

**Topic:** Endocrine system

**Reading:** Chapter 37

**Main concepts:**

- Hormones are a form of cellular communication. Some, such as prostaglandins, are for immediate cell-to-cell communication. Hormones produced by the endocrine system target multiple sites in the body, and generally travel through the bloodstream.
- Two major types of hormones:
  - Protein hormones: interact with receptors on surface of target cells, and set off a series of reactions within the cell.
  - Lipid hormones: usually enter the cell and are directly involved in activities.
- The hypothalamus is the master controller of the endocrine system
  - Hypothalamus receives information from the thalamus about the state of the body.
  - Hypothalamus signals the pituitary to send messages to other glands.
  - Pituitary releases hormones that signal other endocrine glands to produce their hormones. Some pituitary hormones themselves have a direct effect.
- In addition to the endocrine glands, other organs produce some hormones: stomach, kidneys, heart, thymus gland, intestines.

**Pituitary hormones**

Pituitary Hormone	Functions
Follicle-stimulating hormone	Stimulates egg maturation in the ovary and release of sex hormones.
Lutenizing hormone	Stimulates maturation of egg and of the corpus luteum surrounding the egg, which affects female sex hormones and the menstrual cycle.
Thyroid-stimulating hormone	Stimulates the thyroid to release thyroxine.
Adrenocorticotropic hormone	Causes the adrenal gland to release cortisol.
Melanocyte-stimulating hormone	Stimulates synthesis of skin pigments.
Growth hormone	Stimulates growth during infancy and puberty.
Antidiuretic hormone	Signals the kidney to conserve more water.
Oxytocin	Affects childbirth, lactation, and some behaviors.

**Other hormones of the endocrine system**

Gland	Hormones	Functions
Thyroid	Thyroxine	Regulates metabolism
	Calcitonin	Inhibits release of calcium from the bones
Parathyroids	Parathyroid hormone	Stimulates the release of calcium from the bones.

Gland	Hormones	Functions
Islet cells (in the pancreas)	Insulin	Decreases blood sugar by promoting uptake of glucose by cells.
	Glucagon	Increases blood sugar by stimulating breakdown of glycogen in the liver.
Testes	Testosterone	Regulates sperm cell production and secondary sex characteristics.
Ovaries	Estrogen	Stimulates egg maturation, controls secondary sex characteristics.
	Progesterone	Prepares the uterus to receive a fertilized egg.
Adrenal cortex	Epinephrine	Stimulates “fight or flight” response.
Adrenal medulla	Glucocorticoids	Part of stress response, increase blood glucose levels and decrease immune response.
	Aldosterone	Regulates sodium content in the blood.
	Testosterone (in both sexes)	Adult body form (greater muscle mass), libido.
Pineal gland	Melatonin	Sleep cycles, reproductive cycles in many mammals.

### Common misconceptions:

- Many people, when they hear the word “hormone,” think only of the sex hormones. This may be because when young teens go through the rigors of puberty, adults around them blame their mood swings and other changes on “hormones.”
- Various preparations of hormones can be found as pills in nutrition centers, sold as “natural” health aids. However, the term “natural” does not mean “safe.” The body maintains a careful hormone balance, and ingestion of various hormones can lead to trouble.

### Reading notes:

- Describe how hormones stimulate responses in cells.
- Describe how feedback mechanisms regulate hormone release.
- State the difference between endocrine and exocrine glands.
- State the overall role of the pituitary gland, and why the pituitary is sometimes called the “master gland.”
- Describe the negative feedback loops in which the following hormones are involved: thyroxine; insulin and glucagon; calcitonin and parathyroid hormone; aldosterone; ADH.

### Useful websites:

- “The Actions of Hormones” [http://www.wisc-online.com/objects/index\\_tj.asp?objID=AP13704](http://www.wisc-online.com/objects/index_tj.asp?objID=AP13704) is an animated interactive tutorial on animal hormones in general.
- “ADH” <http://www.kscience.co.uk/animations/adh.htm> illustrates the action of antidiuretic hormone in controlling water balance, one example of homeostasis.
- “Thyroid gland and negative feedback” <http://biologyinmotion.com/thyroid/index.html> is an interactive tutorial demonstrating negative feedback and thyroid function.