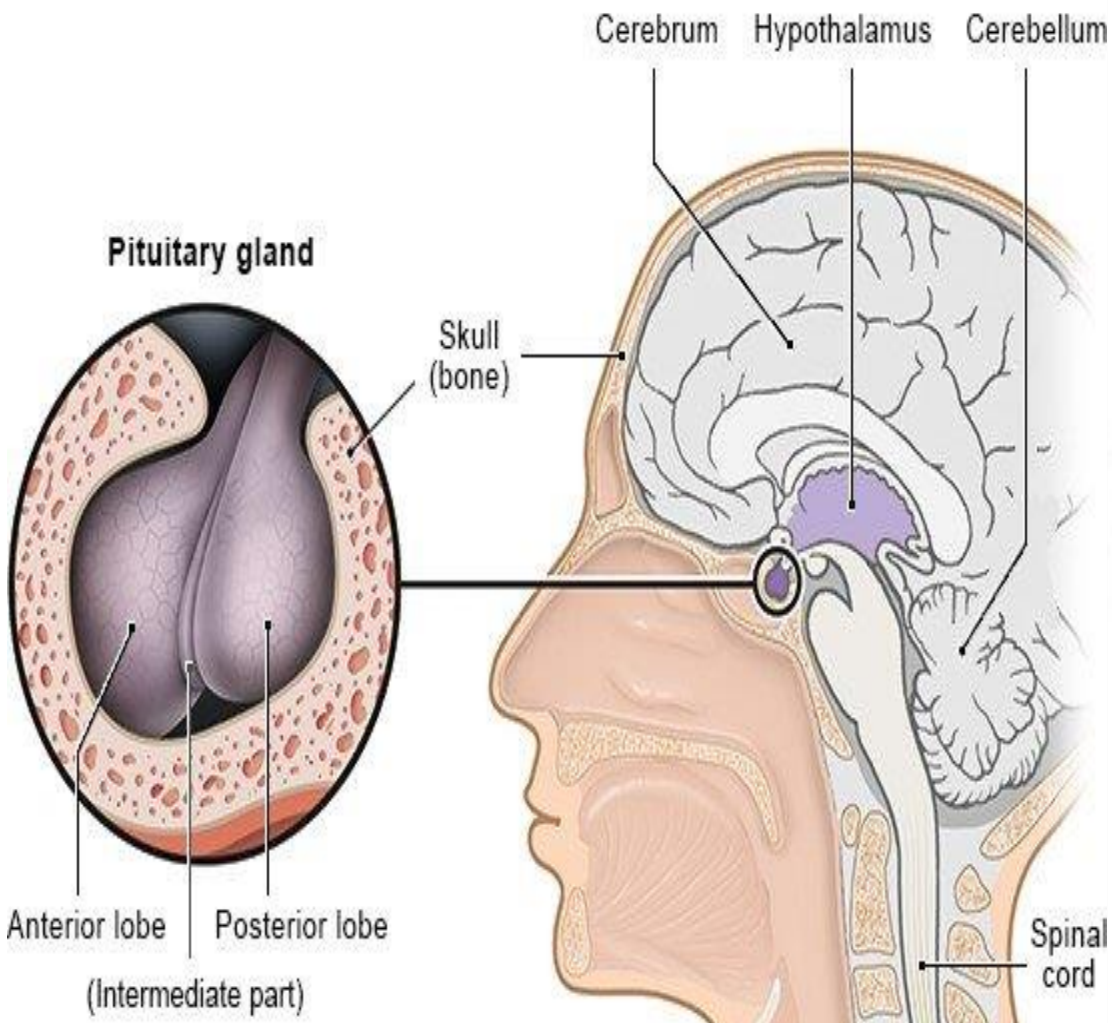
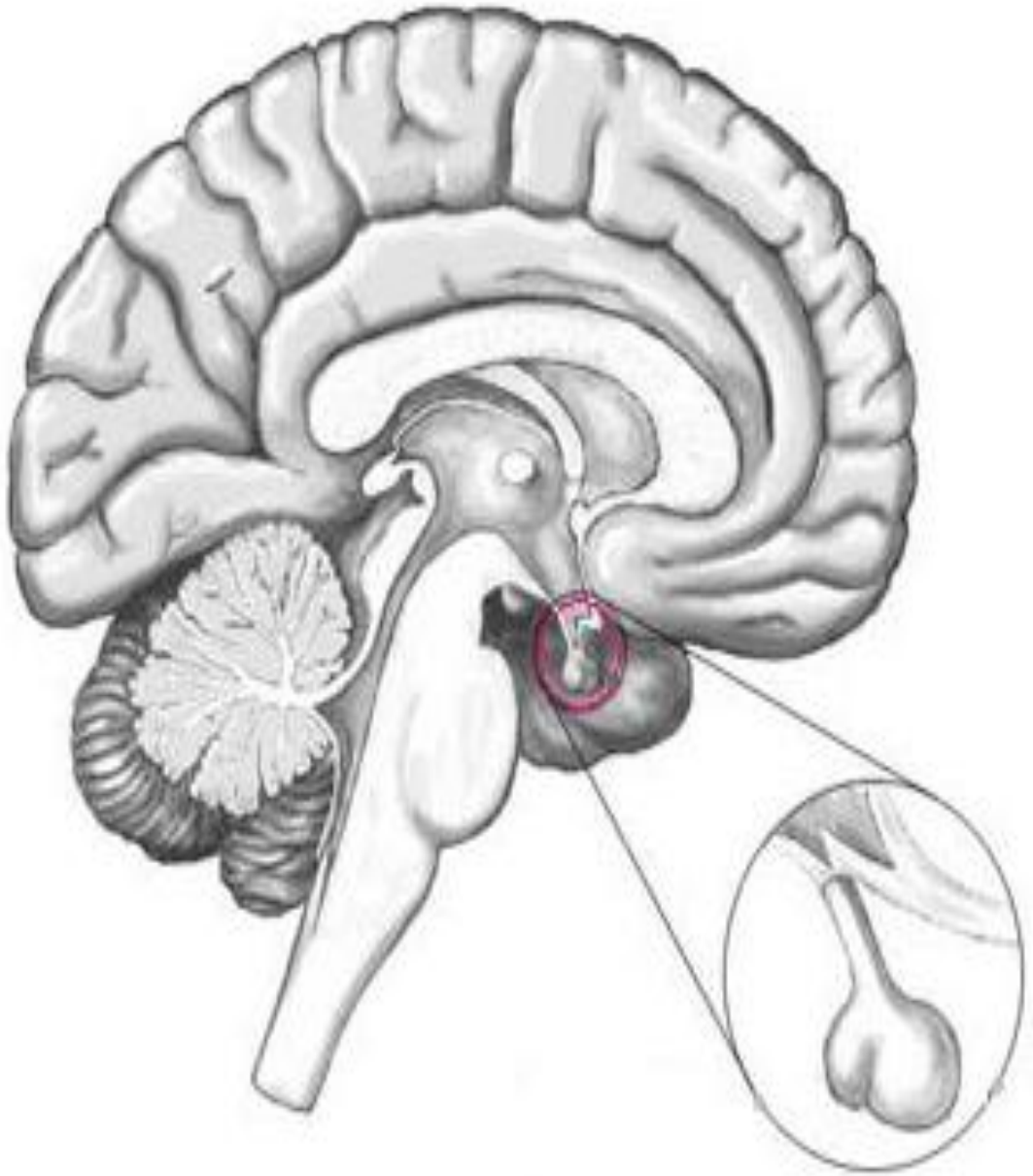
THE PITUITARY GLAND (HYPOPHYSIS CEREBRI)

- The pituitary gland is **an ovoid structure weighing between 500 and 600 mg in an adult.**
- It is located at the base of the brain in a small cavity called ***'pituitary fossa'*** **or** ***'sella tursica',*** which is covered by an extension of the dura mater (***the diaphragma sellae***) **through which passes the pituitary stalk connecting the gland to the hypothalamus.**



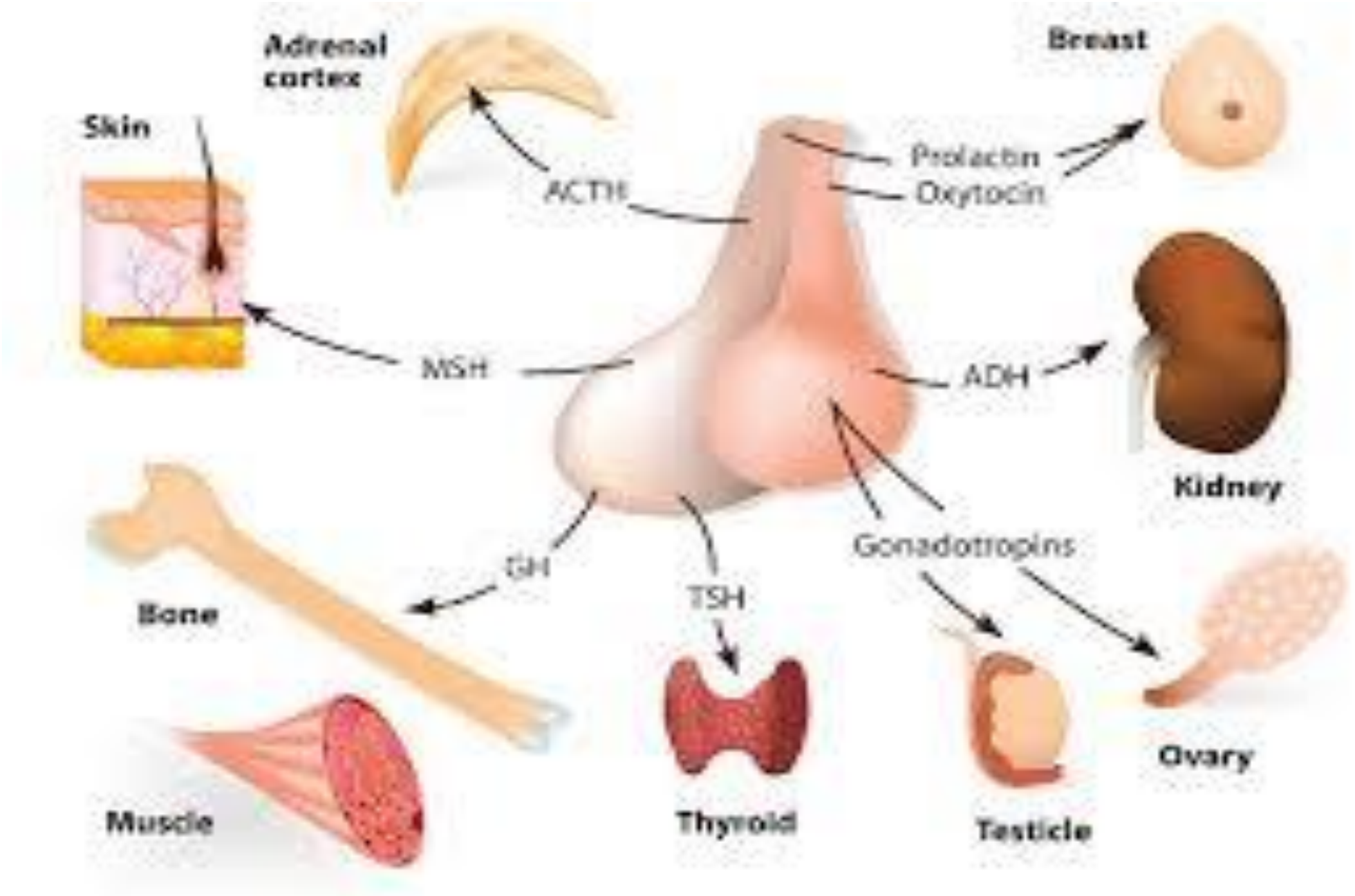


Location of pituitary gland at the base of the brain.

ADENOHYPOPHYSIS (Anterior pituitary)

- The adenohypophysis accounts for 75% of the weight of the pituitary gland**. Its dark red colour is due to the presence of blood sinusoids in between the secretory cells**. In man**, it synthesizes and releases at least 8 hormones:**

1. **Growth hormone** (**also called somatotropic hormone or somatotropin).**
2. **Prolactin** (also called **lactogenic hormone** or mammotropin).
3. **Melanocyte stimulating hormone** (also called **melanotropin or intermedin).**
4. **Thyroid stimulating hormone** (**thyrotropin or thyrotropic hormone).**
5. **Adrenocorticotrophic hormone (or corticotrophin).**
6. **Follicle stimulating hormone.**
7. **Luteinizing hormone** (**in the male it is called interstitial cell stimulating hormone**).
8. **Beta lipotropins.**

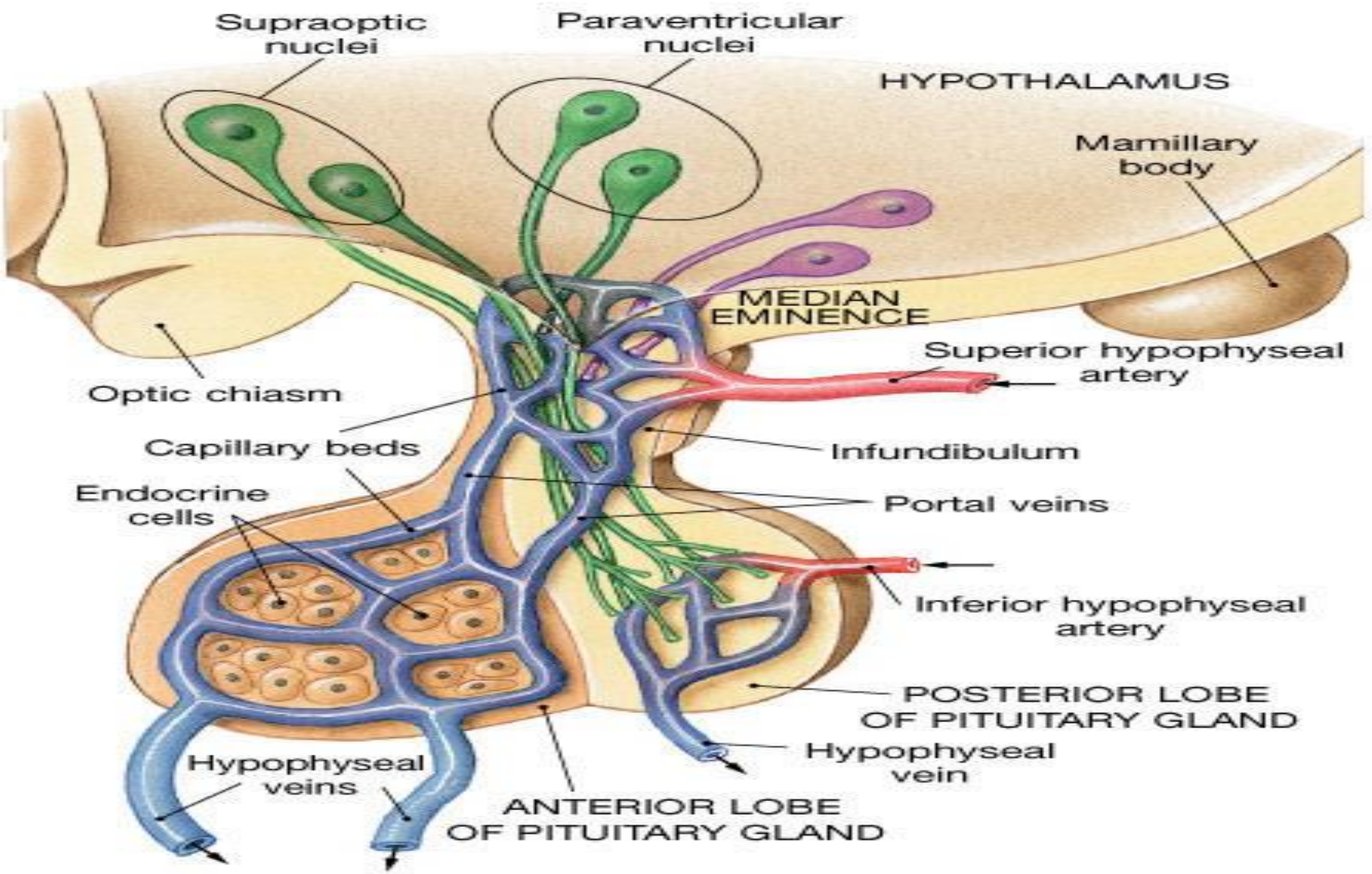

Adrenal cortex
Breast
Skin
Prolactin
Oxytocin
ACTH
MSH
ADH
Kidney
GH
TSH
Gonadotropins
Bone
Ovary
Muscle
Thyroid
Testicle

N.B.: the adenohypophysis controls, through its trophic hormones, all other endocrine glands except the parathyroid, supra-renal medulla and pancreas.

Control of secretion of anterior pituitary hormones:

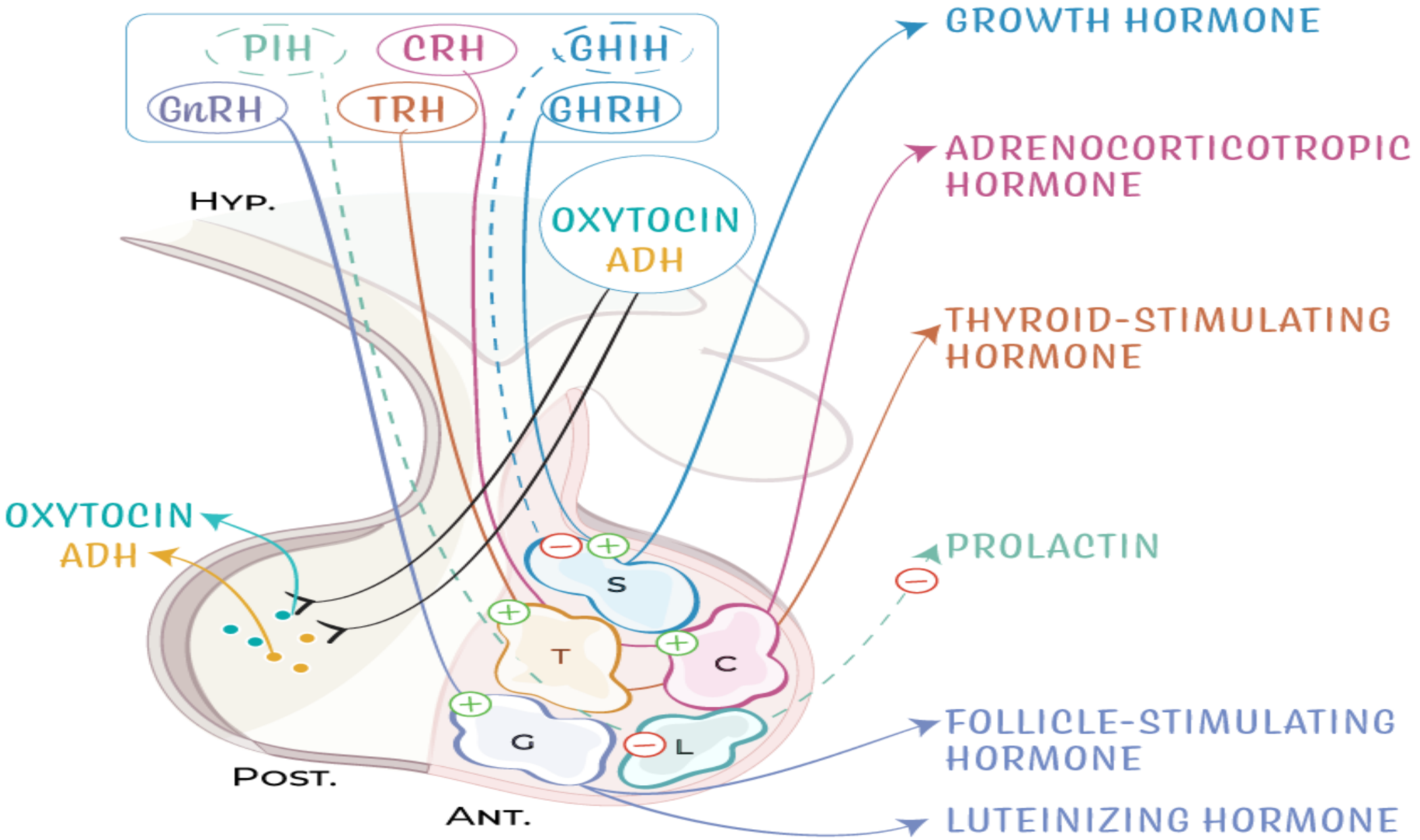
1. Hypothalamic control:

- **The hypothalamus has a major influence on the release and probably the synthesis of the anterior pituitary hormones.** This is achieved by: **hypothalamo-hypophyseal portal circulation.**
- Internal Carotid Artery ---> 2 Superior Hypophyseal Arteries ---> 1st set of capillaries (In Median Eminence & Neural Stalk) ---> Portal Veins **---> 2nd set of capillaries (Sinusoids) (In Anterior Pituitary gland)**



Hormone	Hypothalamic control
- **Growth hormone (GH)**	- **Growth hormone releasing hormone (GHRH)** - Growth hormone release inhibitory hormone (GHRIH) or somatostatin.
- Prolactin or Lactogenic hormone (PH)	- Prolactin releasing hormone (PRH). - **Prolactin release inhibitory hormone (PRIH), more potent.**
- **Melanocyte stimulating hormone (Melanotropin)**	- Melanotropin releasing hormone (MRH). - **Melanotropin release inhibitory hormone (MRIH).**
- Thyroid stimulating hormone (TSH)	- Thyrotropin releasing hormone (TRH).
- **Adrenocorticotrophic hormone (ACTH) and beta-lipoprotein**.	- Corticotropin releasing hormone (CRH).
- Follicle stimulating hormone (FSH) and Luteinizing hormone (LH).	- **Gonadotropin releasing hormone (GRH).**

Hypothalamic & Pituitary Hormones



2. The activity of the anterior pituitary is also influenced by **the hormones of the target glands:** thyroxin, cortisol and the gonadal steroids, **by a negative feedback.**

3. Numerous other mechanisms influence the activity of the anterior pituitary such as physical and emotional stress, coitus and suckling

Pituitary Hormones and Their Functions

PITUTARY GLAND

ANTERIOR LOBE

Growth Hormone
Regulates growth in muscles and bones

Adrenocorticotropic Hormone
Stimulates adrenal gland to secrete cortisol and other hormones

Luteinizing Hormone
Production of estrogen in women and testosterone in men

Endorphin
Regulates pain and associated with brain's pleasure centers

Thyroid Stimulating Hormone
Stimulates thyroid gland to secrete thyroid hormone

Follicle-Stimulating Hormone
Regulates egg cell growth in women and sperm production in men

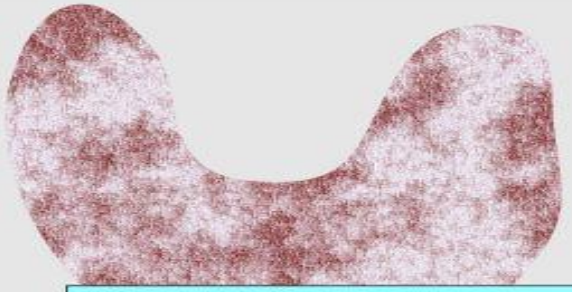
Prolactin
Production of milk during lactation in women

Enkephalins
Associated with endorphins with similar functions

POSTERIOR LOBE

Vasopressin
Conserves water and maintains fluid and electrolyte balance

Oxytocin
Contracts smooth muscles during labor and breast muscles for milk production



Thyroid gland functions

Thyroid gland

TSH stimulate

Functions

1. It has role in growth
2. It has role in the development
3. It stimulate heart rate
4. It stimulates heart contraction
5. Stimulate synthesis of proteins and carbohydrates
6. Degrade cholesterol and triglyceride
7. Enhance beta-adrenergic receptors to catecholamines
8. It increases Vitamin requirements

Gland & region/ cells	Hormones	Regulation of secretion	Functions
Adrenal cortex Zona glomerulosa	Mineralcorticoids, e.g. aldosterone	Stimulated by angiotensin II	Regulates salt & water balance in blood by increasing Na^+ & H_2O absorption and K^+ secretion by the distal convoluted tubules in the kidney
Adrenal cortex Zona fasciculata	Glucocorticoids, e.g. cortisol & weak androgens	Stimulated by adrenal corticotrophic hormone	Suppresses immune response and regulates carbohydrate metabolism
Adrenal cortex Zona reticularis	Weak androgens, e.g. dehydroepiandrosterone	Stimulated by adrenal corticotrophic hormone	Precursor for testosterone production
Adrenal medulla Chromaffin cells	Catecholamines, e.g. Epinephrine & norepinephrine	Preganglionic sympathetic neurons	Increases heart rate, respiration, and blood pressure Constricts vessels to reduce blood flow to GI tract

Type of cell	Secretion	Function
Alpha cell	Glucagon	Raises blood glucose levels
Beta cell	Insulin	Lowers blood glucose levels
Delta cell	Somatostatin	Inhibits growth hormone release from pituitary
PP cell	Pancreatic peptide	Regulate digestive secretion and motility
Epsilon cell	Ghrelin	Orexigenic

The Female Body

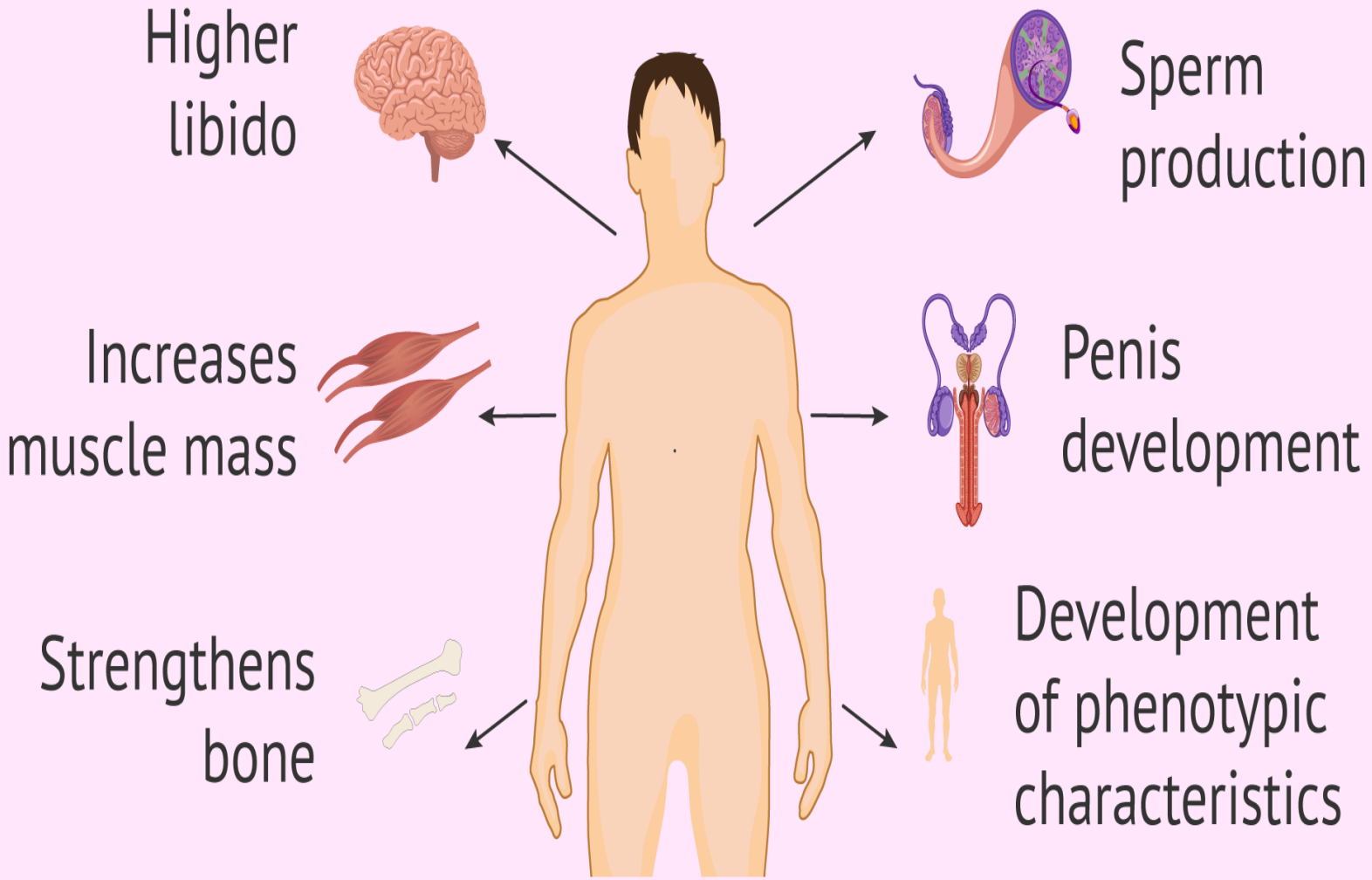
Estrogen

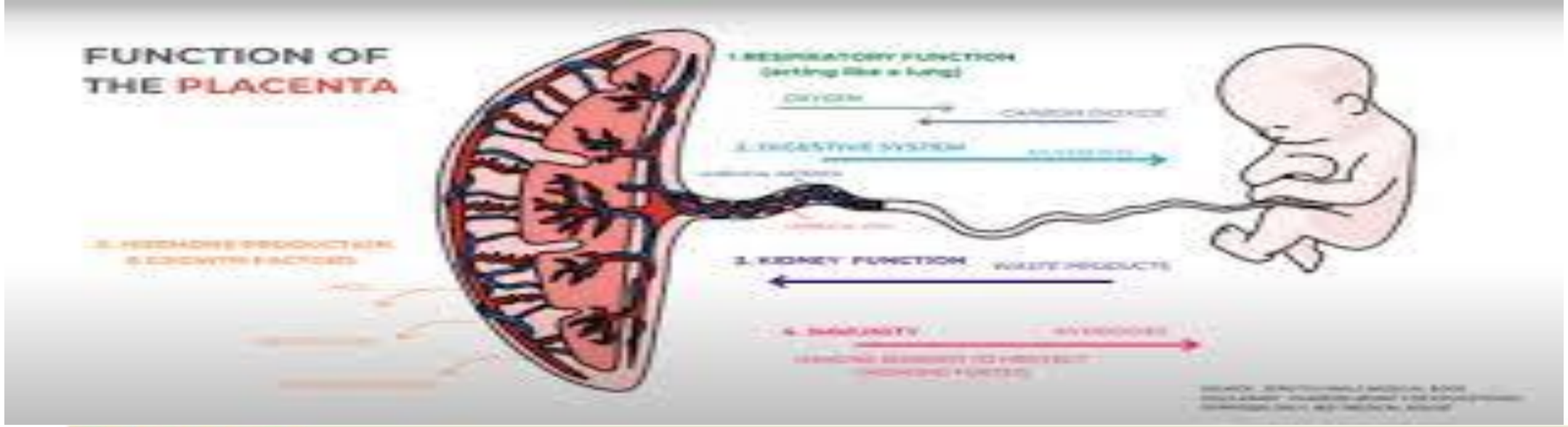
- Development of secondary sex characteristics
- Growth of uterus during puberty
- Initial growth of endometrium during menstrual cycle

Progesterone

- Development of breasts during puberty
- Growth of endometrium during menstrual cycle
- Inhibition of uterine contractions during pregnancy

FUNCTIONS OF TESTOSTERONE





PLACENTA

Human chorionic gonadotropin (hCG)	Stimulates the corpus luteum in the ovary to continue the production of estrogens and progesterone to maintain pregnancy.
Estrogens and progesterone	Maintain pregnancy and help prepare mammary glands to secrete milk.
Human chorionic somatomammotropin (hCS)	Stimulates the development of the mammary glands for lactation.

1- WHICH OF THESE HORMONES FUNCTIONS TO PRODUCE MILK DURING LACTATION?

Growth hormone (a

Luteinizing hormone (b

Endorphin (c

Prolactin (d

Thyroxin (e

2- WHICH OF THESE HORMONES FUNCTIONS TO CONSERVE WATER AND MAINTAIN FLUID AND ELECTROLYTE BALANCE

Oxytocin (a

Endorphin (b

Estrogen (c

Antidiuretic hormone (d

Growth hormone (e

3-WHICH OF THESE HORMONES SERVES TO PRODUCES ESTROGEN IN WOMEN AND TESTOSTERONE IN MEN?

Luteinizing hormone (a

TSH (b

ACTH (c

Growth hormone (d

Melanocyte stimulating hormone (e

4- WHICH OF THESE PLACENTAL HORMONES STIMULATES CORPUS LUTEUM IN THE OVARY TO CONTINUE PRODUCING ESTROGEN AND PROGESTERONE TO MAINTAIN PREGNANCY

Estrogen (a

Human chorionic somatomammotropin (b

Progesterone (c

Human chorionic gonadotropin (d

Relaxin (e