

### Endocrine System

Collection of *cells, tissues, and glands* that release **chemical messengers** (*HORMONES*) into the bloodstream. Compared to the **Nervous System** (NS), the **Endocrine System** sends out slower stimuli, but it produces *widespread effects* that last longer than *Action Potential*.

**What are the similarities of the endocrine and nervous systems?** Both control systems (homeostasis and other)

### Endocrine System vs Nervous System

**What are the similarities of the endocrine and nervous systems?**

- ⚡ Both control systems (homeostasis and other)
- ⚡ Control and coordinate body activities through chemical messengers

### Differences of NS and ES

*Mode:* NS - Neurotransmitters | ES -

### Hormones

*Speed:* NS - fast | ES - slow

*Duration of stimuli:* NS - short-lived | ES -

long-term

### Endocrine Glands and Their Functions

**Hypothalamus** releasing hormones to the anterior pituitary (blood communication) and direct connection to posterior pituitary (nerve communication)

**Pituitary gland** "**Master Gland**"; The **Anterior** produces hormones that regulate other endocrine glands, and the **Posterior** stores and releases vasopressin (ADH) and oxytocin.

**Pineal gland** Sleep, thru release of **Melatonin**

### Endocrine Glands and Their Functions (cont)

**Thyroid gland** follicular cells, high blood calcium, storage of calcium in bone, release **Thyroid Hormone** (**T3 & T4**) to increase metabolism and body temperature

**Parathyroid gland** low blood calcium, **Parathyroid Hormone (PTH)**, release calcium into blood from bone

**Adrenal glands** stress response, blood pressure response, blood osmolarity/concentration, **Sex Hormones (FSH & LH)**

**Pancreas** **Insulin** and **Glucagon**

**Ovaries** make and release **Oestrogen** and **Progesterone**

**Testes** make and release **Androgens** (e.g. **testosterone**)

**Thymus** **Thymosin** - programs T-cells

### 3 Types of Hormones

**Amino Acid (Tyrosine)** hormones from the **Adrenal Medulla, Thyroid Gland** (T3 & T4)

**Protein / Peptide** most abundant; derived from **Amino Acids, Pituitary hormones and Pancreas hormones**

**Steroids** hormones from the **Adrenal Cortex and Gonads** - the **Ovaries & Testes**

**Proteins** (>100 Amino Acids)

**Peptides** (<100 Amino Acids)

### Hormones

GLAND	HORMONE	FUNCTION/S
Hypothalamus	<b>TRH</b>	release TSH
	<b>CRH</b>	release ACTH
	<b>GnRH</b>	release of FSH & LH
Pituitary (Anterior)	<b>GHRH</b>	release of GH & TSH
	<b>Somatostatin</b>	inhibits secretion of GH
	<b>Dopamine</b>	inhibits secretion of Prolactin
Pituitary (Anterior)	<b>GH</b>	growth of bones, muscles, & tissues
	<b>TSH</b>	release T <sub>3</sub> and T <sub>4</sub>
	<b>ACTH</b>	production and release of cortisol
Pituitary (Posterior)	<b>FSH</b>	sperm production and follicle dev.
	<b>LH</b>	triggers ovulation and testosterone prod.
	<b>Prolactin</b>	milk production
Pineal	<b>Oxytocin</b>	uterine contractions and milk ejection; promotes bonding
	<b>ADH</b>	water reabsorption in kidneys; constricts blood vessels
Thyroid	<b>Melatonin</b>	regulates sleep-wake cycles
	<b>T3 &amp; T4</b>	metabolism, growth, and development
	<b>Calcitonin</b>	lowers blood calcium

Hormones (cont)		
Parathyroid	<b>PTH</b>	raises blood calcium
Adrenal Cortex	<b>Mineralocorticoid (Aldosterone)</b>	sodium and potassium balance; maintains blood pressure
	<b>Glucocorticoid (Cortisol)</b>	body response to stress; regulates metabolism
	<b>Androgens</b>	sex drive and development of secondary sex traits
Adrenal Medulla	<b>Epinephrine</b>	increases heart rate, breathing, and energy during stress ("fight or flight")
	<b>Norepinephrine</b>	works with epinephrine
Pancreas	<b>Insulin</b>	lowers blood glucose
	<b>Glucagon</b>	raises blood glucose
	<b>Somatostatin</b>	inhibits secretion of insulin and glucagon
Ovaries	<b>Oestrogen</b>	regulates menstrual cycle
	<b>Progesterone</b>	maintains uterine lining and supports pregnancy
Testes	<b>Testosterone</b>	supports sperm production
Thymus	<b>Thymosin</b>	dev. and activation of T-cells for immune response

### 3 Types of ES Stimuli

- Neural** nerves (**Action Potential - AP**) stimulate hormone release
- Humoral** blood substances (e.g. **calcium, glucose, or sodium**) stimulates release of hormones
- Hormonal** hormones stimulate the release of other hormones

When a hormone ends with **-trophin** or **-tropic** it is usually a hormone that stimulates others, which means it is not the end of the cascade.

### Endocrine Stimuli

