



Chapter 9-10: The Endocrine System

The endocrine glands secrete substances called hormones directly into the fluids of the body. (Exocrine glands secrete their products into tubes or ducts.) As a group, glands of the endocrine system help regulate metabolic processes, including rates of chemical reactions, the transport of substances across membranes, and water concentrations in the body. They also affect body development and growth. A hormone is a substance that's secreted by a cell and has an effect on a distant metabolic cell/tissue. Two mechanisms for hormone action are discussed in the next plate.

Begin by looking over the plate and the various endocrine glands of the body. Most of the glands are large enough to be distinct, and we recommend that you use dark colors to color them. Start in the head and then work your way down the body.

We will begin our study of the endocrine glands with a brief examination of a pea-sized gland called the **pituitary gland (A)**. The pituitary gland has anterior and posterior divisions, each of which secrete a number of hormones. Lying above the pituitary gland and connected to it by a stalk is the **hypothalamus (B)**. The hormone-releasing cells in the hypothalamus are actually specialized neurons that are different from both other secretory cells and other nerve cells.

The third endocrine gland in this area is the **pineal gland (C)**. The pineal gland is a small, oval structure that lies deep within the cerebral hemisphere, which is why it cannot be seen clearly in the plate. We suggest a spot of light color to indicate its general location. The pineal gland secretes melatonin. Varying light conditions outside the body appear to regulate its activity.

We will now move to the neck and thorax region and briefly examine four endocrine glands.

Located just below the larynx on either side and in front of the trachea is the **thyroid gland (D)**. As the plate shows, this gland consists of two large lobes that are connected by a broad isthmus. It secretes a number of hormones that affect metabolism in body cells. Located among the tissues of the thyroid gland are four tiny **parathyroid glands (E)**. (These glands are located on the dorsal surface, but we show them here on the lateral surface to indicate their general location.) Hormones from these glands regulate calcium metabolism in the body.

The plate shows a rather large and prominent **thymus gland (F)**. In the mature adult, the gland shown in the plate is atrophied. However, in very young individuals, the thymus is quite large. Hormones called thymosins that participate in immunity are believed to be synthesized by this gland.

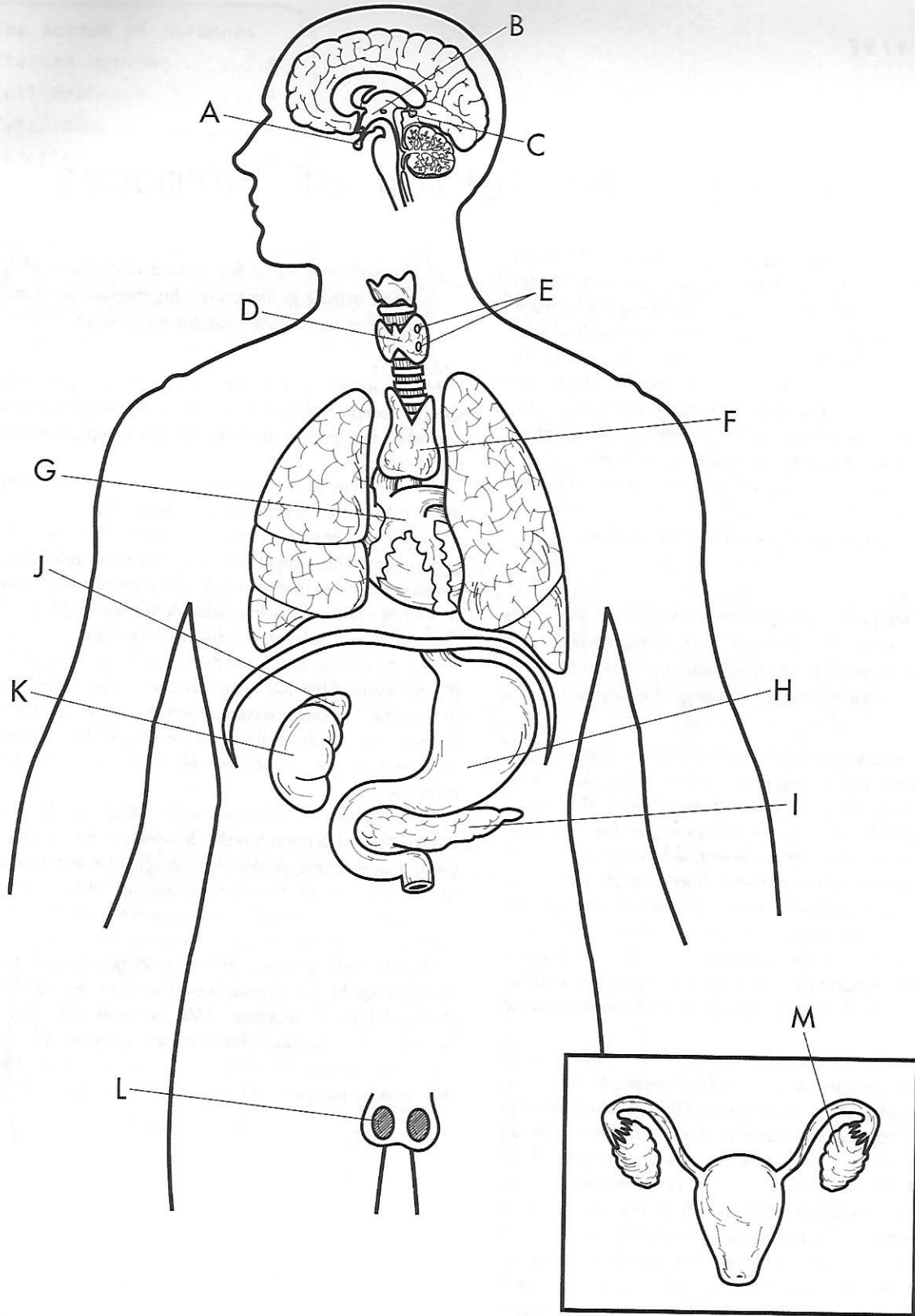
The function of the **heart (G)** in blood circulation is well known, but its endocrine function is less appreciated. Fibers of cardiac muscle in the right atrium produce a hormone called atrial natriuretic peptide, which controls the release of a hormone from the posterior pituitary gland and is involved in the regulation of water levels in the body.

In the final portion of this plate we will examine the endocrine glands of the abdominal and pelvic cavity. In some cases, the organs have other functions beside endocrine functions. Continue your coloring as before.

Many of the digestive processes are controlled by hormones, such as gastrin and secretin, that are released by cells of the **digestive organs (H)**. The **pancreas (I)**, which is a digestive organ as well as an endocrine organ, has specialized cells that produce insulin and glucagon, both of which regulate the levels of glucose in the blood.

Lying on top of the kidneys are the **adrenal glands (J)**. These pyramid-shaped glands are also known as suprarenal glands. Each gland has distinctive cortex and medulla regions, and numerous hormones are produced in both of these regions. Excretions of the **kidneys (K)** have a urinary function as well as an endocrine function. The endocrine cells of the kidney produce the hormones erythropoietin and renin, which are a part of the angiotensin system that regulates water balance in the body.

The reproductive organs produce numerous hormones as well as sex cells. The **testes (L)** produce hormones such as testosterone that regulate sperm production and induce the development of secondary male characteristics. The **ovaries (M)** produces hormones that induce the maturation of eggs and the growth of the reproductive structures. These hormones are called estrogens.



The Endocrine System

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| <input type="radio"/> Pituitary Gland.....A | <input type="radio"/> Parathyroid Gland.....E | <input type="radio"/> Adrenal GlandsJ |
| <input type="radio"/> HypothalamusB | <input type="radio"/> Thymus GlandF | <input type="radio"/> KidneyK |
| <input type="radio"/> Pineal GlandC | <input type="radio"/> Heart.....G | <input type="radio"/> TestisL |
| <input type="radio"/> Thyroid Gland.....D | <input type="radio"/> Digestive OrgansH | <input type="radio"/> Ovary.....M |
| | <input type="radio"/> PancreasI | |