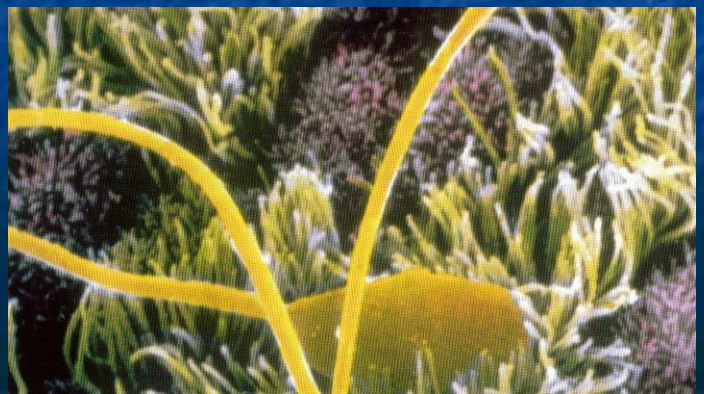
Ch. 39 Endocrine System



The Endocrine System

- The endocrine system is made up of glands that release their products into the bloodstream
- These products deliver messages throughout the body

Hormones

- Hormones - chemicals released in 1 part of the body, that travel through the bloodstream, & affect activities of cells in other parts of the body; “chemical messengers”
- Target cells (receptor cells) - cells that have receptors for a particular hormone

Glands

- A gland is an organ that produces & releases a substance, or secretion
- <u>Exocrine glands</u> - release their secretions (hormones) through ducts (tubes), directly to the organs that use them

Glands

- Endocrine glands - release their secretions (hormones) directly into the bloodstream

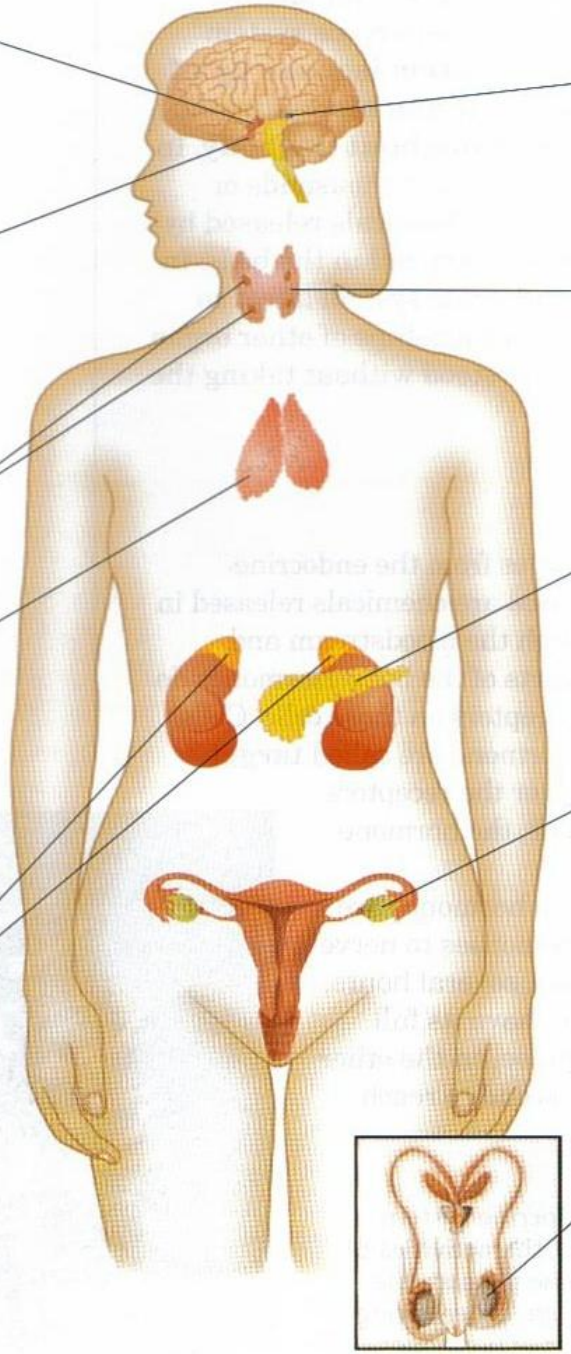
Hypothalamus
The hypothalamus makes hormones that control the pituitary gland. In addition, it makes hormones that are stored in the pituitary gland.

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.



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.

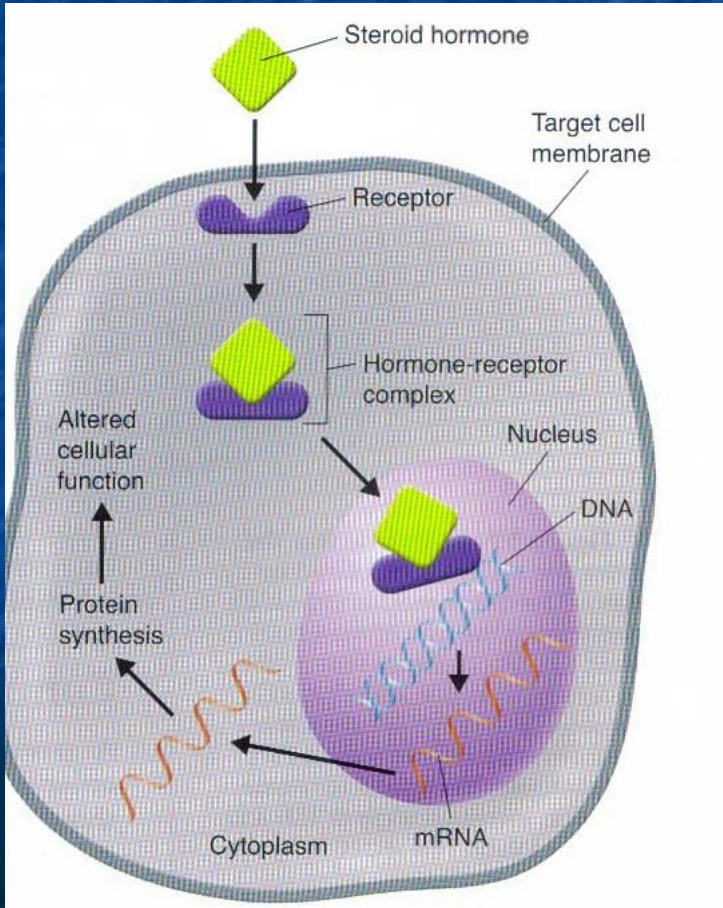
Pancreas
The pancreas produces insulin and glucagon, which regulate the level of glucose in the blood.

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.

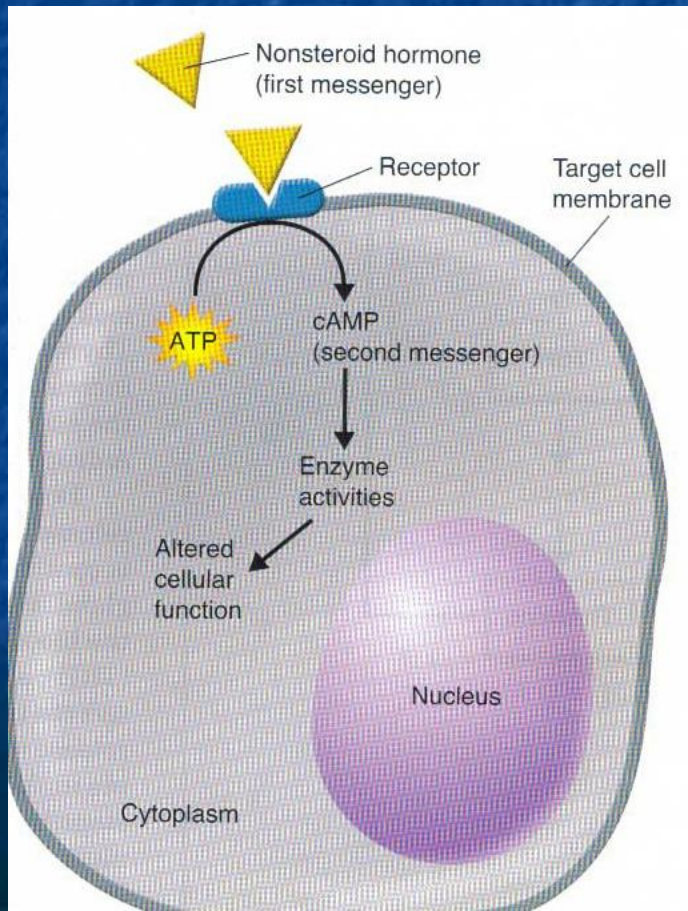
Hormone Action

- Steroid hormones:
  - Because they are lipids, they can cross cell membranes, passing directly into the cytoplasm the nuclei of target cells



Hormone Action

- Nonsteroid hormones:
  - They generally cannot pass through the cell membrane of their target cells



Prostaglandins

- Prostaglandins - modified fatty acids that produce cells, affecting other nearby cells & tissues ("local hormones")
  - Ex.) some cause smooth muscle tissue to contract

Control of the Endocrine System

- Like most systems of the body, the endocrine system is regulated by feedback mechanisms that function to maintain homeostasis
  - Ex.) Pancreas releasing insulin: blood sugar level increases after lunch, pancreas releases insulin, blood sugar level decreases, pancreas stops releasing insulin

Human Endocrine Glands

- The human endocrine system regulates a wide variety of activities
- Any improper functioning of an endocrine gland may result in a disease or disorder

Human Endocrine Glands

- The major glands of the endocrine system are: the pituitary gland, the hypothalamus, the thyroid gland, the parathyroid glands, the adrenal glands, the pancreas, & the reproductive glands

Pituitary Gland

- Pituitary gland - divided into 2 parts: anterior & posterior; it secretes 9 hormones that directly regulate many body functions & controls the actions of several other endocrine glands

Pituitary Gland Hormones

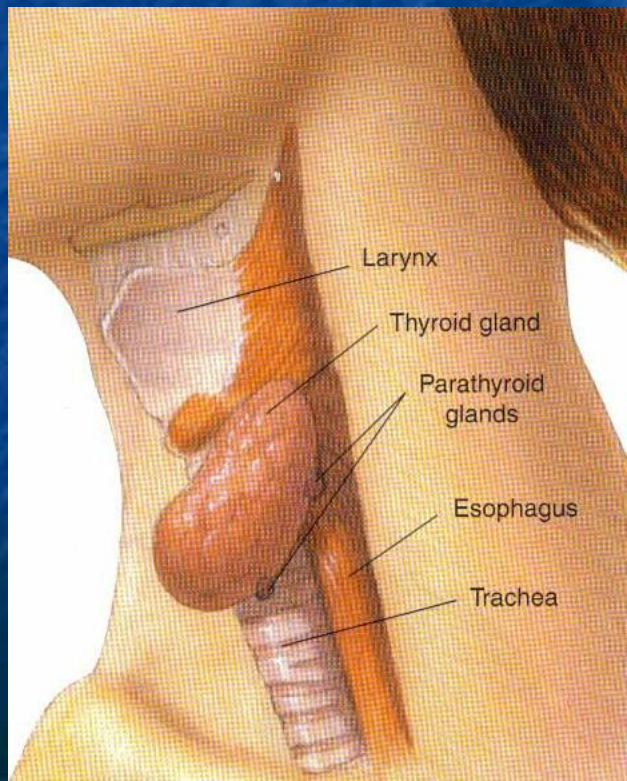
Pituitary Gland	Hormone	Action
Posterior pituitary	Antidiuretic hormone (ADH)	Stimulates the kidneys to reabsorb water from the collecting tubules
	Oxytocin	Stimulates contractions of uterus during childbirth; releases milk in nursing mothers
Anterior pituitary	Follicle-stimulating hormone (FSH)	Stimulates production of mature eggs and sperm
	Luteinizing hormone (LH)	Stimulates ovaries and testes; prepares uterus for implantation of fertilized egg
	Thyroid-stimulating hormone (TSH)	Stimulates the synthesis and release of thyroxine from the thyroid gland
	Adreno-corticotropic hormone (ACTH)	Stimulates release of some hormones from the adrenal cortex
	Growth hormone (GH)	Stimulates protein synthesis and growth in cells
	Prolactin	Stimulates milk production in nursing mothers
	Melanocyte-stimulating hormone (MSH)	Stimulates the melanocytes of the skin, increasing their production of the skin pigment melanin

Hypothalamus

- The hypothalamus controls the secretions of the pituitary gland
- The close connection between the hypothalamus & the pituitary gland, means that the nervous & endocrine systems can act together to help coordinate body activities

Thyroid Gland

- The thyroid gland has the major role in regulating the body's metabolism
- Releases thyroxin which increases metabolism, & cellular respiration



Thyroid Gland

- Unable to produce thyroxin produces condition known as cretinism
- 2 effects of cretinism are dwarfism & severe mental retardation
- Can be prevented by adding small amounts of iodine to table salt

Parathyroid Glands

- The 4 parathyroid glands are found on the back surface of the thyroid gland
- Hormones from the thyroid gland & the parathyroid glands act to maintain homeostasis of calcium levels in the blood

Adrenal Glands

- There are 2 adrenal glands that sit on top of the kidneys, like little hats
- The adrenal glands release hormones that help the body prepare for & deal with stress

Adrenal Glands

- The 2 hormones secreted by the adrenal glands are: epinephrine and norepinephrine
- The hormones produce the “fight or flight” response to stress

Pancreas

- The pancreas has both exocrine & endocrine functions
- It is a digestive gland whose enzymes help break down food
- However, different cells in the pancreas release hormones into the blood

Pancreas

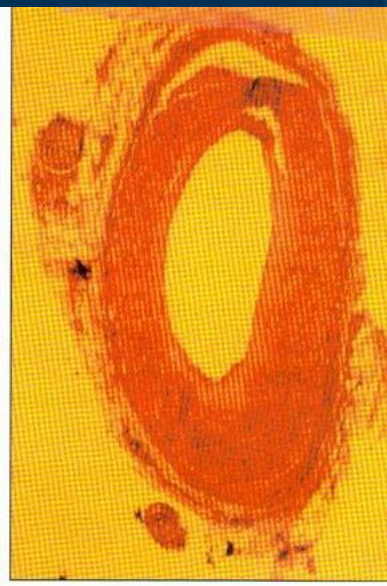
- Insulin & glucagon are released from the pancreas to help keep the blood glucose level stable
- Insulin stimulates liver cells to remove sugar from the blood & store it as glycogen
- Glucagon stimulates the liver to break down stored glycogen & release sugar back into the blood

Pancreas

- Diabetes mellitus - when the pancreas does not produce insulin
- There are 2 types of diabetes, Type I and Type II
- Type I requires daily injections of insulin, due to the fact that the body produces no insulin

Pancreas

- Type II develops in people after the age of 40, produces normal insulin but cells don't respond properly to the hormone
- Usually controlled through diet, exercise, & medication taken ora



Normal Coronary Artery

Coronary Artery Totally Blocke