HORMONES

- The substances that are synthesized in certain parts of the body and initiate or regulate certain functions of the organism are called hormones. Hormones are mostly transported from the place of expression to the sites of action by the circulatory system (blood or lymph) and affect the target cells there. This type of hormones are called endocrine hormones. Some hormones act on neighboring cells without moving away from where they are synthesized, and these hormones are called tissue hormones (local hormones or paracrants).
- In the endocrine system, hormone synthesis and secretion, the hypothalamus and pituitary in the brain, thyroid, parathyroid, pancreas, adrenal and gonads (testis and ovaries) are distributed in different glands in different parts of the body. The hormone is synthesized in the placenta in the GI system and during pregnancy.

- Biosynthesis of hormones follows different pathways depending on their chemical structure. The synthesized hormones are usually stored in vesicles depending on the proteins. From here;

- Intact amounts (thyroid hormones), regardless of a pattern, but without constant and external stimulation,

- According to the daily (glucocorticoids) or monthly (female sex hormones) mold,

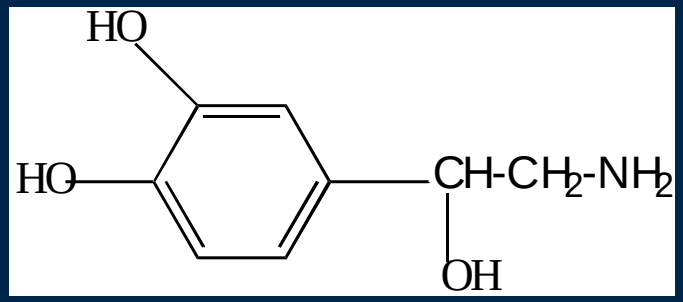
- If needed, they are secreted by stimulation and without a specific pattern (insulin, vasopressin, epinephrine, aldosterone).

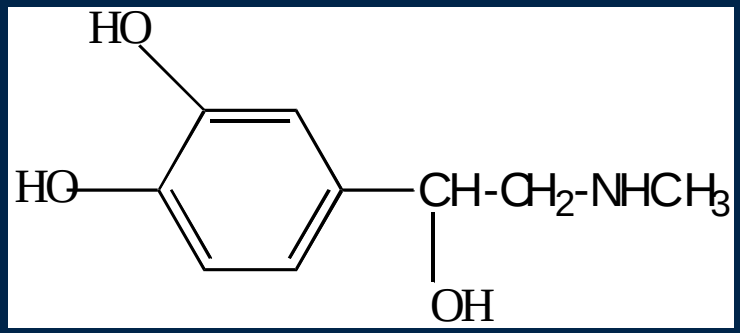
- Hormones have 4 basic functions.
- Optimizing the internal environment according to external conditions and keeping it at optimal level (water-electrolyte balance, acid-base balance, blood pressure etc.),
- Energy production, use, storage,
- Reproductive,
- Growth and development.

- Chemical structures and classifications
- Hormones according to their chemical structure;
- Amine hormones,
- Amino acid structure hormones,
- Peptide hormones,
- They can be classified into four main groups as steroid hormones.

Amines hormones

The most important examples of adrenal medulla hormones are Norepinephrine (noradrenaline) and epinephrine (adrenaline).





Norepinefrin (Noradrenalin)

Epinefrin (Adrenalin)

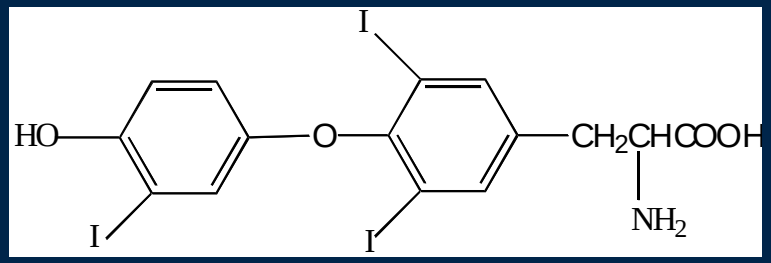
- Noradrenaline and adrenaline are hormones that are responsible for regulating many important activities of the organism.

- They regulate basal metabolism, carbohydrate and lipid metabolism, and provide the functions of vital organs and tissues such as the heart and circulatory system, GI system, liver, kidneys, reproductive organs, bronchi, eye through sympathetic nerves.

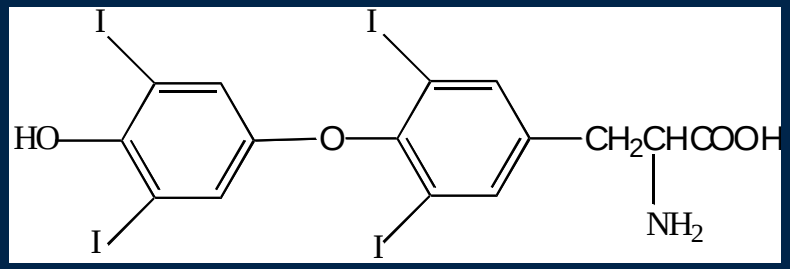
- They show their effects in the target cells by adrenergic receptors in the cell membrane.

Hormones in amino acid structure

The main examples are liothyronine and thyroxine, which are synthesized in the thyroid gland.



Liothyronine (T_3) (triiyodothyronine)
L-3,3',5-triiyodothyronine



Thyroxine (T_4) (levothyroxine)
L-3,3',5,5'-tetraiyodothyronine

- **Peptide hormones**
- **Peptides which are formed as a result of the binding of amino acid molecules by peptide bonds.**

- **Some peptide hormones are combined with carbohydrates via free amine groups to form glycosides, glycoproteins.**

- **Steroid hormones**
- **The hormones that carry the steroid nucleus are called steroid hormones. The main drugs of this group are sex hormones and adrenal cortex hormones (adrenocorticoids).**

THYROID HORMONES AND RELATED COMPOUNDS

- The synthesis and secretion of thyroid hormones are related to thyrotrophin (TSH) from the hypothalamus hormones, tiroliberin and pituitary hormones and it is related to serum thyroid hormone level.
- Serum thyroid hormone level decreases when thyroberine and thyrotropin are secreted and the thyroid hormone biosynthesis is stopped when the level increases.

- If the thyroid hypofunction is present in congenital or in the developmental period, somatic and mental development is clearly behind.

- In adults, the most prominent sign of hypofunction is the decrease of basal metabolism..

- In addition, symptoms such as deceleration in the pulse, cold sensitivity, decreased bowel movements and constipation, hair loss, increased plasma cholesterol levels, weight gain, drowsiness, loss of thought, dry skin.

- When thyroid hormone cannot be synthesized sufficiently, the secretion of TSH increases, as a result of which the thyroid gland grows (simple goiter or endemic goiter).

- The most common cause of hormone synthesis deficiency is the inability to get enough iodine from the diet.
- Due to the lack of iodine in water and soil, it is seen as endemic in the regions that cannot enter enough iodine in the food chain (such as Central and Eastern Black Sea Regions). Endodic goiter has been greatly reduced in developed countries where iodine is added to animal feed and food preservatives with iodised salt and bread.

- Simple goiter is treated by administering thyroxine (T4) (LevotirirR, TeforR).

- Excessive secretion of thyroid hormones and excessive hormone exposure of tissues are called hyperthyroidism (toxic goiter). The main symptoms are; increased basal metabolism, weight loss, tachycardia, excessive sweating, insensitivity to heat, irritability, tremor, weakness, increased appetite.
- Therapy;
- With antithyroid drugs,
- It is performed in the form of radioiodine therapy or thyroidectomy.

- **Hashimoto's Disease**

- **This name was given in 1912 because it was defined by the Japanese scientist Akira Hashimoto.**

- Upper respiratory tract infection, sudden intense sadness, the use of continuous iodised salt or genetic factors, such as factors such as the immune system "accidentally" or "surprised" produced by some antibodies (auto-antibodies), thyroid cells go to the adheres, destroys them and the inflammatory condition ("thyroiditis" occurs. As a result of this inflammation and destruction of the hormone-producing thyroid cells become inoperable, the level of thyroid hormone (thyroxine) in the blood drops, the level of TSH increases.

- The disease cannot be treated. In other words, there is no treatment approach for the progression of the disease. However, the only negative result of the disease is that the thyroid gland cannot produce enough hormones. In this sense, instead of the hormone that is missing with the aim of treatment, all the negativity of Hashimoto Disease to the body can be completely eliminated.

Antithyroid drugs

- 1-KClO4, KSCN It inhibits iodide transport, and iodination does not occur.

- 2-Organic antithyroidal compounds (mercaptoimidazole and thiyouracil)

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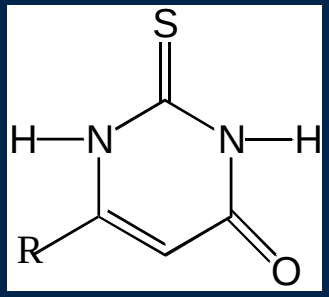
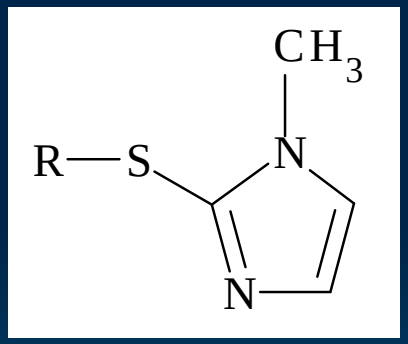
- Thiourea is an effective antithyroidal compound, but it is not used in the treatment because of its toxicity. These drugs prevent thyroid hormone biosynthesis.



R= CH_3 **Metiltiyourasil** (6-Metil-2-tiyokso-2,3-dihidro-1(4)H-pirimidin-4-on)

R=C_3H_7 **Propiltiyourasil** (6-n-Propil-2-tiyokso-2,3-dihidro-1(4)H-pirimidin-4-on)

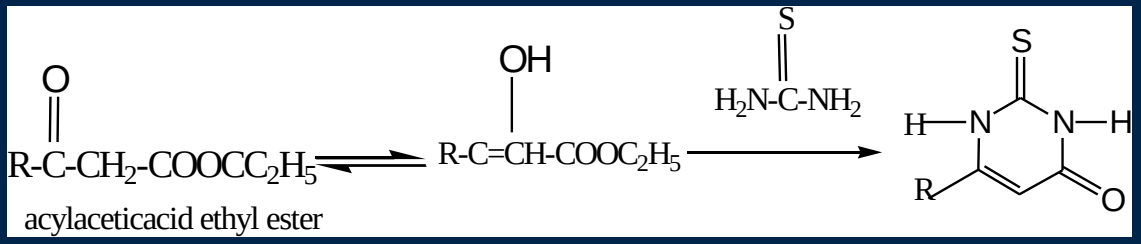
R=$CH_2C_6H_5$ **Benziltiyourasil** (6-Benzil-2-tiyokso-2,3-dihidro-1(4)H-pirimidin-4-on)

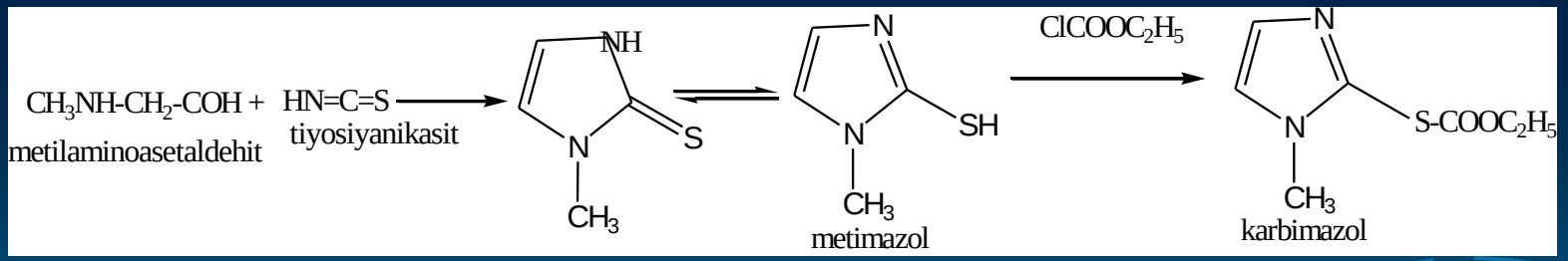


R= H **Metimazol** (1-Metil-2-merkaptoimidazol)

R= $COOC_2H_5$ **Karbimazol** (1-Metil-2-etoksikarboniltiyoimidazol)

Synthesis


O
R-C-CH2-COOCC2H5
acylaceticacid ethyl ester
OH
R-C=CH-COOC2H5
S
H2N-C-NH2
S
H
N
N
H
R
O


CH3NH-CH2-COH +
metilaminoasetaldehit
HN=C=S
tiyosiyanikasit
NH
N
S
CH3
N
N
SH
CH3
metimazol
ClCOOC2H5
N
N
S-COOC2H5
CH3
karbimazol

Radioiodine (131 I)

This isotope β and γ rays, which have a half-life of eight days, cause destruction of thyroid tissue and decrease in hormone production. Besides its high efficacy, it has the advantage that it can be applied to patients with other antithyroidal medications which cannot be used or other drugs cannot be used due to allergic reactions.

PEPTIDE HORMONES

- Peptide hormones are synthesized and secreted in organisms;

- Hypothalamus hormones,
- Pituitary hormones,
- Thyroid hormone,
- Parathyroid hormone,
- Pancreatic hormones,
- GI is classified as system hormones.

Hypothalamus hormones;

Somatostatin

It is a cyclic tetradecapeptide. It is also synthesized in pancreas other than hypothalamus. Its main function is to stop the synthesis and secretion of pituitary growth hormone somatotropin, but it inhibits most of the glands. Thyotropin from the pituitary, insulin and glucagon from the pancreas, pepsin, gastric mucosa, reduces secretion of gastrin and secretin. In GI system diseases (gastric acid and pepsin release disorders), hormone-secreting tissue tumors (pancreas-like tumors) are given by IV route. Since the half-life of the natural hormone is very short, synthetic analogue octreotide is preferred.

Pituitary hormones

Synthesis and secretion of the hypothalamus with hormones.

1-Back Lobe (neurohypophysis, posterior pituitary) Hormones	2-Front Lobe (adenohypophysis, anterior pituitary) Hormones
-regulates blood pressure, -uterine contraction, -antidiuretic effect	-skeletal and muscle development, -growth, -sexual life and reproduction, -milk secretion, -Thyroid is responsible for secretion of the glands such as thyroid, pancreas and adrenal cortex.
1.Oxytocin 2.Vasopressin	1. Somatotropin, 2. Lactotrophs's, 3. Corticotropin, 4. The gonadotropins 5. Follitropin, 6. Lutropin. 7.Thyrotropin

- Oxytocin
- It stimulates uterine smooth muscle, increases uterine motility (oxytocic effect), initiates birth, strengthens uterine contractions and facilitates delivery. It facilitates the milk flow by causing contractions in the breast tissue. In order to increase lactation, it is used sublingually or nasally before breastfeeding.

- Oxytocin antagonists-tocolytic drugs
- Terbutalin, fenoterol, hexoprenaline and ritordin are used for the prevention of premature labor or in cases requiring surgical intervention.

- Vasopressin (ADH, anti-diuretic hormone)
- The main function is a hormone that prevents the loss of water in the urine. It is an important hormone for hemostasis.
- It regulates the hydration mechanism in the body, it has a high concentration of vasoconstrictor effect and causes an increase in blood pressure. Usually i.m, s.c is sometimes given i.v or nasally as antidiuretic. The effect is short-term, so it is not much to use directly for treatment, Argipressin Tannate and synthetic derivatives such as lypressin, ornipressin, desmopressine are preferred.

Somatotropin

It enables the growth and development of the body,

causes increased blood glucose levels,

increases lipolysis,

stimulates muscle growth.

Excessive secretion - before childhood and teenager period; overexposure (giant disease) - in adults; there is no longitudinal extension of the bones but abnormal growth (ear, nose, chin, fingers grow disproportionately).

Inadequate secretion- during childhood; causes dwarfism

- Gonadotropins (Follitropin, Lutropin)
- There are three gonadotropic hormones: Follitropin (FSH), Lutropin (LH) and carionic gonadotropin (HCG). FSH and LH; pituitary anterior lobe, HCG; placenta hormone.
- The follitropin; follicle formation in women provides spermatogenesis in men.
- The lutropin; The secretion of estrogen in women, ovulation and corpus luteum formation, androgen secretion in men.
- Gonadotropins are used in the treatment of infertility caused by deficiency of ovulation in women and inadequate sperm production in men.

Thyrotropin (TSH)

MA is 28,000 glycoproteins. It is secreted by the effect of tyrolone. It provides synthesis and secretion of thyroid hormones in thyroid gland. Secretion is related to the serum level of thyroid hormones.

Thyroid hormone: calcitonin-tirokalsitonin

A polypeptide of 32 α. It controls serum calcium levels with paratirin and vitamin D. When the calcium concentration is increased, it is secreted and lowers the calcium concentration.

Parathyroid hormone: parathormone-paratirin (PTH)

(Parathyroid is four small glands on thyroid)

It consists of 84 a.a. When serum calcium level decreases, the level of calcium is increased and synthesis and secretion is stopped. Provides calcium mobilization in bones, calcium passes from bones to extracellular fluid

- **Pancreas hormones**

- α cells ; glukagon,
- β cells ; insuline,
- δ cells ; somatostatin,
- F cells ; secrete pancreatic polypeptides.