

Anterior pituitary hormones

BY

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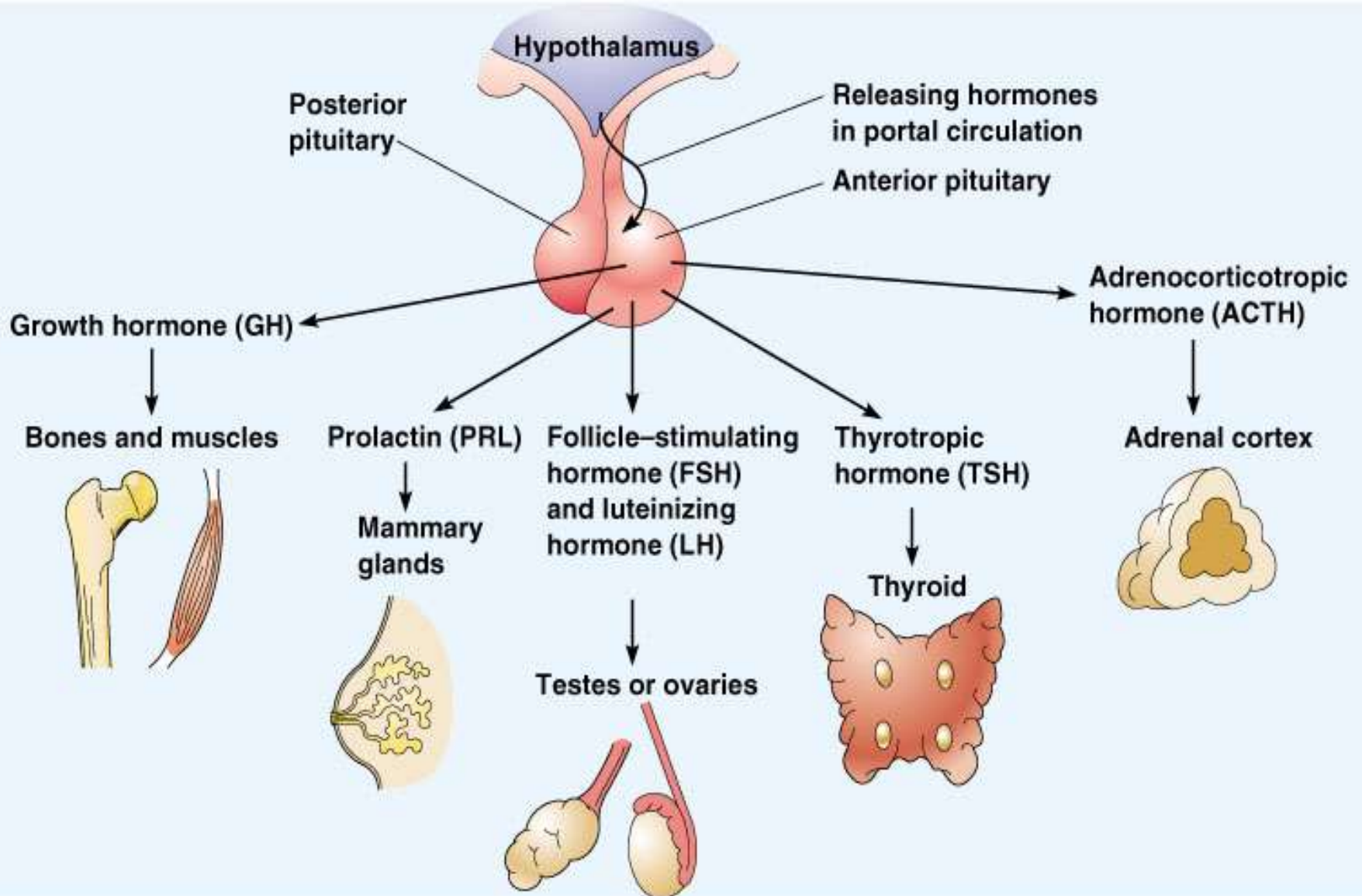
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• **Anterior pituitary (Adenohypophysis)**

- “Master gland” (makes & secretes various **tropic** or **tropin** hormones)
- **Tropic or tropin hormones**
 - Act on other endocrine glands
 - Stimulate release of their hormones
 - often in a negative feedback relationship

Hormones of the anterior pituitary



Hormones of anterior pituitary

1. Thyroid stimulating hormone or Thyrotropic hormone **(TSH)**
2. Adrenocorticotrophic hormones **(ACTH)**
3. Gonadotropic hormones
 - Follicle stimulating hormone **(FSH)**
 - Luteinizing hormone **(LH)**
4. Growth hormone **(GH)**
5. Prolactin **(PRL)**

Thyroid stimulating hormone (TSH)

“Thyrotropin”

- **Functions:**

- 1 - It stimulates the development of the thyroid gland, helps its growth and increases vascularity.
- 2 - It also stimulates the process of thyroxine hormone formation.

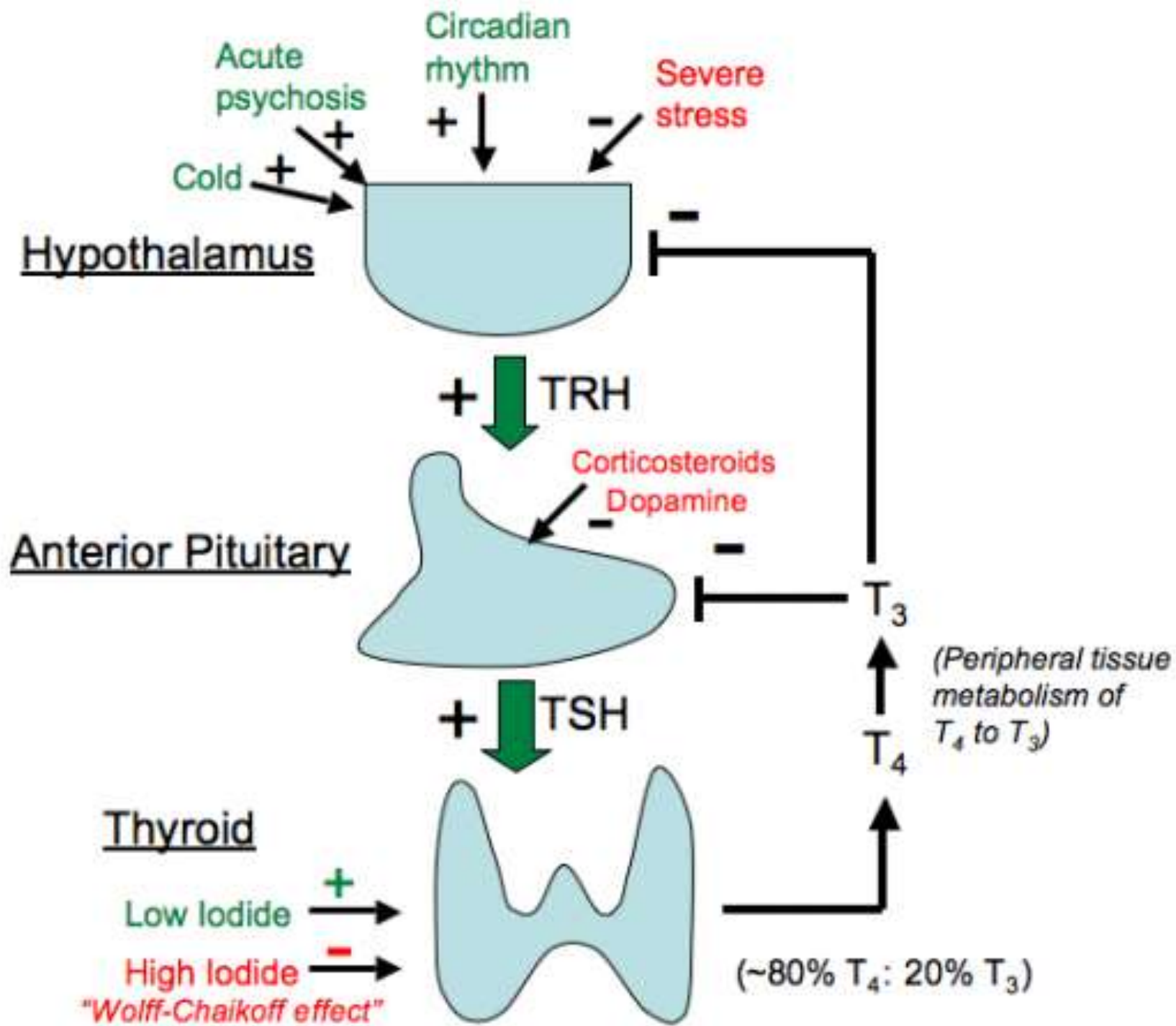
CONTROL

- **1- Negative feedback mechanism**

Increase thyroxine level in blood inhibits TSH secretion and inhibits the thyrotropin releasing factor from the hypothalamus.

- **2-Thyrotropin releasing factor**

Stimulates TSH secretion



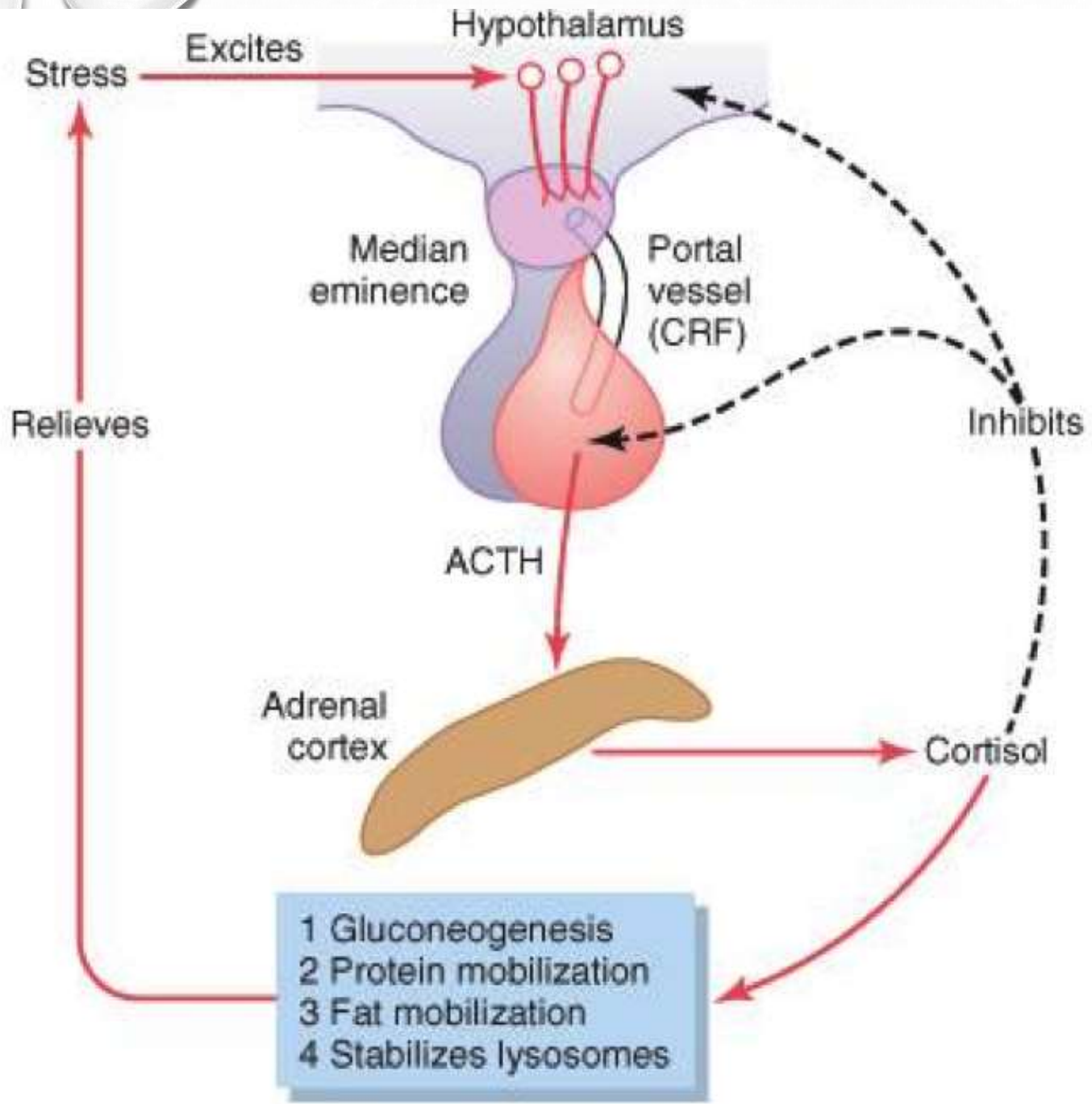
Adrenocorticotrophic hormone (ACTH) or “corticotropin”

Functions:

- 1- It stimulates the development of the adrenal cortex.
- 2- It stimulates the formation and secretion of all the adrenal cortex hormones **except** aldosterone hormone .
- 3- It has a fat mobilizing effect.
- 4- It has melanocyte-stimulating effect.

CONTROL

- 1- Feedback mechanism : Increase in adrenocortical hormones level in blood → inhibits **ACTH** secretion directly on the anterior pituitary and through inhibition of the hypothalamus.
- 2- Stress: Emotional stress stimulate the hypothalamus to secrete corticotropin - releasing factor to stimulate **ACTH** secretion.
- 3- ADH : Stimulates corticotropin release.



Gonadotropins hormones

A- follicle-stimulating hormone (FSH)

B-luteinizing hormone (LH)

- Two hormones are secreted from the anterior pituitary to **REGULATE THE OVARIAN AND TESTICULAR ACTIVITY** :

FUNCTIONS:

A- Follicle-stimulating hormone (FSH):

IN FEMALES It stimulates the growth and maturation of graafian follicle and secretion of estrogen from it .

IN MALES It stimulates spermatogenesis.

B-luteinizing hormone (LH) OR Interstitial cell stimulating hormone:

IN FEMALE

- It stimulates final maturation of graafian follicle and ovulation
- Formation of corpus luteum and secretion of progesterone.

IN MALE It stimulates the interstitial cells of leydig and secretion of testosterone hormone

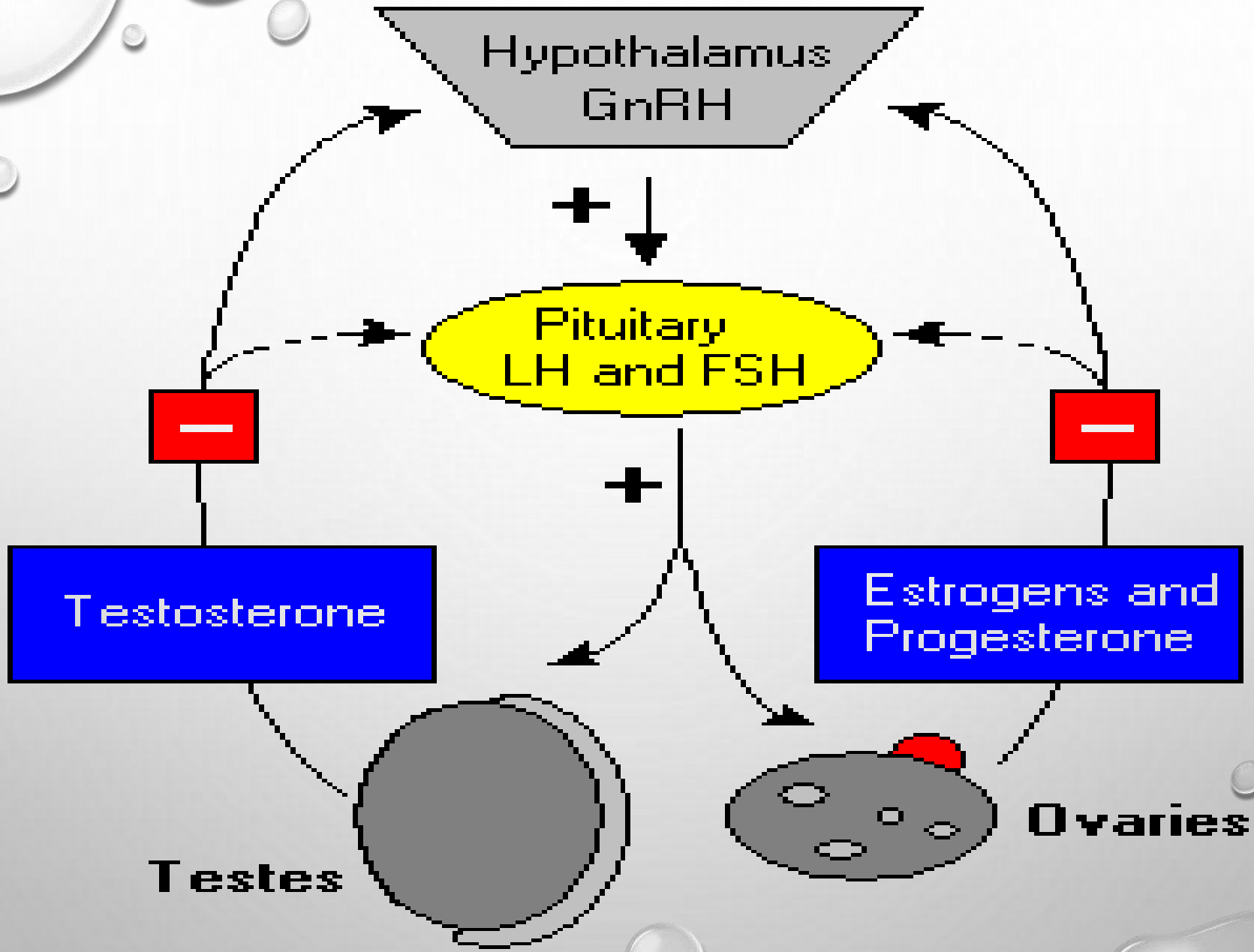
CONTROL

1- FEEDBACK MECHANISM

- **Moderate constant increase in the plasma estrogen level** inhibits FSH secretion (negative feed back effect).
- **Sudden increase in the plasma estrogen level** Stimulates LH secretion.
(LH surge) (positive feed back effect).
- **Increase in progesterone level in blood** inhibits LH secretion .
- **High testosterone blood level** feeds back to inhibit LH secretion at both the hypothalamic and pituitary levels

2- HYPOTHALAMUS

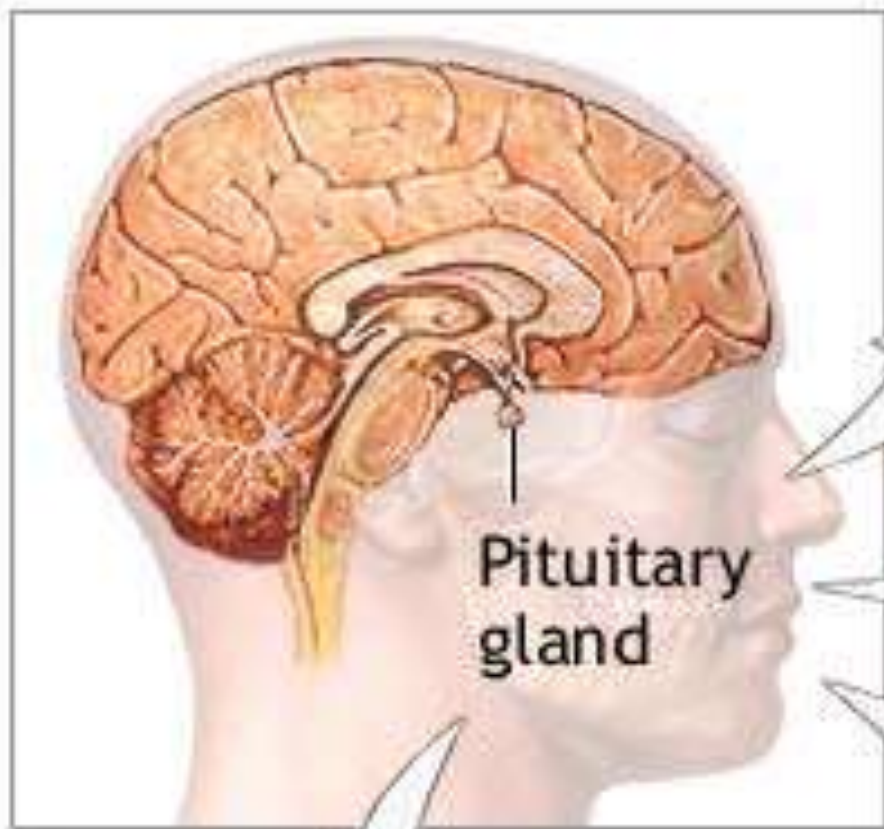
- It secretes gonadotropin-releasing factor (*LH-FSH-releasing factor*) .
- Fear of pregnancy in girls and emotional upsets inhibit the releasing factors
→ inhibit FSH and LH secretion → stoppage of menstrual cycle



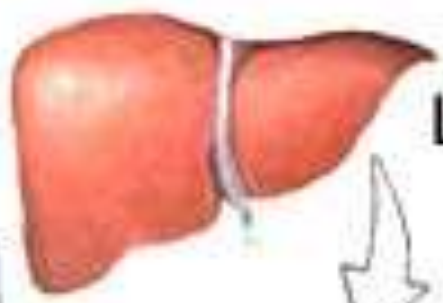
GROWTH HORMONE (GH)

“SOMATOTROPIN”

- * **It is** a polypeptide hormone formed of 191 amino acids.
- * The growth hormone is metabolized rapidly in the liver which is responsible for its duration of action (**20 minutes**) .



Pituitary gland



Liver



Bone



Skeletal muscle



Adipose tissue

Functions of growth hormone

This hormone stimulates growth of all tissues of the body .

it increases the **size** and **number** of the cells by :

1- Increase rate of protein synthesis

- It causes protein accumulation in all cells of the body by enhancement of amino acids transport through the cell membrane.
- This results in decreased amino acid blood level
- It increases transcription of DNA to form RNA.
- It stimulates RNA translation in ribosomes.

2- Lipolytic and ketogenic effect (Stimulate lipolysis)

- It increases mobilization of fatty acids and increases the use of fatty acids for supplying energy (protein sparing effect).
- So, Excess hormone → Ketosis

3- Decreases utilization of carbohydrate for energy production

- It decreases the use of glucose for energy production as a result of increased utilization of fatty acids for energy.
- It depresses uptake of glucose by the cells , so it increases the blood glucose level = anti-insulin effect (diabetogenic effect) .
- It increases insulin release from pancreas (over stimulation) that causes burn out of the beta cells of the pancreas.

4- **it increases calcium absorption** from the G.I.T.

5- **it causes reabsorption of Na^+ , K^+ , Ca^{++} , PO_4^{--} ,
and CL^-** from the kidney and so , helping bone
matrix formation.

6-chondrogenesis and bone growth

- In **young subjects** in which the epiphysis have not yet fused to the long bones , growth hormone stimulates **chondrogenesis** (proliferation of epiphyseal cartilage), and as the cartilaginous epiphyseal plates widen, they lay down more matrix at the end of long bones with stimulation of osteoblastic activity (bone forming cells) → increased length of long bones.
- In **adult subjects** in which the epiphysis are closed the linear growth is impossible.

Control of growth hormone secretion

1-feedback mechanism:

- Hypoglycemia and increased amino acid concentration in blood, stimulate the release of G.H.
- Growth hormone feeds back to inhibit its own secretion through the following:

A-Increased blood level of FFAs

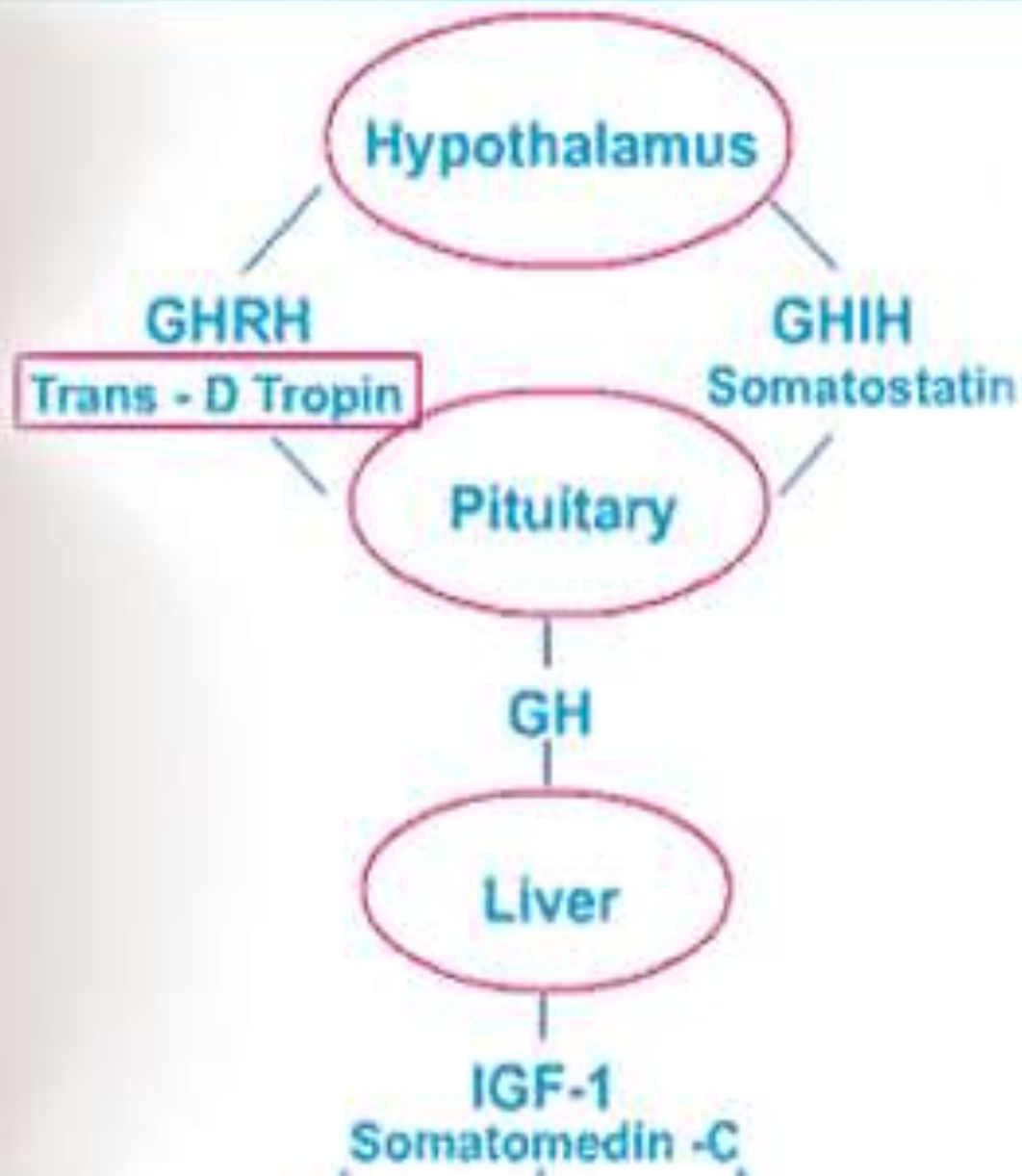
B-Increased blood level of IGF-1

Both cause inhibition of the GH release from the anterior pituitary

2- hypothalamus:

- It secretes a **somatotropin- releasing factor** (SRF) which stimulates the release of G.H.
Cellular depletion of proteins enhances SRF secretion (to correct the protein deficiency) beside stressful stimuli.
- The hypothalamus also release an inhibitory factor , **somatostatin**.

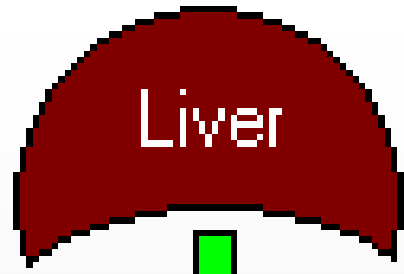
Flow Chart Representing Growth Hormone Production



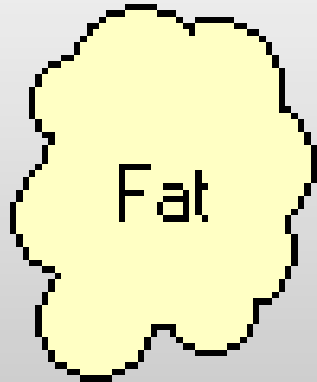
Mechanism of action of growth hormone

- G.H. Acts on the liver to produce **somatomedin C** (**IGF-1**)
- Induce growth promoting activities in many tissues as cartilage with a prolonged duration of action.

**Growth
Hormone**



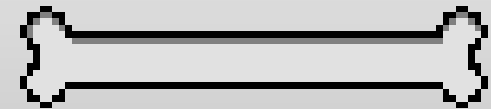
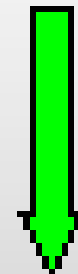
Liver



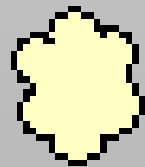
Fat



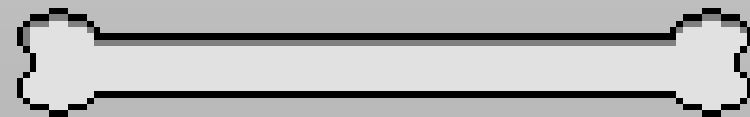
IGF-1



**Direct
effect**



**Indirect
effect**



Prolactin hormone

- **It is** one of the hormones of the anterior pituitary gland , secreted by the lactotrope cells .
- It is a polypeptide hormone consists of 199 amino acids.

Control of secretion

1. Hypothalamic control:

- The hypothalamic effect is mainly inhibitory.
- Two hypothalamic factors for prolactin regulation
 - **Prolactin release inhibiting factor: Dopamine**
 - **Prolactin releasing factor: TRH**

2.Hormones

1-Thyroxine → Inhibit prolactin secretion via -ve feedback

2-Estrogens → Stimulate the release of prolactin via:

A- increase the number of TRH receptors on the lactotrope cells.

B- stimulate lactotrope to secrete prolactin.

C- increase proliferation of lactotrope.

3- prolactin secretion is increased also during sleep (its level rises after the onset of sleep and persists throughout the sleep period)

4- prolactin secretion is increased also during exercise

(through dopamine inhibition at hypothalamus)

Normal level of prolactin

- The normal level of prolactin is 10-25 ng/ml with diurnal variation in which the peak level occurs 4-5 hours after the onset of sleep.
- During pregnancy , Prolactin levels rise to high concentrations (reach 200-400 ng/ml at term) this is due to **increase in estrogen** secretion from the placenta.

- In non-breast-feeding woman , Prolactin level returns to normal non pregnant level in 7 days after delivery.
- In breast-feeding woman , Suckling increases the prolactin level to 400-800 ng/ml

Functions of prolactin

1. It is the principal hormone that stimulates **milk formation**.
2. It inhibits ovulation by blocking the effect of gonadotropic hormone on ovaries . this is the cause of amenorrhea during lactation
3. It has a general metabolic functions like those of growth hormone. e.g. diabetogenic action .

4. During pregnancy , the high level of prolactin stimulates breast growth, however, no lactation occurs

- **Lactation** is inhibited during pregnancy by estrogen and progesterone (secreted from the placenta) which interferes with lactogenic effect of prolactin.
- The rapid disappearance of estrogen and progesterone after delivery allow prolactin to stimulate milk formation.

A vibrant sunset or sunrise over a body of water. The sky is a mix of deep red, orange, and purple, with a bright sun partially obscured by dark, silhouetted clouds. The sun's light reflects on the water below. The text 'THANK you' is overlaid in large, bold, blue letters with a white outline. The word 'THANK' is in all caps, while 'you' is in lowercase. The background image is framed by a light gray border with several white, bubble-like circles scattered around the edges.

THANK you