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• Composed of **glands** that release their products into the bloodstream. These products deliver messages throughout the body.

• <u>Hormones</u> are travelling chemicals that affect the function of various organs and cells.

• <u>Target cells</u> have special receptors on their cell membranes to which specific hormones can bind, thus activating a particular process.



Glands of the System

• <u>Glands</u> are organs that produce and secrete chemical substances into the body.

1) **Exocrine glands**:

- secrete hormones via ducts (small tubes) directly into intended organs.
- e.g. sebaceous glands in skin, salivary glands, tears, sweat

2) Endocrine glands:

- secrete hormones into bloodstream.
- e.g. pituitary, thyroid, pancreas, ovaries, testes



39-1 Endocrine System Intro.notebook

Hypothalamus The hypothalamus makes hormones that control the pituitary gland. In addition, it makes hormones that are stored in the pituitary gland.

Pituitary gland

The pituitary gland produces hormones that regulate many of the other endocrine glands.

Parathyroid glands These four glands release parathyroid hormone, which regulates the level of calcium in the blood.

Thymus During childhood, the thymus releases thymosin, which stimulates T cell development and proper immune response.

Adrenal glands / The adrenal glands

release epinephrine and norepinephrine, which help the body respond to stress.

Figure 39 - 2, p.

998 Pineal gland The pineal gland releases melatonin, which is involved in rhythmic activities, such as daily sleep-wake cycles.

Thyroid

The thyroid produces thyroxine, which regulates metabolism throughout the body.

Pancreas

The pancreas produces insulin and glucagon, which regulate the level of glucose in the blood.

Ovary

Ovaries produce estrogen and progesterone. Estrogen is required for the development of female secondary sex characteristics and for the development of eggs. Progesterone prepares the uterus for a fertilized egg.

Testis

The testes produce testosterone, which is responsible for sperm production and the development of male secondary sex characteristics.

Gland	Function	Some Hormones Produced
hypothalamus	controls the secretions of the pituitary gland	thyroid-releasing hormone
pituitary	regulates body functions and controls actions of other glands	growth hormone, thyroid-stimulating hormone
thyroid	regulates the body's metabolism	thyroxine
adrenal	helps the body prepare for and deal with stress	corticosteroids, epinephrine, norepinephrine
pancreas	maintains the level of glucose in the blood	insulin, glucagon
ovaries	produce eggs and female sex hormones	estrogen, progesterone
testes	produce sperm and male sex hormones	testosterone

Hormone Action

Steroid Hormones:

- Can help control metabolism, immune functions, water balance, etc.
- Are lipids synthesized from cholesterol, so they can pass directly through cell membrane.
- Bind to receptor of target cell to create a **hormone-receptor complex.**
- Complex enters cell nucleus and binds to DNA control sequence.
- Specific gene transcription is initiated and proteins are created as a result.



Figure 39 - 3, p. 999

• Steroid hormones can turn on and off genes, and thus can alter gene expression.

Non-steroid Hormones

- Mainly peptide based, like insulin and glucagon.
- They *cannot* cross cell membrane, so will bind to a receptor on the cell's surface.
- This binding action activates an internal <u>enzyme</u>.
- The enzyme facilitates the actions of a **<u>secondary</u> messenger** which can activate or inhibit cell processes.



Prostaglandins

- Almost all cells produce small amounts of hormone-like subtances called **prostaglandins**.
- They generally only affect nearby cells, and so are known as "<u>local</u> <u>hormones</u>."
- e.g. can cause uterine or blood vessel contractions; smooth muscle contractions in small intestine

Control Mechanisms Recall - **Homeostasis**

• Homeostasis is maintained by **<u>negative feedback</u>**, or feedback inhibition.

Controlling metabolism:

• <u>Metabolism</u> is the sum of all chemical reactions in the body.

• Metabolism is increased by <u>thyroxine</u>, a hormone produced by the thyroid.

• The thyroid doesn't choose how much thyroxine to produce on its own, but relies on a negative feedback mechanism.



1. Hypothalamus senses a drop in thyroxine in the blood and secretes

TRH (thyrotropin-releasing hormone).

2. TRH stimulates the pituitary gland to produce TSH (*thyroid-stimulating hormone*)

3. TSH stimulates the thyroid to produce thyroxine.

4. High levels of thyroxine inhibit the production of TRH, thus ending the cycle.

Blood Glucose Feedback Loop





Major Endocrine Glands (Correction).pdf

Hormones.asf