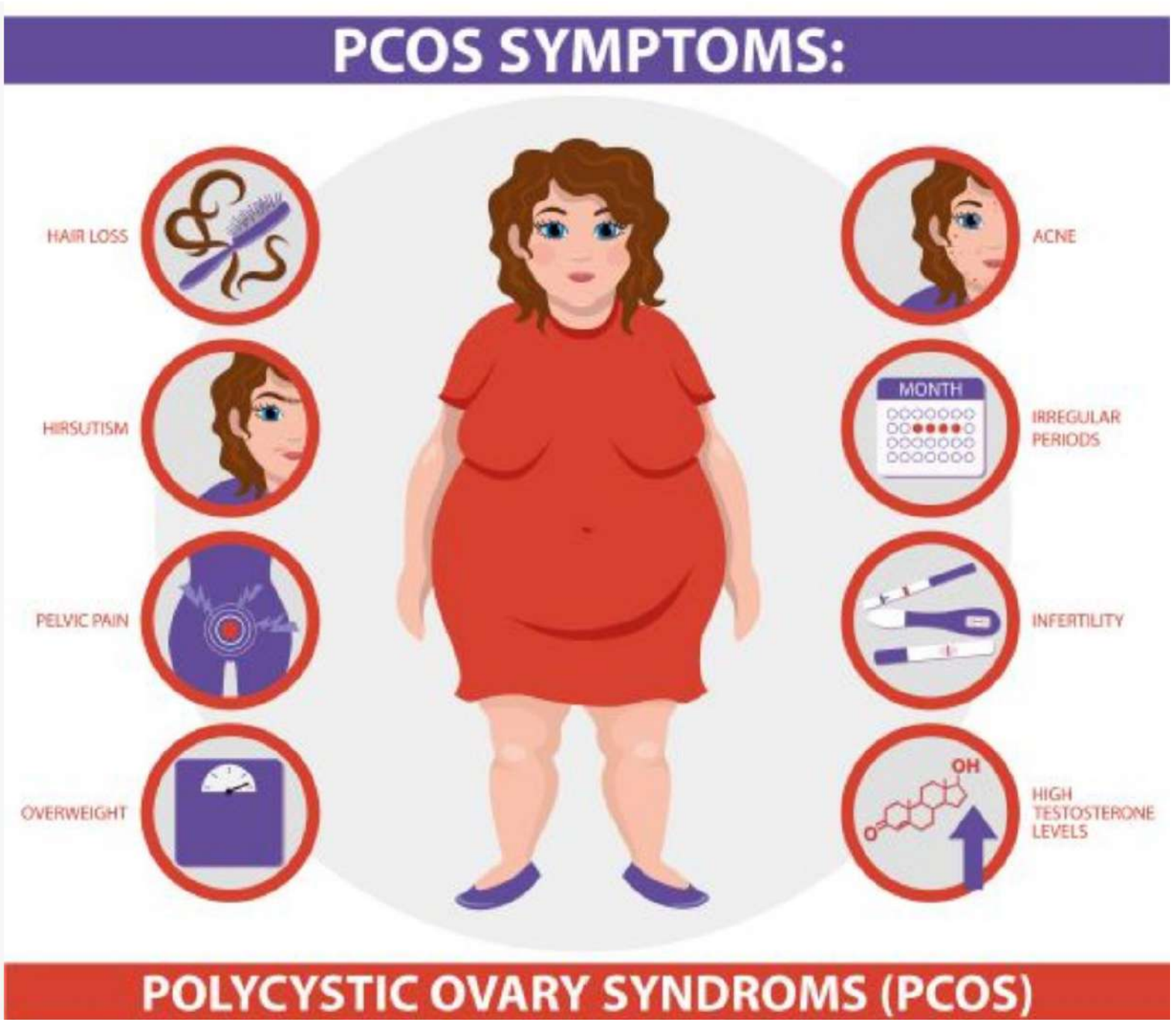
Acromegaly



Grave's disease





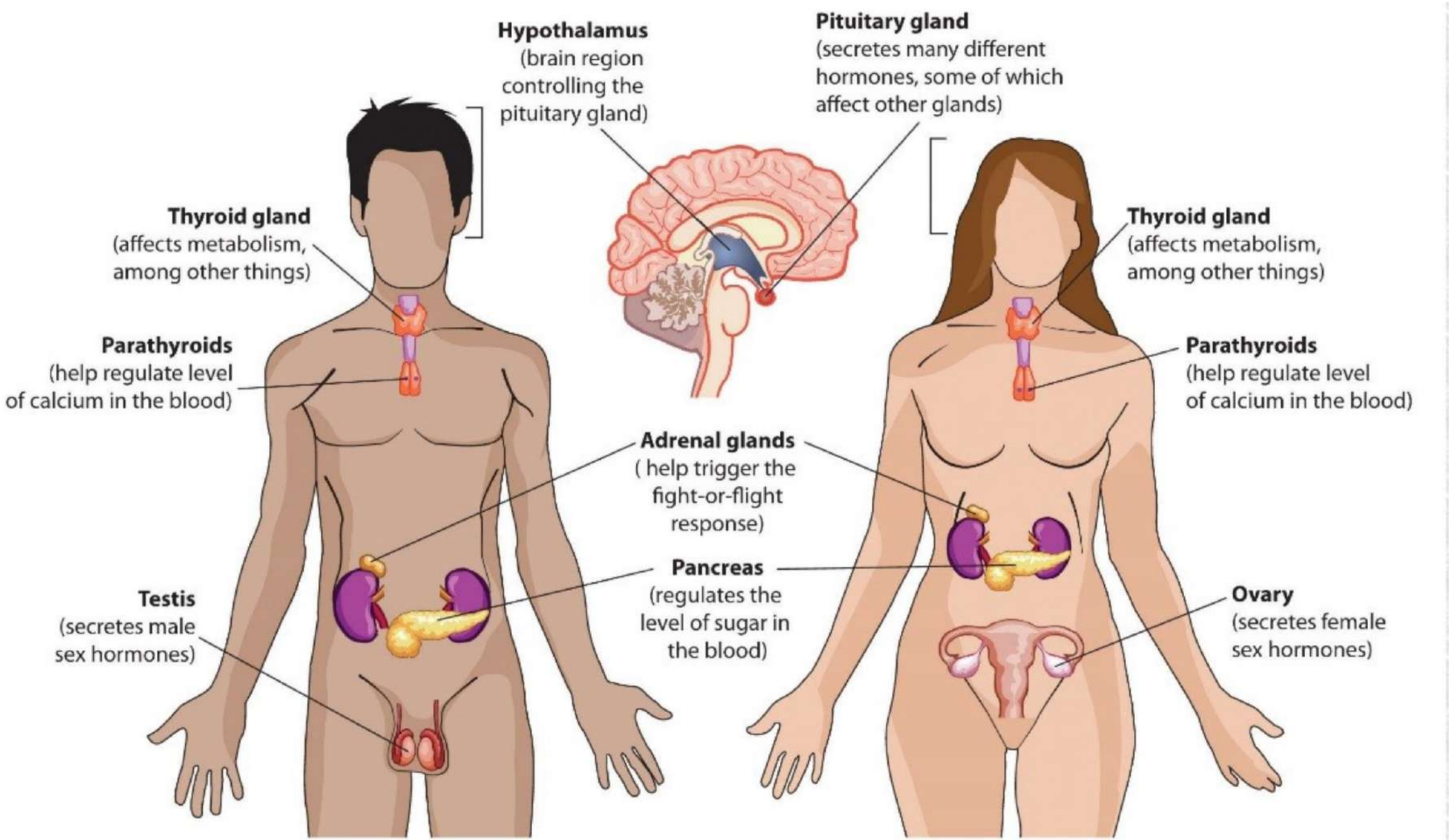

PCOS SYMPTOMS:
HAIR LOSS
HIRSUTISM
PELVIC PAIN
OVERWEIGHT
ACNE
MONTH
IRREGULAR PERIODS
INFERTILITY
OH
HIGH TESTOSTERONE LEVELS
POLYCYSTIC OVARY SYNDROMS (PCOS)

- Addison’s syndrome
- Amenorrhoe
- Diabetes mellitus
- Diabetes insipidus



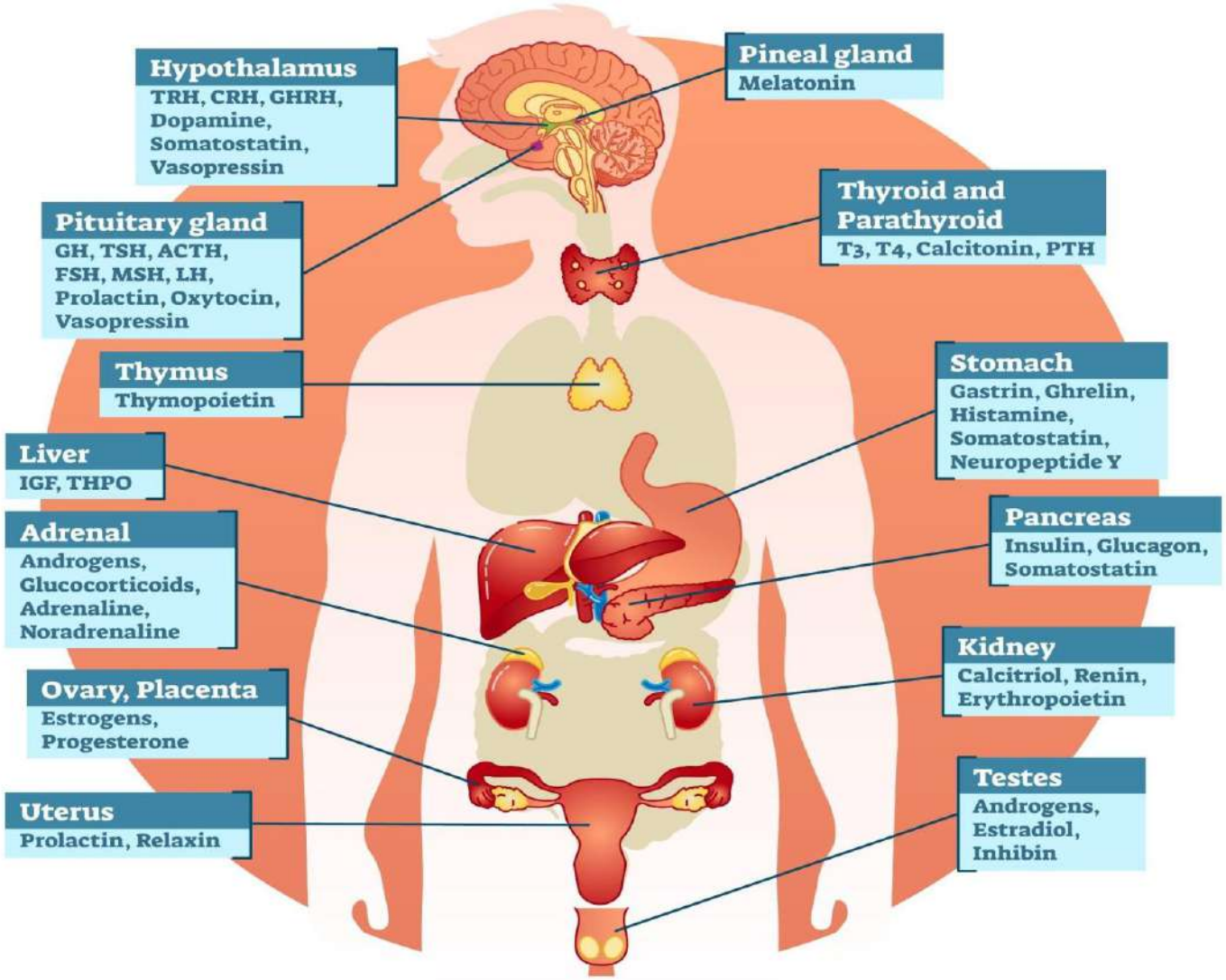
APPENDIX

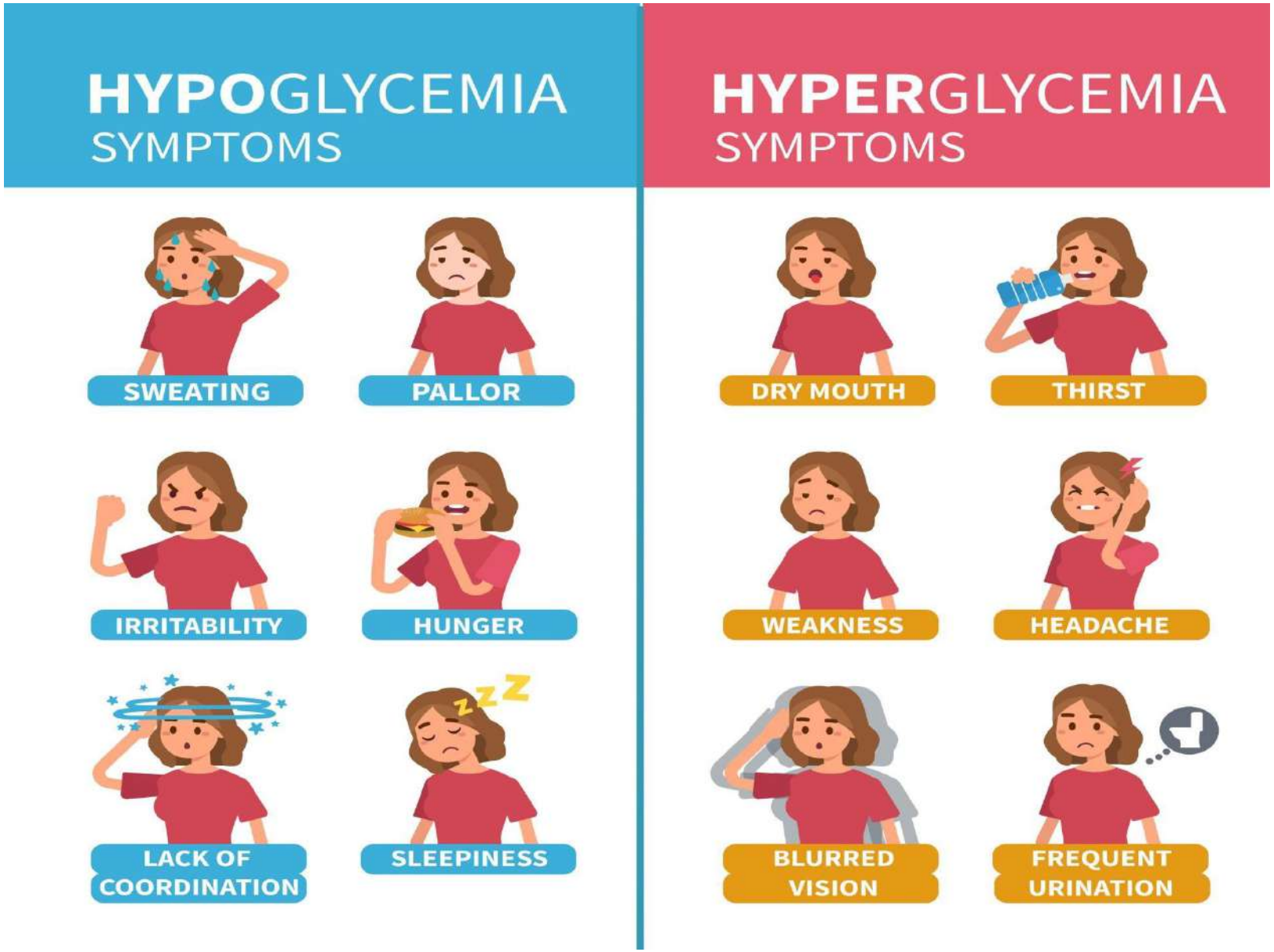


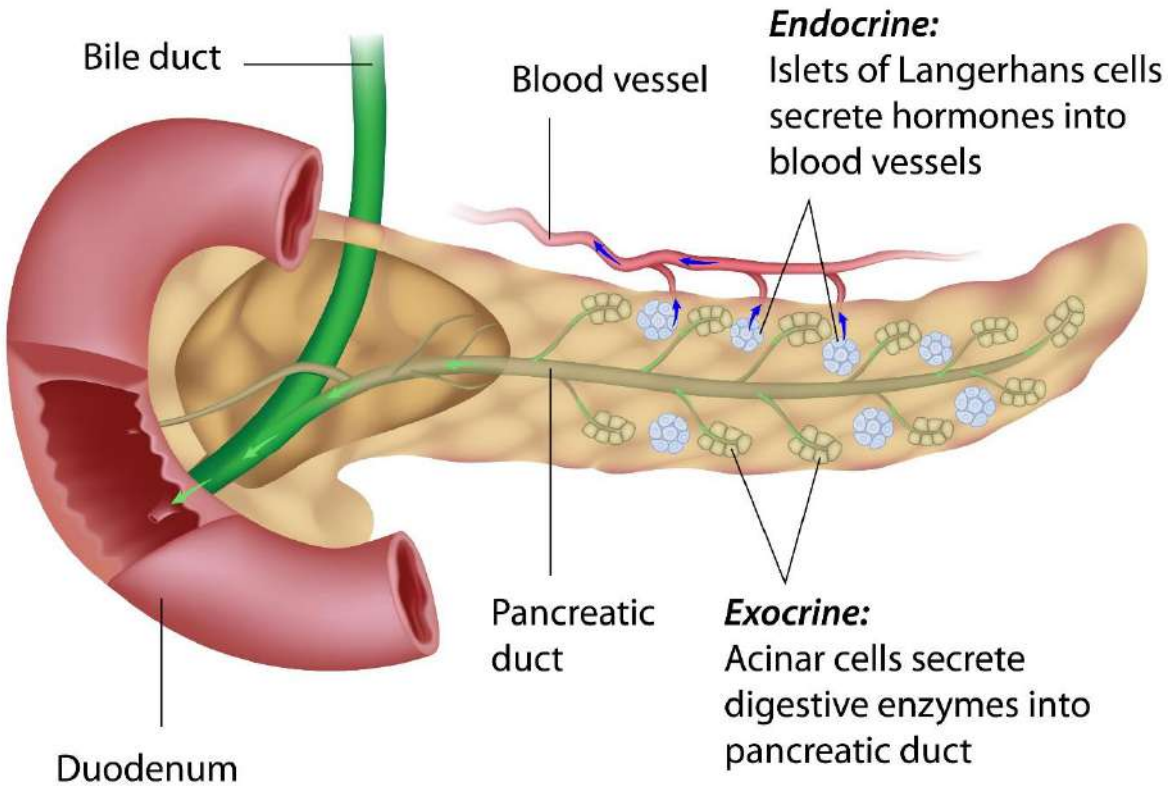

Hypothalamus
(brain region controlling the pituitary gland)
Pituitary gland
(secretes many different hormones, some of which affect other glands)
Thyroid gland
(affects metabolism, among other things)
Parathyroids
(help regulate level of calcium in the blood)
Adrenal glands
(help trigger the fight-or-flight response)
Pancreas
(regulates the level of sugar in the blood)
Testis
(secretes male sex hormones)
Thyroid gland
(affects metabolism, among other things)
Parathyroids
(help regulate level of calcium in the blood)
Ovary
(secretes female sex hormones)

Gland	Function
Adrenal glands	Located on the tops of the kidneys, these glands produce steroid hormones such as corticosterone, which helps regulate the body's stress response and maintain homeostasis.
Pituitary gland	The pituitary gland is a small bean-shaped gland at the base of the brain. It controls the thyroid gland, adrenal glands, ovaries and testicles by secreting hormones that signal those glands to also produce hormones.
Hypothalamus	The hypothalamus is a small gland in the brain located near the pituitary gland. It collects information from virtually all other areas of the central nervous system, and in response it releases hormones that tell the pituitary gland which hormones to send out to other glands.
Thyroid gland	The thyroid is a butterfly-shaped gland located in the neck. It controls the metabolic activity of all cells.
Parathyroid glands	These four small glands are located behind the thyroid, like spots on a butterfly's wings. They monitor and regulate calcium levels.
Pancreas	The pancreas is a long, flat organ that sits just behind the stomach. It produces insulin, which allows muscles and tissues to absorb sugar in the bloodstream, and glucagon, which releases sugars from fat to raise blood sugar levels. The pancreas also secretes digestive enzymes called pancreatic juice.
Ovaries	Human females are typically born with two ovaries — female gonads that stem from the uterus. They are the primary female reproductive organs, producing reproductive hormones called estrogen and progesterone, and some lesser hormones called relaxin and inhibin.
Testes	Testes, or testicles, are the male reproductive organs, which are contained in sacs of skin called the scrotum. They produce hormones called androgens, which control the male reproductive system. The most well-known androgen is testosterone.

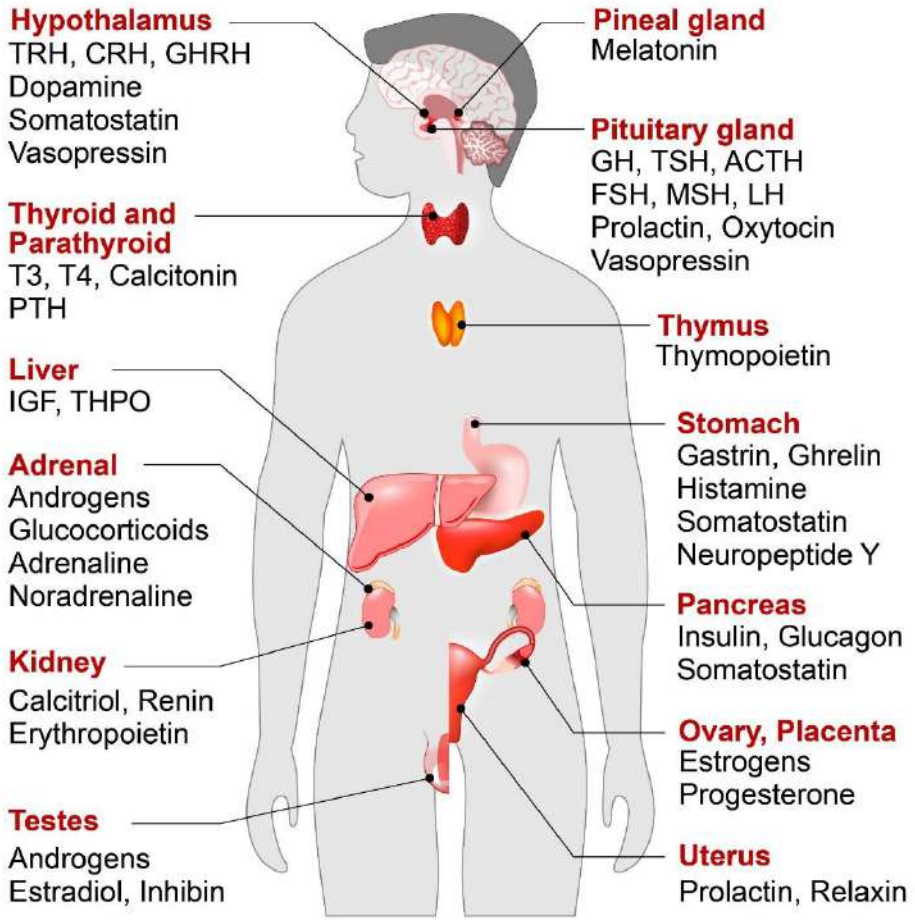
HORMONES


Hypothalamus
TRH, CRH, GHRH, Dopamine, Somatostatin, Vasopressin
Pineal gland
Melatonin
Pituitary gland
GH, TSH, ACTH, FSH, MSH, LH, Prolactin, Oxytocin, Vasopressin
Thyroid and Parathyroid
T3, T4, Calcitonin, PTH
Thymus
Thymopoietin
Stomach
Gastrin, Ghrelin, Histamine, Somatostatin, Neuropeptide Y
Liver
IGF, THPO
Pancreas
Insulin, Glucagon, Somatostatin
Adrenal
Androgens, Glucocorticoids, Adrenaline, Noradrenaline
Kidney
Calcitriol, Renin, Erythropoietin
Ovary, Placenta
Estrogens, Progesterone
Testes
Androgens, Estradiol, Inhibin
Uterus
Prolactin, Relaxin

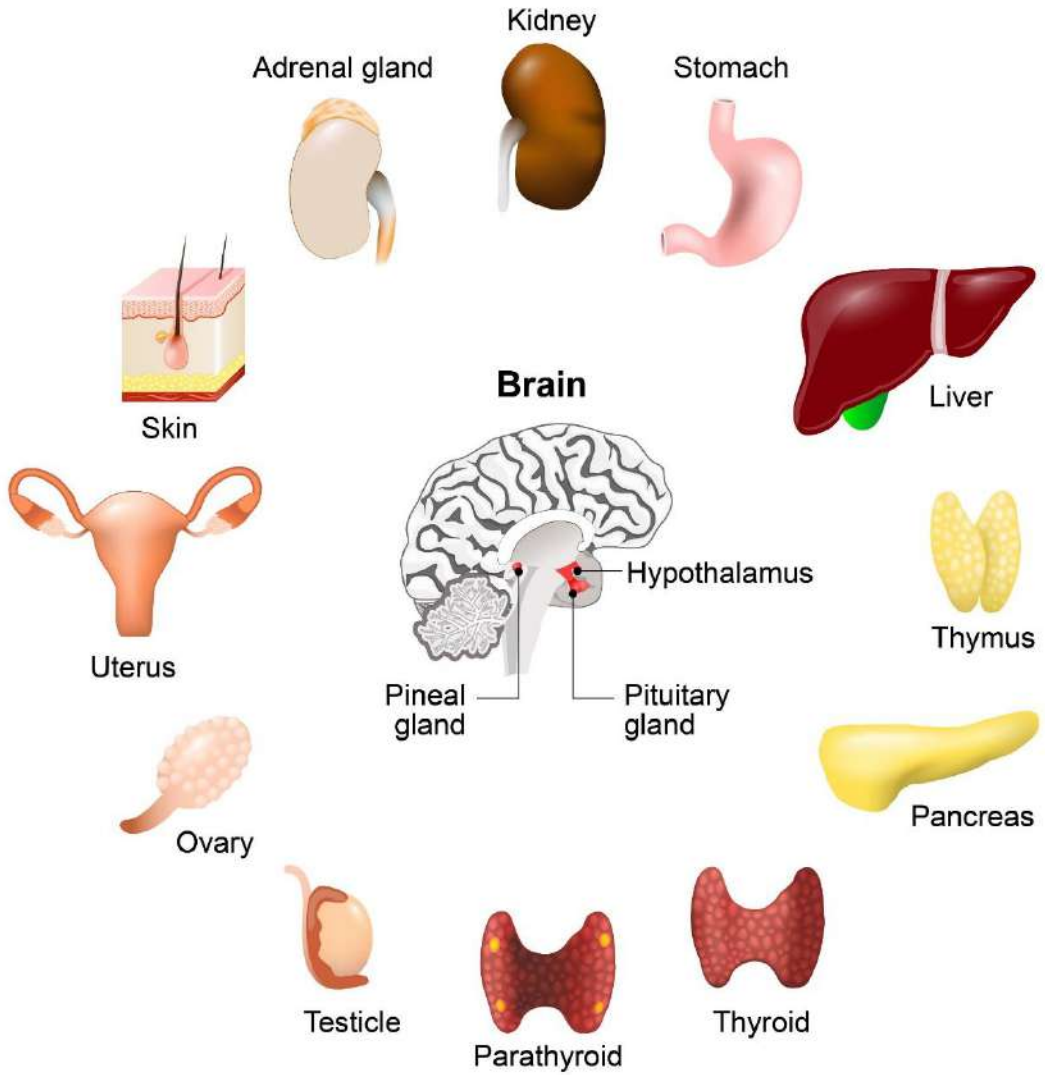

HYPOGLYCEMIA
SYMPTOMS
SWEATING
PALLOR
IRRITABILITY
HUNGER
LACK OF COORDINATION
SLEEPINESS
HYPERGLYCEMIA
SYMPTOMS
DRY MOUTH
THIRST
WEAKNESS
HEADACHE
BLURRED VISION
FREQUENT URINATION


Bile duct
Blood vessel
Endocrine:
Islets of Langerhans cells secrete hormones into blood vessels
Pancreatic duct
Exocrine:
Acinar cells secrete digestive enzymes into pancreatic duct
Duodenum

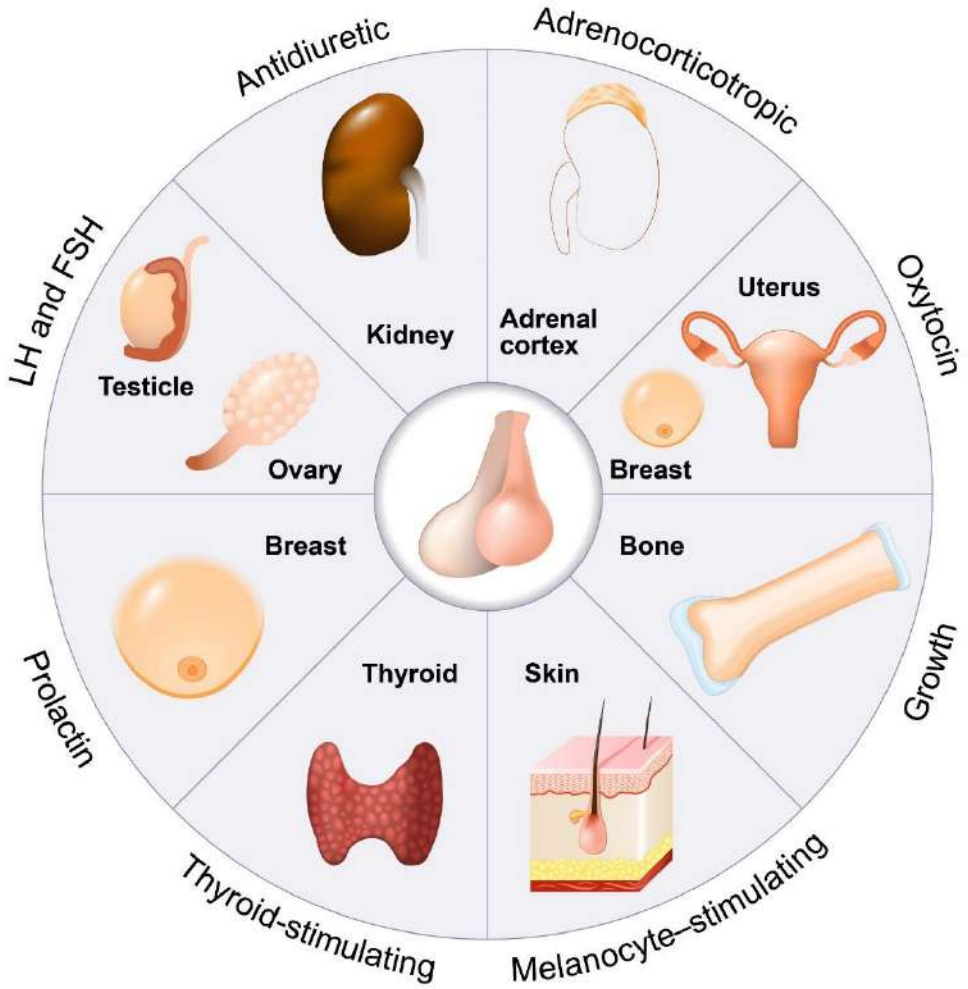
HORMONES


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T3, T4, Calcitonin
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Vasopressin
Thymus
Thymopoietin
Stomach
Gastrin, Ghrelin
Histamine
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Neuropeptide Y
Pancreas
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Ovary, Placenta
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Progesterone
Uterus
Prolactin, Relaxin

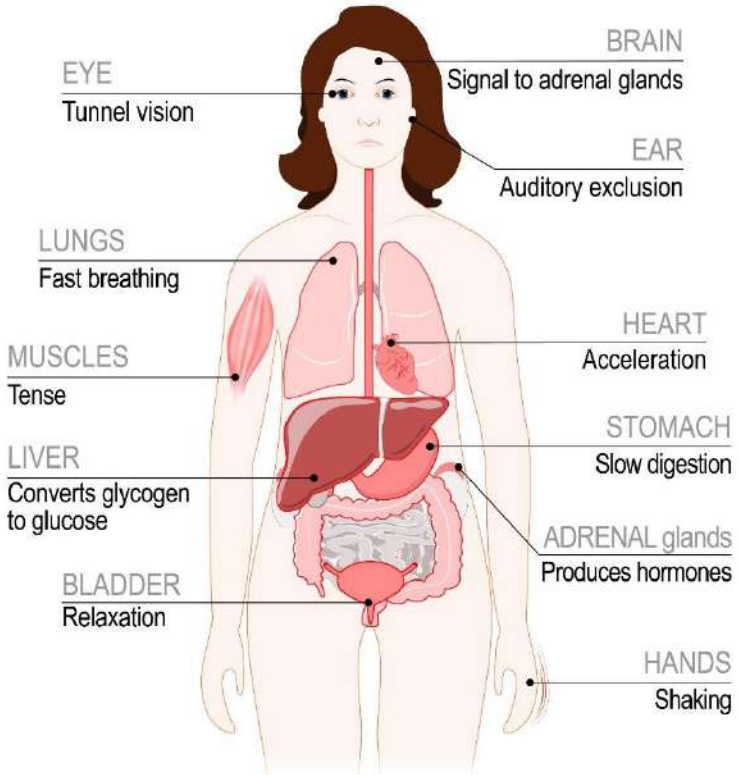
ENDOCRINE SYSTEM

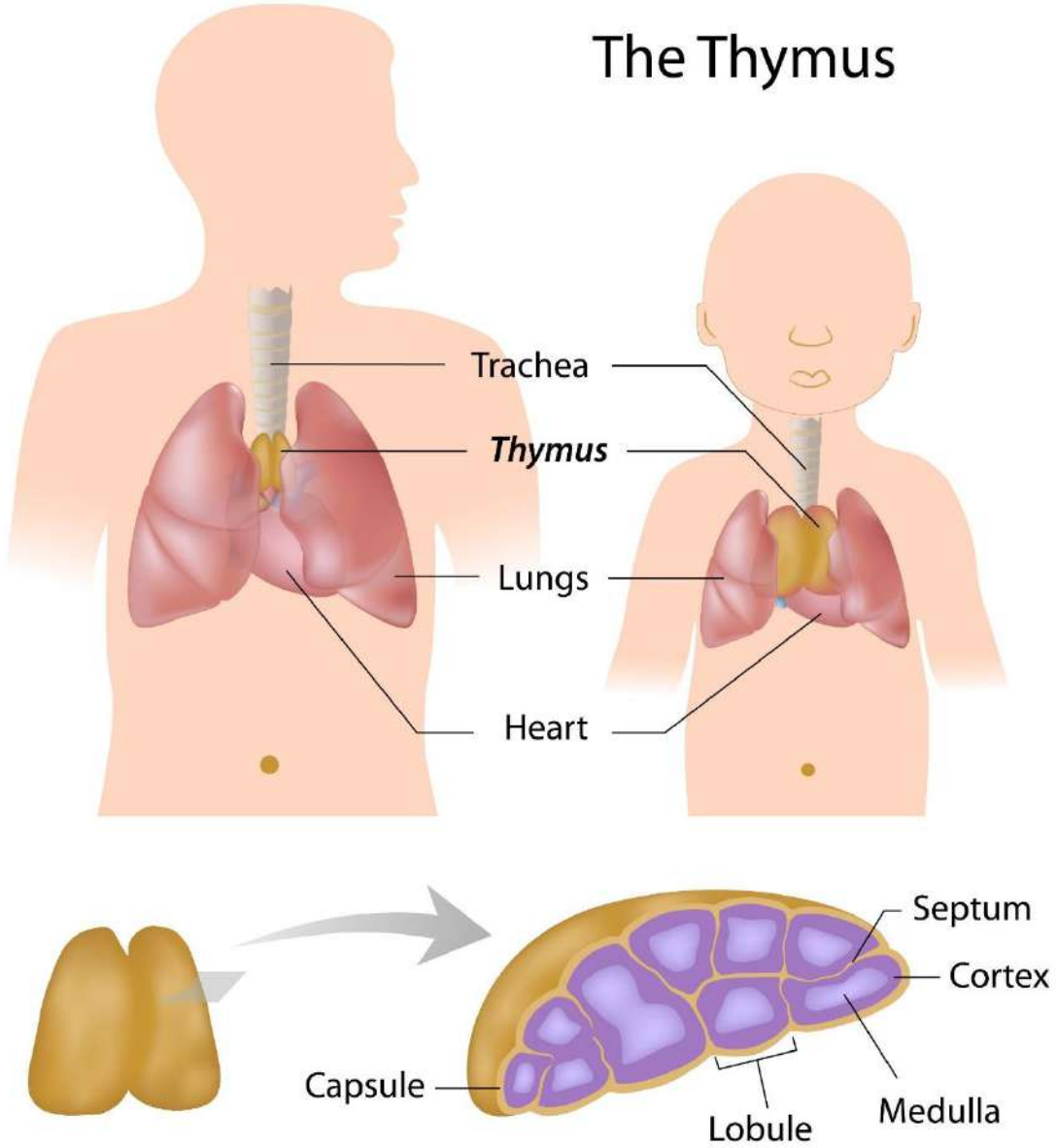


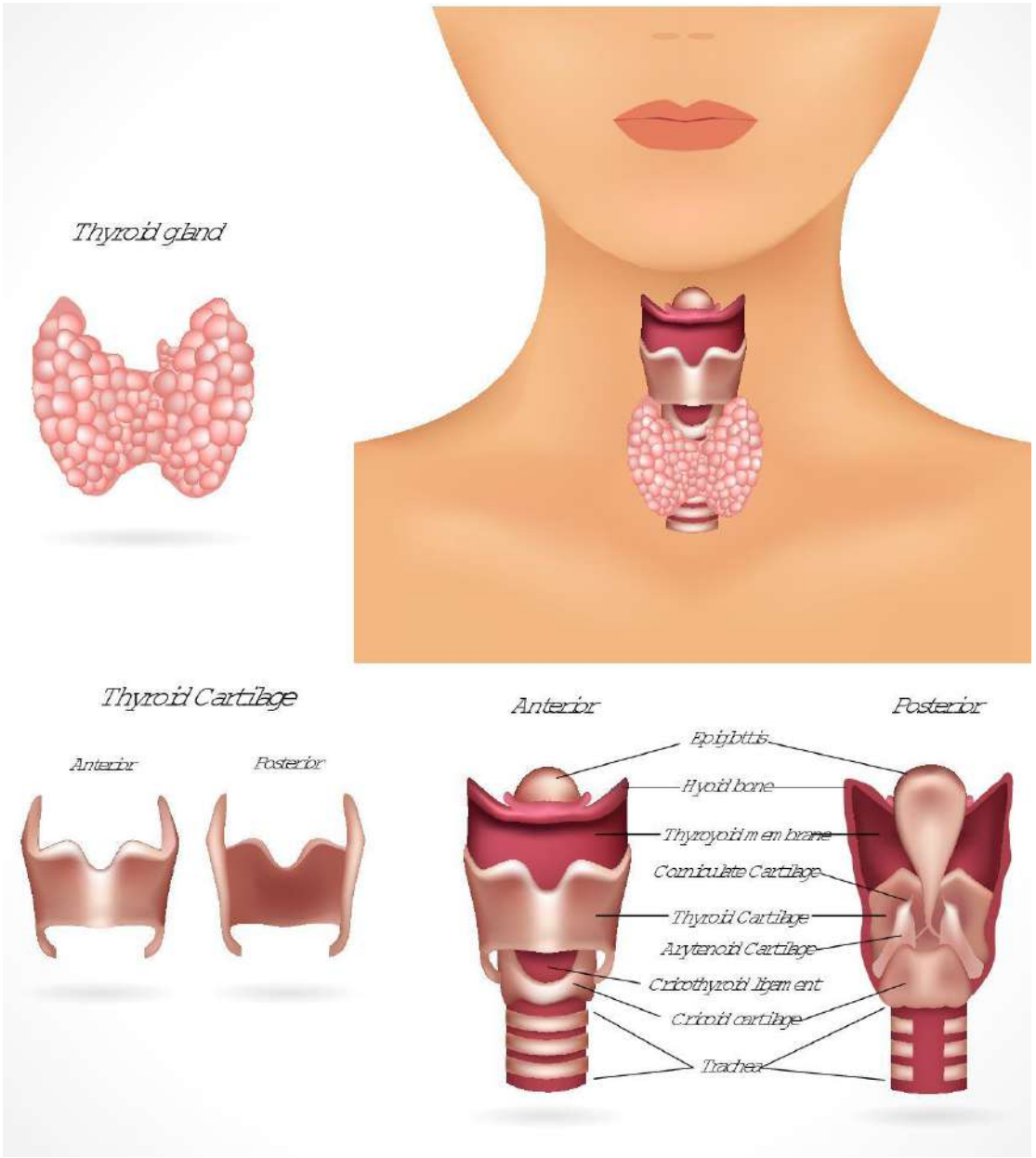
PITUITARY HORMONES



Fight-or-flight response




The Thymus
Trachea
Thymus
Lungs
Heart
Septum
Cortex
Capsule
Lobule
Medulla


Thyroid gland
Thyroid Cartilage
Anterior
Posterior
Anterior
Posterior
Epiglottis
Hyoid bone
Thyroyoid membrane
Corniculate Cartilage
Thyroid Cartilage
Arytenoid Cartilage
Cricothyroid ligament
Cricoid cartilage
Trachea