Volume 3, Issue 4, April 2025 ISSN (E): 2938-3765

DRUGS THAT AFFECT THE ACTIVITY OF THYROID HORMONES

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Abstract
The thyroid gland is one of the endocrine glands that plays an important role in the human body, and it participates in regulating the metabolic activity of the body. In recent years, drugs that affect the activity of this gland, their effectiveness and negative consequences, have been widely studied. The reason for choosing this topic is to deeply study the effect of thyroid hormones and drugs that affect them on the health of the body, to analyze current problems and scientific innovations in this regard.

Introduction

Thyroid Gland Anatomy and Physiology: Basic Concepts
Hormones produced by the thyroid gland affect many physiological processes, including heart rate, body temperature, nervous system activity, and overall energy metabolism.
The thyroid gland is an endocrine gland of humans and animals. The development of the thyroid gland begins in the fetal period, and by the time the child reaches 1 year of age, its weight is 1-2 g, and during growth it increases to 20-22 g. The thyroid gland develops from the epithelium of the embryonic gill sac. The thyroid gland is fully formed and begins to secrete hormones at 8-9 months of human embryonic development. It is located in the neck, in the area of the laryngeal cartilages; it consists of 2 lobes and a neck. The thyroid gland is supplied with blood by a pair of upper and a pair of lower arteries, and is innervated by sympathetic and parasympathetic nerve fibers. It produces the iodine hormones thyroxine (T4), triiodothyronine (T3) and thyrocalcitonin, which are involved in the regulation of substance and energy metabolism in the body. The function of the thyroid gland is controlled by the central nervous system, and its activity is controlled by the pituitary gland.
Thyroid dysfunction leads to the following consequences:
When thyroid activity increases:
-Tachycardia
-Body Room Lift
-Nervousness
-Profuse sweating
-Muscle Relaxation
- Tears of the Eye
Thyroid gland when activity slows down:
-Bradycardia

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-Lowering Blood Pressure
-Myxedema
-Weakness
-dry skin is observed
Types of Drugs That Affect Thyroid Function
Thyroxine/Triiodothyronine Analogs
● Levothyroxine (Eutirox)
● Triiodothyronine (Liothyronine)
● Thyrocomb (KJ + Levothyroxine + Liothyronine)

Application:
● In the prevention of endemic goiter
● Hypothyroidism-- in acute cases (e.g. coma):
Triiodothyronine is used (due to its rapid onset of action) for long-term treatment: L-thyroxine

2.2. Antithyroid drugs According to the mechanism of action:
Drugs that reduce TSH synthesis
● Iodine
● Diodityrosine Thyrotropin synthesis blockers:
● Thiamazole (Mercazolyl)
● Propylthiouracil Thioamides disrupt the entry of iodine into the follicular cell (↓):
● Potassium perchlorate (chlorogen) (can cause aplastic anemia) Follicular cell killer:
● Radioactive iodine Other:
● Iodides: Lugol's solution (5% iodine solution + 10% KJ) Application:
● Thyrotoxicosis
● To prevent recurrence in postoperative cases
● In the prevention of endemic goiter (iodine, diiodotyrosine) Side effects:
● Aplastic anemia (therefore, blood tests are necessary once a week)
● "Bull-like" effect, vascularization ↑ (due to TSH ↑ via feedback) as a result of the use of thioamides
● Iodism: rhinorrhea, cough, conjunctivitis, acne

2.3Calcitonin
► Consists of 32 amino acids
Task:
● Bone resorption ↓ : osteoclast activity ↓
● Ca2+ reserves in tissues (bones) ↑
● In the small intestine: Ca2+, phosphate absorption ↓
● In the kidney: Ca2+ and phosphate reabsorption ↓ In the blood Ca2+ ↓ Analogs:
● Sibacalcin (synthetic Calcitonin)
● Miacalcic (derived from Lasos)
● Calcitrin (derived from pigs)

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Application:

- Osteoporosis
- Nephrocalcinosis

Current Research and Future Directions

1. Genomic and molecular research

Next-generation sequencing (NGS) is being used to detect thyroid tumors and genetic mutations (e.g., BRAF, RET/PTC, and RAS mutations).

This approach plays an important role in the diagnosis of thyroid cancer and the creation of individual treatment plans.

2. Liquid biopsies

It is possible to detect thyroid cell DNA and biomarkers through blood, which can help with early diagnosis and monitoring of relapses.

3. Radiological innovations

The ability to accurately distinguish the type of thyroid tumor is increasing with the help of PET-CT, ultrasound elastography, and AI (artificial intelligence)-based analyses.

4. Biotechnology and regenerative medicine

Research is underway to create thyroid tissue based on organoids and induced pluripotent stem cells (iPSCs).

This paves the way for future transplantation treatments for glandular insufficiency (e.g., patients undergoing thyroidectomy).

5. Personalized therapy

For cancer patients, approaches such as targeted therapy (e.g., tyrosine kinase inhibitors) and immunotherapy are being used based on individual genetic profiles.

6. Iodine deficiency and public health

Biofortification (e.g., iodized salt) and promotion of healthy lifestyles continue to be promoted to prevent iodine deficiency worldwide.

In the future, work is underway to create food products that better absorb iodine through genetic selection.

Conclusion:

It is very important for us to have a deep knowledge of the structure, function and diseases of the thyroid gland, because this gland plays a key role in regulating the hormonal balance of the entire body. The fact that modern research is opening up opportunities for early detection, individualized treatment and even prevention of thyroid diseases through genetic manipulation is of great importance for us, the doctors of the future. Also, advanced technologies, such as artificial intelligence, liquid biopsies and regenerative medicine, are helping to introduce new approaches

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to medical practice. Therefore, scientific and practical knowledge related to the thyroid gland is an important part of medical education, and we, as students, need to regularly study innovations in this field.

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