

Lecture No.-4

Hypothalamus

1. It is **located** adjacent to the third ventricle
2. It receives input from various regions of brain, sensory signals from visceral organs and retina.
3. It controls autonomic nervous system,
4. Regulates body temperature,
5. Thirst, hunger,
6. Sexual behaviour and defense reactions like fear and rage.
7. It forms the critical link between the nervous system and the endocrine system.
8. It regulates both autonomic nervous activity and several aspects of endocrine function.
9. It monitors the state of the body's internal environment by analyzing negative feedback
10. Secretory neurons in the **arcuate, paraventricular, supra optic nuclei and preoptic area** of hypothalamus synthesize and secrete **seven hormones called hypophysiotropins** otherwise known as hypothalamus-releasing hormones/factors (RH or RF) and hypothalamus inhibitory hormones or factors (IH or IF).
11. These hypothalamic hormones pass via the hypophyseal portal system to pituitary gland and regulate the release of all the six hormones of the adenohypophysis.
12. Regulation of the anterior pituitary secretions is mediated by the reciprocal actions of RH or IH of the hypothalamus and the concentrations of hormones of the pituitary gland
13. The releasing hormones of hypothalamus include

- a. Growth Hormone-Releasing Hormone (GHRH/ GRH): Increases the release of GH
- b. Thyroid Stimulating Hormone–Releasing Hormone (TRH): Increases the release of TSH
- c. Corticotropin- Releasing Hormone (CRH): Increases the release of ACTH
- d. Gonadotropic - Releasing Hormone (GnRH/LHRH): Increases release of FSH and LH
- e. Prolactin-Releasing Hormone (PRH): increases release of prolactin

14.The inhibitory hormones of hypothalamus include

- a. Somatostatin (SRIF/ GHIH): Inhibits the release of GH.
- b. Prolactin Release Inhibitory Hormone (PIH-Dopamine): Inhibits the prolactin secretion

15.The hormones released by the neurohypophysis –Oxytocin and ADH, are actually formed in the paraventricular and supraoptic nuclei of hypothalamus.

16.They then travel via nerve fibres to the neurohypophysis for storage until release.

GHRH (SOMATOCRININ OR SOMATOTROPIN RELEASING HORMONE)

1. Peptide hormone **containing 44** amino acids.
2. It regulates GH release.
3. Factors that stimulate release of GHRH
 - **estradiol, progesterone, stress (trauma and fever), deep sleep and exercise.**
4. Factors that inhibit GHRH release –

somatomedins, increased levels of glucose and fatty acids, , melatonin.

5. GH exhibits a negative feed back inhibition to GHRH release.
6. As a **galactopoitic agent GHRH causes 10 to 25 % increase in milk yield, total milk fat, protein, and lactose when injected to cow and ewes.**

TRH (THYROID STIMULATING HORMONE - RELEASING HORMONE)

1. TRH is a tripeptide and it stimulates release of TSH.
2. TRH also stimulates the secretion of ACTH, PRL, vasopressin, and GH.
3. Circulating level of T₃ or T₄ has negative feedback effect on TRH and TSH.

CRH (CORTICOTROPIN RELEASING HORMONE)

1. It is a **41 amino acid peptide that stimulates ACTH synthesis and release by the corticotroph cells of pituitary gland.**
2. Stress enhances its synthesis and release.
3. **CRH secretion is influenced by circadian light- darkness cycle.**
4. In diurnal animals (cattle, dog, horse) it stimulates ACTH synthesis during morning hours.
5. CRH stimulate the sympathetic nervous system,

SOMATOSTATIN (SOMATOTROPION RELEASE-INHIBITING HORMONE - SRIF)

1. It is a **peptide present in two forms - 14 and 24-28 amino acids, also present in pancreas**
2. Potent inhibitor of GH, also inhibits TSH, insulin and glucagon.
3. Its production is stimulated by GH release from the pituitary, ingestion of carbohydrate, fat, protein, and high level of glucose, amino acids,

4. Somatomedin C (from the liver), inhibit the release of somatostatin.
5. Somatostatin has been isolated from brain, pancreas and intestine.

GnRH (GONDOTROPIC RELEASING HORMONE)/(LHRH)

1. It is a **decapeptide** that stimulates the release of both FSH and LH.
2. The frequency of GnRH stimulus is the major regulator of the relative proportions of FSH and LH synthesis and release i.e., less frequent GnRH pulse leads to FSH secretion and more frequent GnRH pulse causes LH secretion.
3. When estradiol predominates GnRH favours the LH surge to effect ovulation.
4. Under the influence of high progesterone level GnRH induces FSH to stimulate folliculogenesis and steroidogenesis.
5. **Inhibinis a glycoprotein hormone from ovarin follicle and testicular seminiferous tubules inhibit GnRH secretion.**
6. **Prolactin and LH inhibit GnRH via short-loop negative feed back effect.**
7. **GnRH secretion is also influenced by light- dark cycle, pheromones and stress.**

PIH (PROLACTIN - INHIBITING HORMONE)

1. Dopamine is the PIH.
2. Apomorphine and ergot alkaloids inhibit prolactin secretion.
3. Bromocriptine – a long acting dopamine receptor agonist reduces prolactin secretion.