12.1: Case Study: Hormones and Health

Case Study: Hormonal Havoc

18-year-old Gabrielle checks her calendar. It has been 42 days since her last menstrual period, two weeks later than the length of the average woman’s menstrual cycle. Although many women would suspect pregnancy if their period was late, Gabrielle has not been sexually active. She is not even sure she is “late” because her period has never been regular. Ever since her first period at 13 years of age, her cycle lengths have varied greatly, and there are months where she does not get a period at all. Her mother told her that a girl’s period is often irregular when it first starts, but Gabrielle’s still has not become regular five years later. She decides to go to the student health center on her college campus to get it checked out.

Figure 1: (Andreanna Moya Photography; https://flic.kr/p/5jLKHc; CC BY-NC 3.0)
The doctor asks her about the timing of her menstrual periods and performs a pelvic exam. She also notices that Gabrielle is overweight, has acne, and excess facial hair. As she explains to Gabrielle, while these physical characteristics can be perfectly normal, in combination with an irregular period they can be signs of a disorder of the endocrine, or hormonal, system called polycystic ovary syndrome (PCOS).

In order to check for PCOS, the doctor refers Gabrielle for a pelvic ultrasound and sends her to the lab to get blood work done. When her lab results come back, Gabrielle learns that her levels of androgens (a group of hormones) are high, and so is her blood glucose (sugar). The ultrasound showed that she has multiple fluid-filled sacs known as cysts in her ovaries. Based on Gabrielle’s symptoms and test results, the doctor tells her that she does indeed have PCOS.

PCOS is common in young women. It is estimated that between 1 in 10 to 20 women of childbearing age have PCOS — as many as five million women in the United States. You may know someone with PCOS or may have it yourself.

Read the rest of this chapter to learn about the glands and hormones of the endocrine system, their functions, how they are regulated, and the disorders — such as PCOS — that can arise when hormones are not regulated properly. At the end of the chapter, you will learn more about PCOS, its possible long-term consequences including fertility problems and diabetes, and how these negative outcomes can sometimes be prevented with lifestyle changes and medications.

Chapter Overview: Endocrine System

In this chapter, you will learn about the endocrine system, a system of glands that secrete hormones that regulate many of the body’s functions. Specifically, you will learn about:

- The glands that make up the endocrine system and how hormones act as chemical messengers in the body.
- The general types of endocrine system disorders.
- The types of endocrine hormones, including steroid hormones such as sex hormones, and non-steroid hormones such as insulin; and how they affect the functions of their target cells by binding to different types of receptor proteins.
- How the levels of hormones are regulated mostly through negative, but sometimes through positive, feedback loops.
- The master gland of the endocrine system, the pituitary gland, which controls other parts of the endocrine system through the hormones that it secretes; and how the pituitary itself is regulated by hormones secreted from the hypothalamus of the brain.
- The thyroid gland and its hormones, which regulate processes such as metabolism and calcium homeostasis; how the thyroid is regulated; and the disorders that can occur when there are problems in thyroid hormone regulation, such as hyperthyroidism and hypothyroidism.
- The adrenal glands, which secrete hormones that regulate processes such as metabolism, electrolyte balance, responses to stress, and reproductive functions; and the disorders that can occur when there are problems in adrenal hormone regulation, such as Cushing’s syndrome and Addison’s disease.
- The pancreas, which secretes hormones that regulate blood glucose levels such as insulin; and disorders of the pancreas and its hormones including diabetes.

As you read this chapter, think about the following questions:

1. Why can hormones have such a broad-range effect on the body, such as is seen in PCOS?
2. Which hormones normally regulate blood glucose and how is this related to diabetes?
3. What are androgens? How do you think their functions relate to some of the symptoms that Gabrielle is experiencing?