Practical endocrinology –First course

Lecture- 1- INTRODUCTION TO ENDOCRINOLOGY

Sawa University	جامعـــــة ســـــــاوة الاهلية
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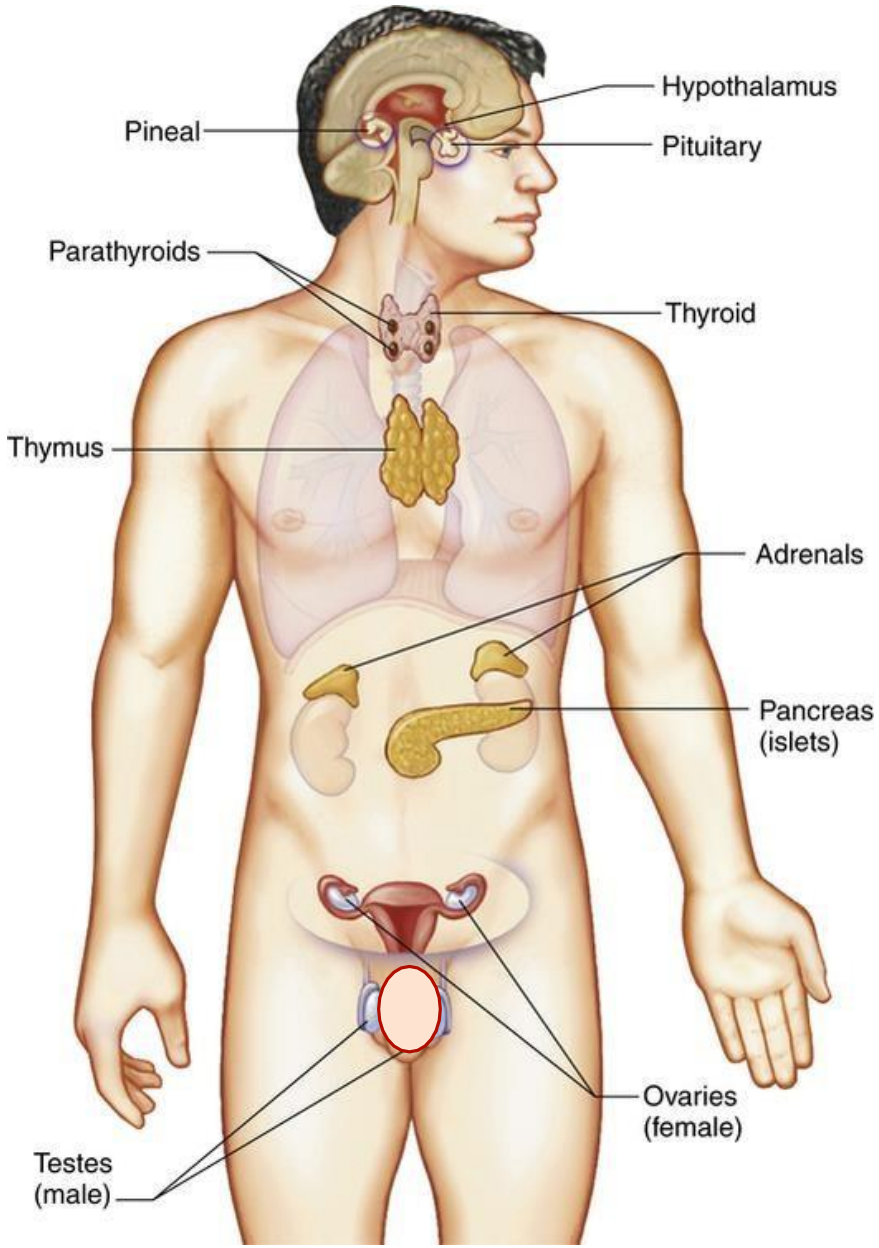
Third Stage	المرحلـــــــــــة الثالثة

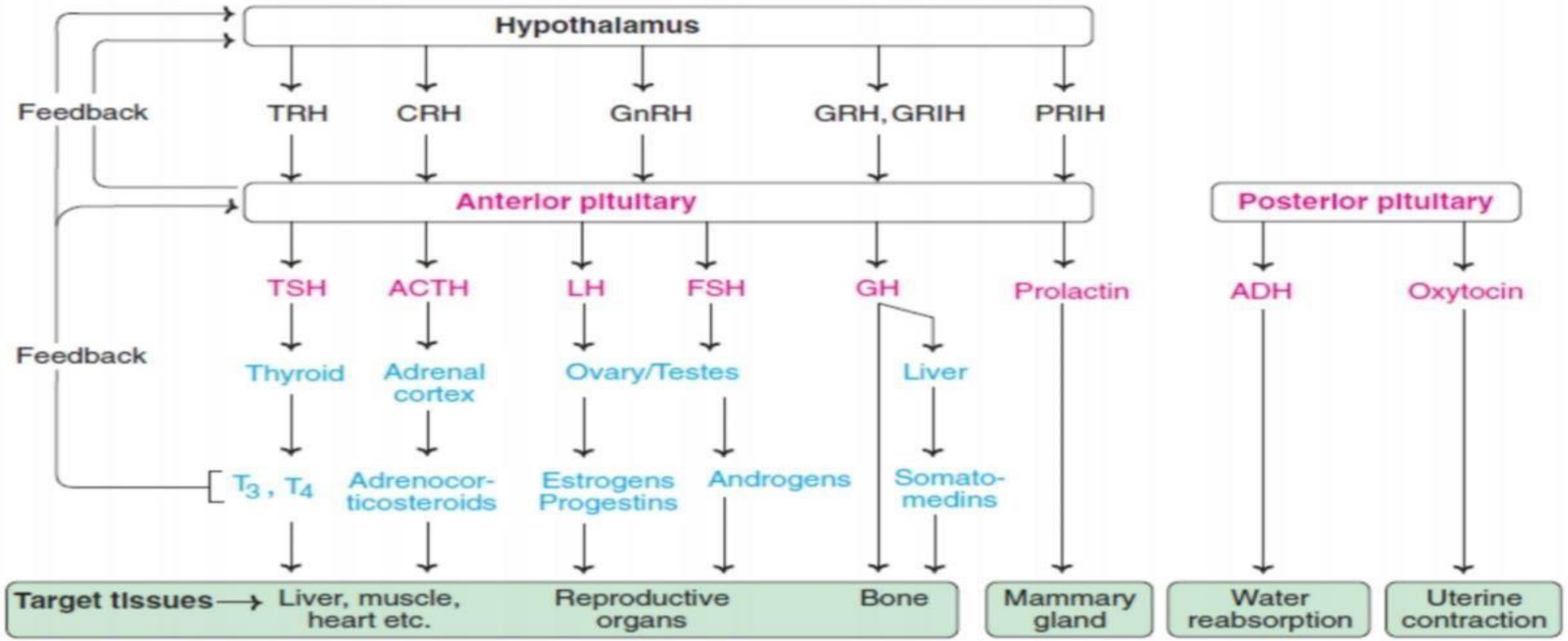
الجانب العملي محاضرة رقم 1

Practical Lecture No. 1

تدريسي المادة : م. صكر عبد الكاظم صكر


Hypothalamus
Pineal
Pituitary
Parathyroids
Thyroid
Thymus
Adrenals
Pancreas
(islets)
Ovaries
(female)
Testes
(male)

مخطط مهم جدا اضافي من عندي



Introduction Endocrinology

Most glands of the body deliver their secretions by means of ducts These are called exocrine glands.

There are few other glands that produce chemical substance that they directly secrete into the bloodstream for transmission to various target tissues. These are ductless or endocrine glands.

The secretions of endocrine glands are called as hormones.

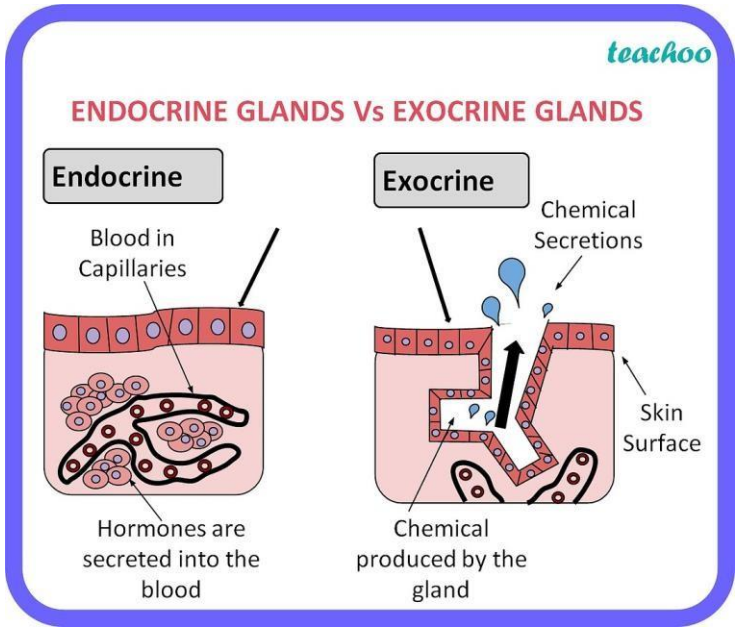
Definition of Hormones

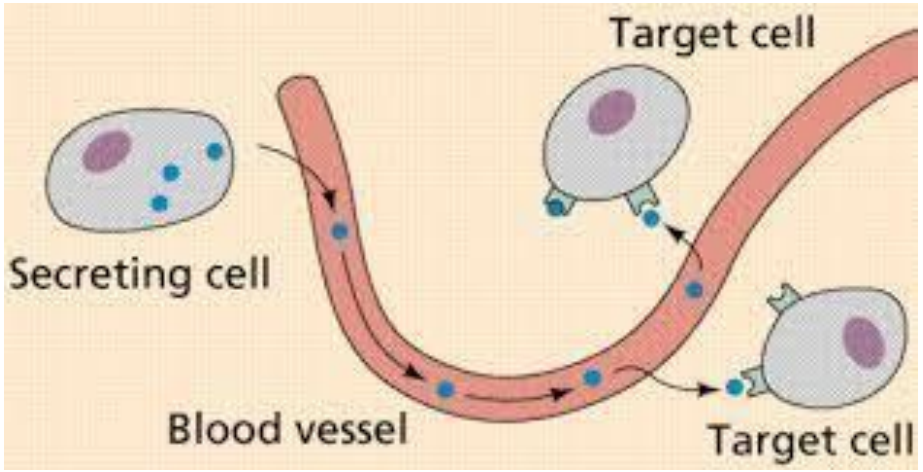
It is a chemical substance which is produced in one part of the body, enters the circulation and is carried to distant target organs and tissues to modify their structures and functions.

Hormones are strictly speaking stimulating substances and act as body catalysts.

The hormones catalyse and control diverse metabolic processes, despite their varying actions and different specificities depending on the target organ.

exocrine glands and endocrine glands





Similarities of Hormone and Enzyme

✓ The hormones have several characteristics in common with enzymes:

1. They act as body catalysts resembling enzymes in some aspect.

2. They are required only in small quantities.

3. They are not used up during the reaction.

Dissimilarities of Hormone and Enzyme

✓ They differ from enzymes in the following ways:

1. They are produced in an organ other than that in which they ultimately perform their action.

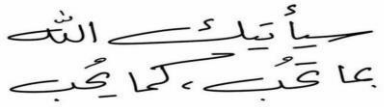
2. They are secreted in blood prior to use.

3. Thus, the circulating levels of hormones can give some indication of endocrine gland activity and target organ exposure Because of the small amounts of the hormones required, blood levels of the hormones are extremely low. In many cases it is ng/µg or mIU, etc.

.4 Structurally they are not always proteins. Few hormones are protein in nature, few are small peptides. Some hormones are derived from amino acids while some are steroid in nature.

✓ The major hormone secreting glands are:

1. Pituitary النخاميه
2. Thyroid درقي
3. Parathyroid الغده الدرقيه
4. Adrenal الكظريه
5. Pancreas بنكرياس
6. Ovaries المبايض
7. Testes الخصيتين



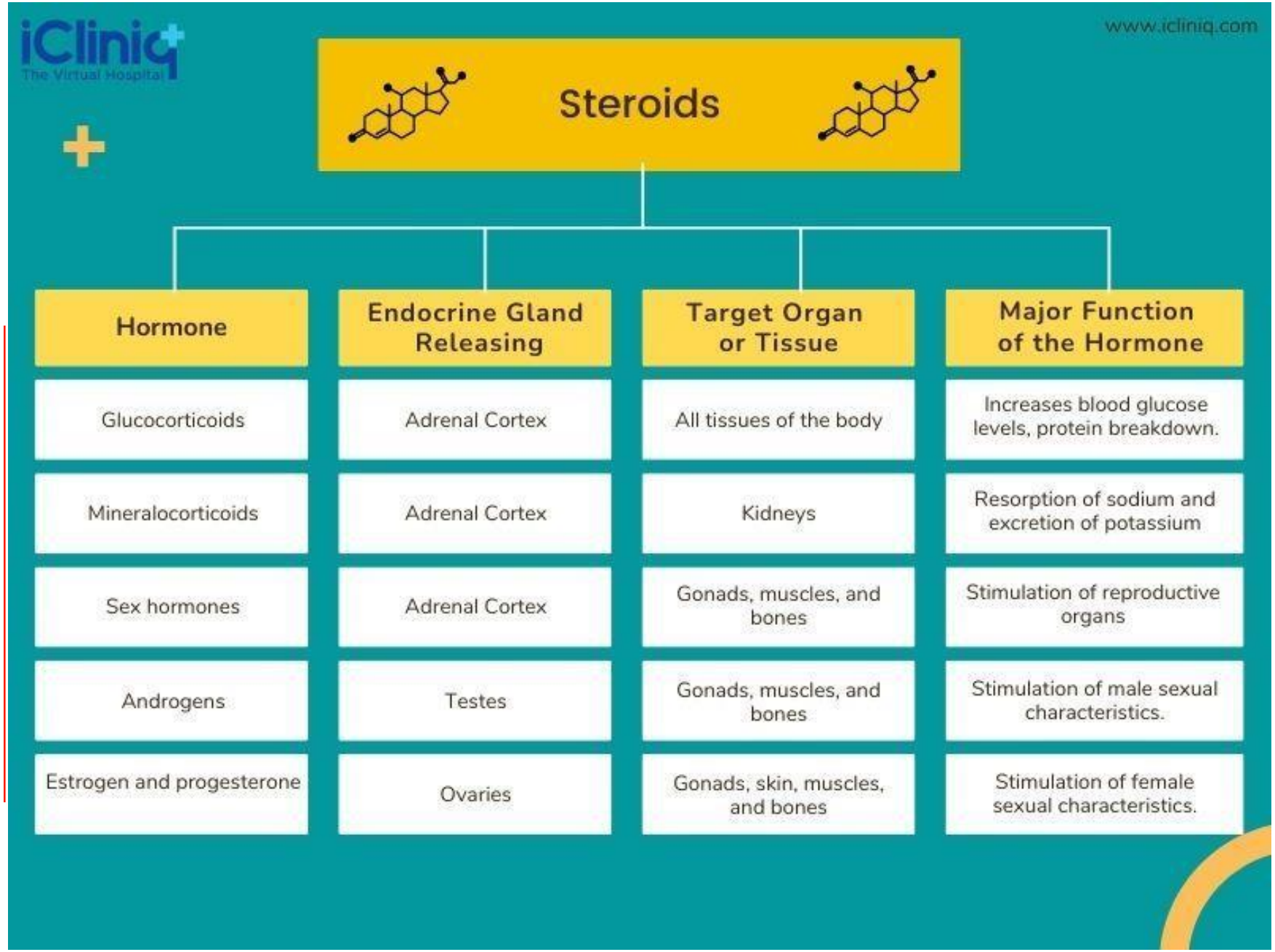
Classification of Hormones:

hormones can be classified chemically into three major groups:

1. Steroid hormones: These are steroid in nature such as adrenocorticosteroid hormones, androgens, estrogens and progesterone.

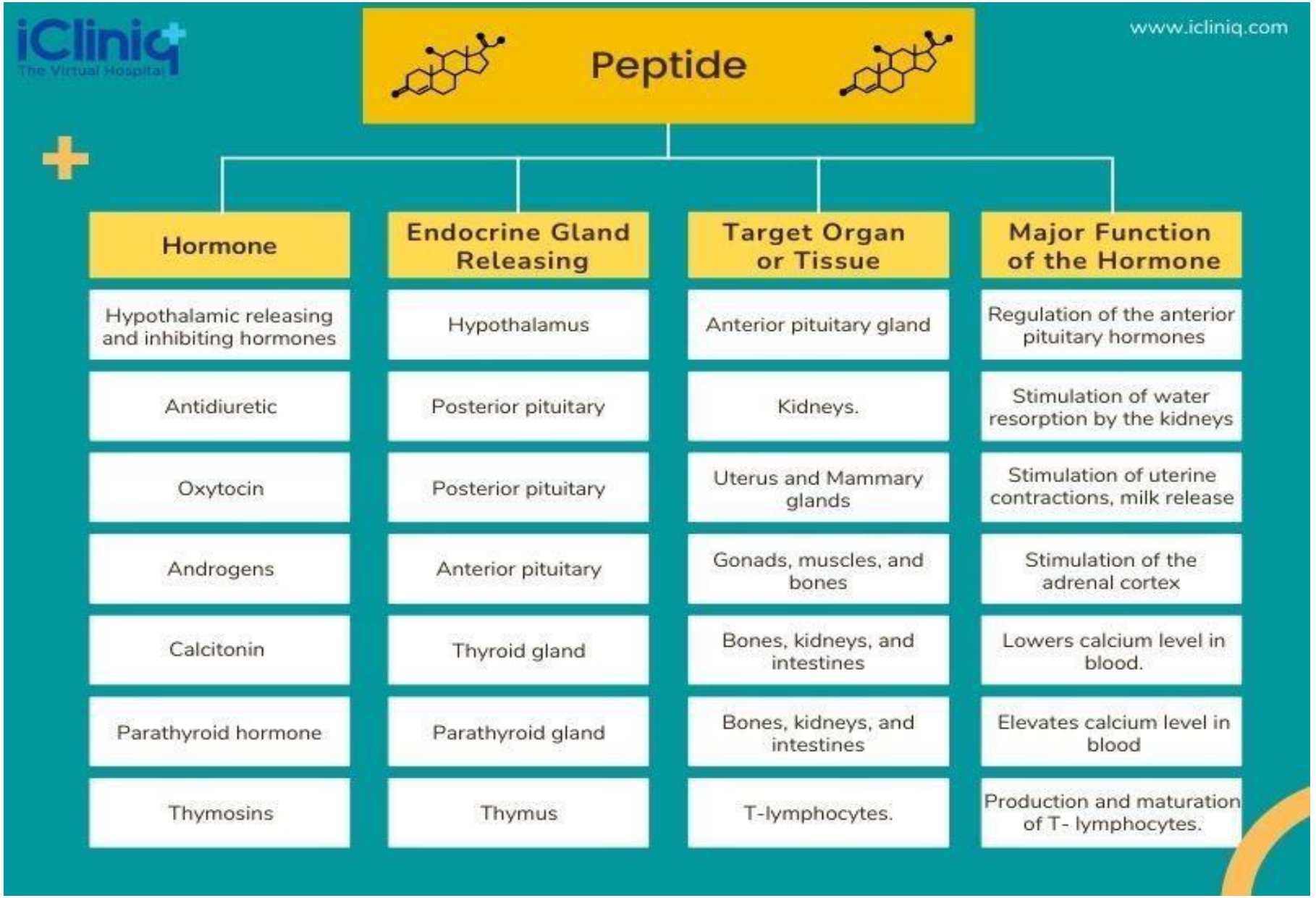
2. Amino acid derivatives: These are derived from amino acid tyrosine, e.g. epinephrine, norepinephrine and thyroid hormones.

3. Peptide/Protein hormones: These are either large proteins or small or medium size peptides, e.g. Insulin, glucagon, parathormone, calcitonin, pituitary hormones

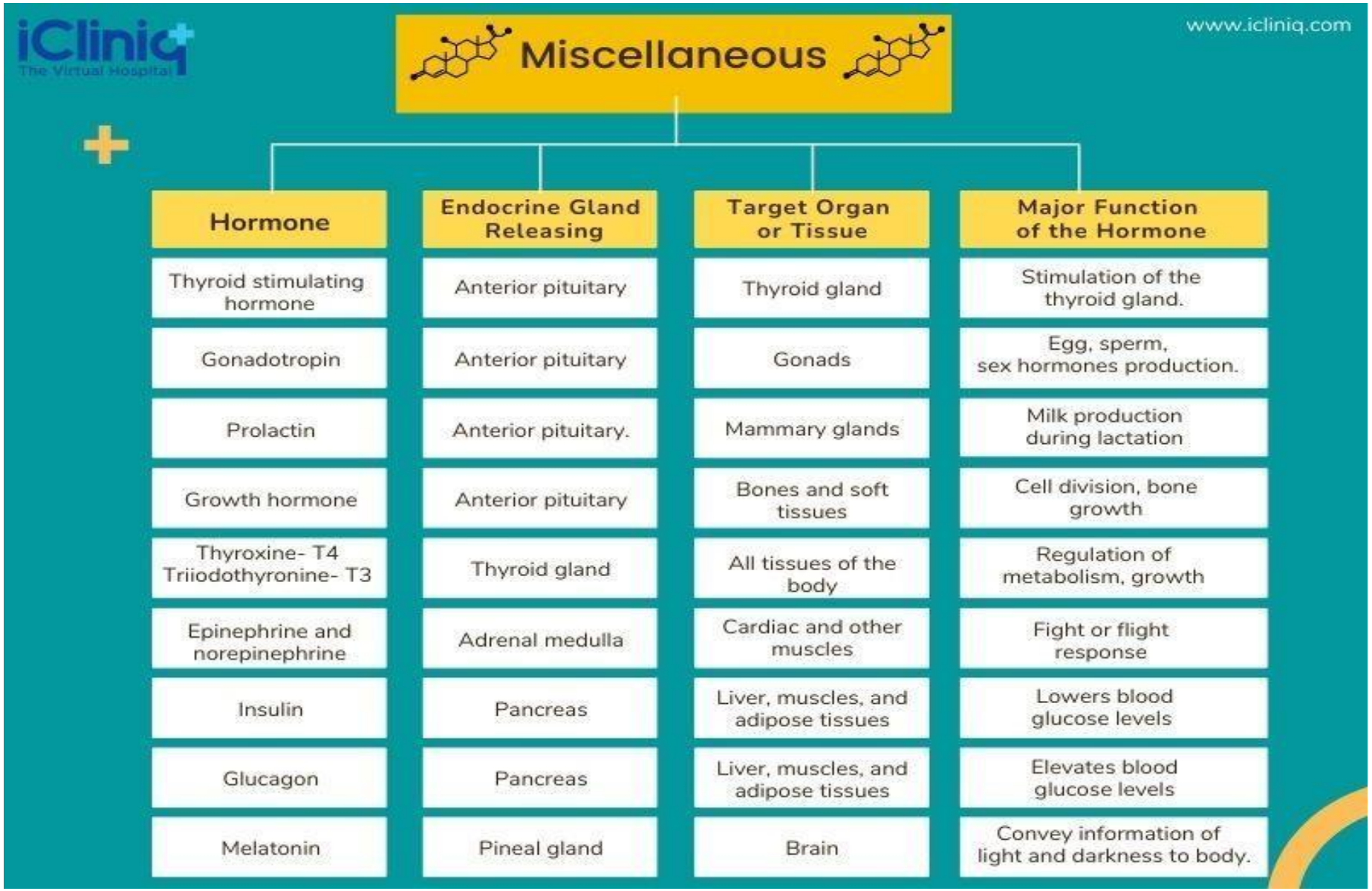


Hormone	Endocrine Gland Releasing	Target Organ or Tissue	Major Function of the Hormone
Glucocorticoids	Adrenal Cortex	All tissues of the body	Increases blood glucose levels, protein breakdown.
Mineralocorticoids	Adrenal Cortex	Kidneys	Resorption of sodium and excretion of potassium
Sex hormones	Adrenal Cortex	Gonads, muscles, and bones	Stimulation of reproductive organs
Androgens	Testes	Gonads, muscles, and bones	Stimulation of male sexual characteristics.
Estrogen and progesterone	Ovaries	Gonads, skin, muscles, and bones	Stimulation of female sexual characteristics.

ثُم يعوِضكَ الله، دائمًا هُناك خيرة ❤



Hormone	Endocrine Gland Releasing	Target Organ or Tissue	Major Function of the Hormone
Hypothalamic releasing and inhibiting hormones	Hypothalamus	Anterior pituitary gland	Regulation of the anterior pituitary hormones
Antidiuretic	Posterior pituitary	Kidneys.	Stimulation of water resorption by the kidneys
Oxytocin	Posterior pituitary	Uterus and Mammary glands	Stimulation of uterine contractions, milk release
Androgens	Anterior pituitary	Gonads, muscles, and bones	Stimulation of the adrenal cortex
Calcitonin	Thyroid gland	Bones, kidneys, and intestines	Lowers calcium level in blood.
Parathyroid hormone	Parathyroid gland	Bones, kidneys, and intestines	Elevates calcium level in blood
Thymosins	Thymus	T-lymphocytes.	Production and maturation of T- lymphocytes.



Hormone	Endocrine Gland Releasing	Target Organ or Tissue	Major Function of the Hormone
Thyroid stimulating hormone	Anterior pituitary	Thyroid gland	Stimulation of the thyroid gland.
Gonadotropin	Anterior pituitary	Gonads	Egg, sperm, sex hormones production.
Prolactin	Anterior pituitary.	Mammary glands	Milk production during lactation
Growth hormone	Anterior pituitary	Bones and soft tissues	Cell division, bone growth
Thyroxine- T4 Triiodothyronine- T3	Thyroid gland	All tissues of the body	Regulation of metabolism, growth
Epinephrine and norepinephrine	Adrenal medulla	Cardiac and other muscles	Fight or flight response
Insulin	Pancreas	Liver, muscles, and adipose tissues	Lowers blood glucose levels
Glucagon	Pancreas	Liver, muscles, and adipose tissues	Elevates blood glucose levels
Melatonin	Pineal gland	Brain	Convey information of light and darkness to body.

 Several other glandular tissues are considered to secrete hormones, viz:.

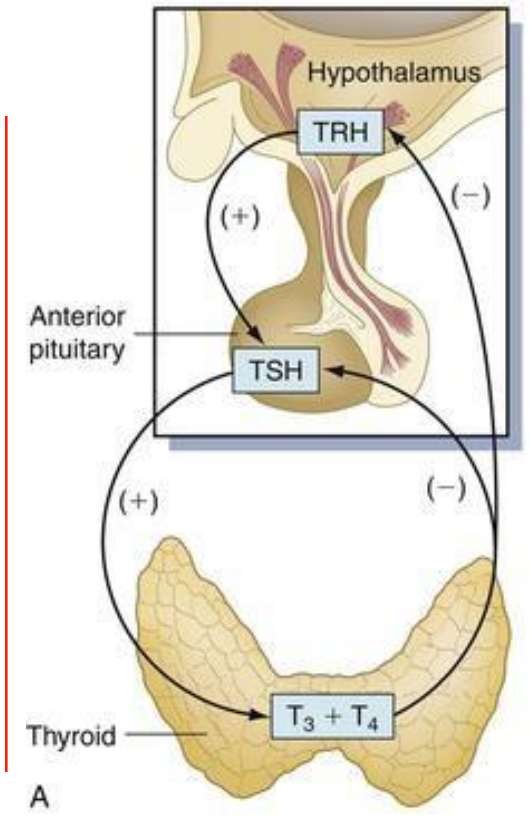
1. Juxtaglomerular (JG) cells of kidney: May produce the hormone erythropoietin which regulates erythrocyte maturation, erythropoiesis.

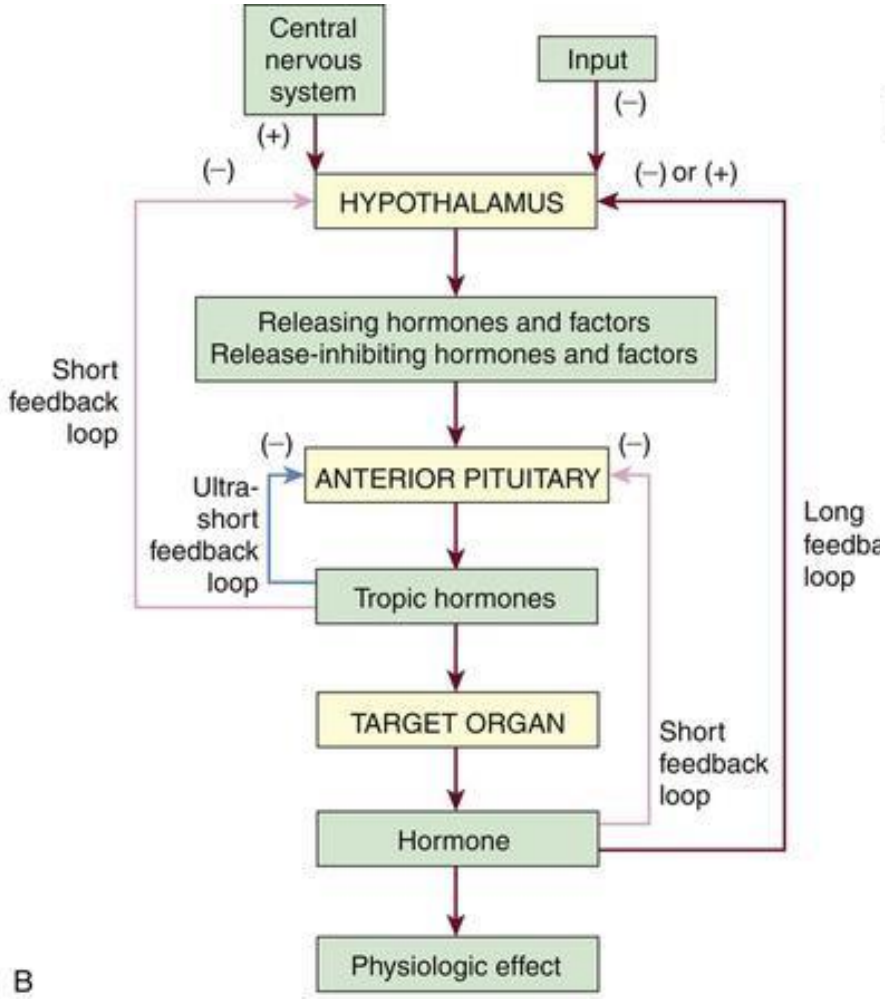
2.Thymus: This produces a hormone that circulates from this organ to stem cells in lymphoid organ inducing them to become immunologically competent lymphocytes.

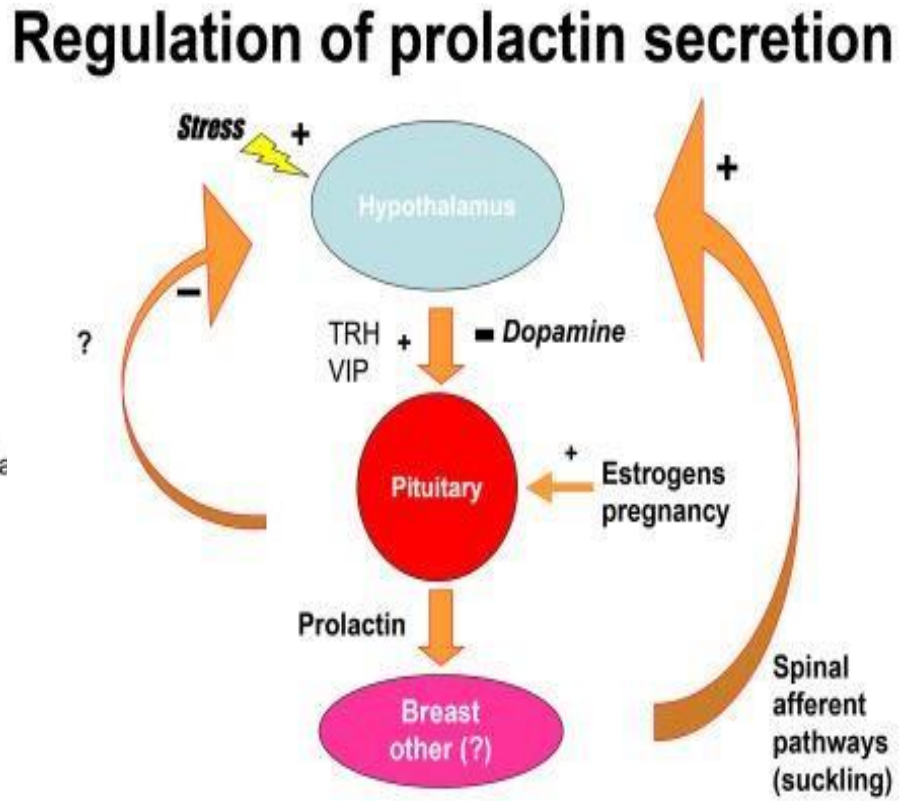
3. .Pineal gland: It produces a hormone that antagonises the secretion or effects of ACTH. It also produces factors called glomerulotrophins that regulates the adrenal secretion of aldosterone.

4. .GI tract: Few hormones are also produced by certain Specialised cells of GI tract and they are called GI Hormones

REGULATION OF HORMONE SECRETION







Factors Regulating Hormone Action

✓ Action of a hormone at a target organ is regulated by four factors:

1Rate of synthesis and secretion: The hormone is stored in the endocrine gland.

2. n some cases, specific transport systems in plasma.

3. Hormone-specific receptors in target cell membranes which differ from tissue to tissue

4Ultimate degradation of the hormone usually by the liver or kidneys.

REGULATION OF HORMONE SECRETION

✓ Hormone secretion is strictly under control of several mechanisms.

1. Neuroendocrinal control mechanism: Nerve impulses control some endocrine secretions. Cholinergic sympathetic fibres stimulate catecholamine secretion from adrenal medulla. Centers in the midbrain, brainstem, hippocampus, etc. can send nerve impulses which react with the hypothalamus through cholinergic and bioaminergic neurons.

At the terminations of these neurons, they release acetylcholine and biogenic amines to regulate the secretions of hypophysiotropic peptide hormones from hypothalamic peptidergic neurons. Some of the endocrine releases are controlled by either stimulatory or inhibitory hormones from a controlling gland, e.g. corticosteroids are controlled by corticotropin and thyroid hormones are controlled by thyrotropin from anterior pituitary. The tropins are further regulated by hypothalamic releasing hormones.

2 .Feedback control mechanism: It is due mainly to negative feedback that such control is brought about. When there is a high blood level of a target gland hormones, it may inhibit the secretion of the tropic hormone stimulating that gland. Adrenal cortex secretes a hormone called cortisol which bring about the inhibition of secretion of corticotropin from anterior pituitary and corticotropin releasing hormone from the hypothalamus by long-loop feedback. This leads to reduction in cortisol secretion.

3 .Endocrine rhythms: There are certain cyclic rhythms associated with the secretion of hormones over a period of time. When there is a cyclic periodicity of 24 hours, it is called as circadian rhythm. However, if it is more than 24 hours, it is named as infradian rhythm and when it is less than 24 hours it is called as ultradian rhythm. Due to such rhythms, the highest and lowest conc of corticotropin is normally found in the morning and around midnight. Growth hormone and prolactin rise in the early hours of deep sleep.

Cortisol peak is found between 4 AM and 8 AM.

Endocrine rhythms result from cyclic activities of a biological clock in the limbic system, supplemented by the diurnal light-dark and sleep activity cycles and mediated by the hypothalamu


Thank
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