THE ENDOCRINE SYSTEM!

Diagram of the endocrine system showing the Pineal, Hypothalamus, Pituitary, Thyroid, Parathyroids, Thymus, Adrenals, Pancreas, Ovary, Testes.
Look... somebody has to bring up the subject of growth hormones...

DID YOU KNOW BEER CONTAINS TRACES OF FEMALE HORMONES?

Hey?

NO, WHEN I DRINK A LOT, I START TALKING NONSENSE AND CRASH MY CAR.
The ENDOCRINE SYSTEM = the organ system that regulates internal environment conditions by secreting hormones into the bloodstream.

Hormones play a huge role in maintaining homeostasis!

Hormones can have an effect on pretty much ALL the organ systems!

Hormones control many developmental changes like PUBERTY!
THE ENDOCRINE SYSTEM

- **HORMONE** = chemicals released by one type of cell (usually a gland) that has an effect on other cells of the body

- **GLAND** = an organ that secretes hormones and other useful substances

Endocrine hormones are produced in glands and secreted direction into the blood stream – thus, the circulatory system carries them to the various organs of the body!
MAJOR GLANDS OF THE HUMAN BODY

- HYPOTHALAMUS
- PITUITARY GLAND
- THYROID GLAND
- PARATHYROID GLAND
- PANCREAS
- ADRENAL GLANDS
- KIDNEYS
- FEMALE OVARY
- MALE TESTES
THE ENDOCRINE SYSTEM

- **Hormones** are secreted into the bloodstream, and can reach **ALL** the cells of the body, **BUT** they **will only affect specific target cells**

Cells each have **specific hormone receptors** on their cell membranes or inside the cell.

This means **they will only allow **SPECIFIC** hormone molecules to attach.**

The number of receptors on an individual cell may vary. Cells may have receptors for one hormone and not another.
THE ENDOCRINE SYSTEM

• There are **TWO types of hormones:**
  – **STEROID HORMONES**
  – **PROTEIN HORMONES**

Steroid hormones are **made from cholesterol** and include the **sex hormones** and **cortisol**.

Protein hormones include **insulin** and **growth hormone**. These hormones are chains of amino acids.
1. Steroid hormones **diffuse** through the cell membrane of a target cell.

2. Inside the cytoplasm, the hormone **attaches to its specific receptor**.

3. The hormone-receptor complex then moves into the **nucleus**, where it activates a gene and **initiates protein synthesis**.
THE ENDOCRINE SYSTEM

PROTEIN HORMONES

1. Protein hormones attach to a specific receptor site in the target cell membrane.

2. The hormone-receptor complex promotes the formation of cyclic AMP from ATP.

3. Cyclic AMP acts as a secondary messenger, activating enzymes within the cell.
THE ENDOCRINE SYSTEM

- The **PITUITARY GLAND** = a gland at the base of the brain that secretes more types of hormones than **any** other endocrine gland!!!!!!

  The pituitary gland is only the size of a pea!!!!!!

The pituitary gland often called the **MASTER GLAND**!
THE ENDOCRINE SYSTEM

The PITUITARY GLAND is divided into two lobes:
- ANTERIOR LOBE
- POSTERIOR LOBE

The PITUITARY GLAND and the HYPOTHALAMUS interact with each other to produce a variety of different effects on distant body parts.

Pituitary Gland + Hypothalamus =
THE ENDOCRINE SYSTEM

The PITUITARY GLAND is connected by a stalk to the HYPOTHALAMUS.

The HYPOTHALAMUS is the area of the brain associated with homeostasis.

Here the interaction between the NERVOUS SYSTEM and the ENDOCRINE SYSTEM becomes obvious! The pituitary gland produces and stores hormones. The hypothalamus stimulates the release of pituitary hormones via nerves.
THE ENDOCRINE SYSTEM

Neurons in the hypothalamus secrete HORMONE-RELEASING FACTORS into small blood vessels that lead to the anterior lobe of the pituitary gland.

The pituitary gland then releases a number of different hormones.
THE ENDOCRINE SYSTEM

HYPOTHALAMUS

HORMONE-RELEASING FACTOR

SMALL BLOOD VESSELS

ANTERIOR LOBE OF PITUITARY GLAND

VARIOUS HORMONES ARE RELEASED

HORMONES ACT ON OTHER PARTS OF THE BODY
Additionally, nerve cells in the hypothalamus produce hormones that travel down the bloodstream and are secreted into the bloodstream within the posterior lobe of the pituitary and released into the rest of the body.
THE ENDOCRINE SYSTEM

- Two releasing factors from the hypothalamus can also inhibit the release of pituitary hormones.

  » DOPAMINE – inhibits the secretion of prolactin (PRL)

  » SOMATOSTATIN – inhibits the release of somatotropin (STH)
<table>
<thead>
<tr>
<th>HORMONE</th>
<th>TARGET</th>
<th>FUNCTION</th>
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<tbody>
<tr>
<td>Thyroid-stimulating hormone (TSH)</td>
<td>Thyroid gland</td>
<td>- Stimulates the release of thyroxine from thyroid</td>
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<td></td>
<td>- thyroxine regulates cell metabolism.</td>
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<tr>
<td>Adrenocorticotropic hormone (ACTH)</td>
<td>Adrenal cortex</td>
<td>- Stimulates release of hormones involved in stress responses.</td>
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<tr>
<td>Somatotropin (STH), or growth hormone (GH)</td>
<td>Most cells</td>
<td>- Promotes growth</td>
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<td>Follicle-stimulating hormone (FSH)</td>
<td>Ovaries, testes</td>
<td>- In females, stimulates follicle development in ovaries.</td>
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<td>- In males promotes development of sperm in testes.</td>
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<tr>
<td>Luteinizing hormone (LH)</td>
<td>Ovaries, testes</td>
<td>- In females, stimulates ovulation and formation of the corpus luteum</td>
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<td></td>
<td></td>
<td>- in males, stimulates the production of the sex hormone testosterone</td>
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<tr>
<td>Prolactin (PRL)</td>
<td>Mammary glands</td>
<td>Stimulates and maintains milk production in lactating females</td>
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## POSTERIOR LOBE PITUITARY HORMONES

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<tbody>
<tr>
<td>Oxytocin</td>
<td>Uterus, mammary glands</td>
<td>- Initiates strong contractions</td>
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<tr>
<td></td>
<td></td>
<td>- Triggers milk release in lactating females</td>
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<tr>
<td>Antidiuretic hormone (ADH)</td>
<td>Kidneys</td>
<td>Increases water reabsorption by the kidneys</td>
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