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 (control/integrator)	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	***TRH***	release TSH
	CRH	release ACTH
	GnRH	release of FSH & LH
	GHRH	release of GH & TSH
	Somatostatin	inhibits secretion of GH
	Dopamine	inhibits secretion of Prolactin
Pituitary (Anterior)	***GH***	growth of bones, muscles, & tissues
	TSH	release T_3 and T_4
	ACTH	production and release of cortisol
	FSH	sperm production and follicle dev.
	LH	triggers ovulation and testosterone prod.
	Prolactin	milk production
Pituitary (Posterior)	***Oxytocin***	uterine contractions and milk ejection; promotes bonding
	ADH	water reabsorption in kidneys; constricts blood vessels
Pineal	***Melatonin***	regulates sleep-wake cycles
Thyroid	***T3*** & ***T4***	metabolism, growth, and development
	Calcitonin	lowers blood calcium

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Hormones (cont)

Parathyroid	***PTH***	raises blood calcium
Adrenal Cortex	***Mineralocorticoid (Aldosterone)***	sodium and potassium balance; maintains blood pressure
	Glucocorticoid (Cortisol)	body response to stress; regulates metabolism
	Androgens	sex drive and development of secondary sex traits
Adrenal Medulla	***Epinephrine***	increases heart rate, breathing, and energy during stress ("***fight or flight***")
	Norepinephrine	works with epinephrine
Pancreas	***Insulin***	lowers blood glucose
	Glucagon	raises blood glucose
	Somatostatin	inhibits secretion of insulin and glucagon
Overies	***Oestrogen***	regulates menstrual cycle
	Progesterone	maintains uterine lining and supports pregnancy
Testes	***Testosterone***	supports sperm production
Thymus	***Thymosin***	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 -***tropin*** or -***tropic*** it is usually a hormone that stimulates others, which means it is not the end of the cascade.

Endocrine Stimuli