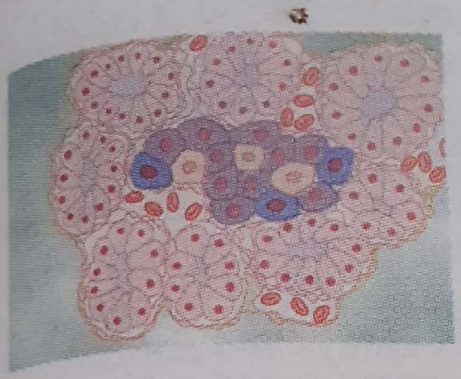

The pancreas, in addition to its digestive functions, secretes two important hormones, *insulin* and *glucagon*, that are crucial for normal regulation of glucose, lipid, and protein metabolism. Although the pancreas secretes other hormones, such as *amylin*, *somatostatin*, and *pancreatic polypeptide*, their functions are not as well established. The main purpose of this chapter is to discuss the physiologic roles of insulin and glucagon and the pathophysiology of diseases, especially *diabetes mellitus*, caused by abnormal secretion or activity of these hormones.

Physiologic Anatomy of the Pancreas. The pancreas is composed of two major types of tissues, as shown in Figure 78–1: (1) the *acini*, which secrete digestive juices into the duodenum, and (2) the *islets of Langerhans*, which secrete insulin and glucagon directly into the blood. The digestive secretions of the pancreas are discussed in Chapter 64.

The human pancreas has 1 to 2 million islets of Langerhans, each only about 0.3 millimeter in diameter and organized around small capillaries into which its cells secrete their hormones. The islets contain three major types of cells, *alpha*, *beta*, and *delta* cells, which are distinguished from one another by their morphological and staining characteristics.

The beta cells, constituting about 60 per cent of all the cells of the islets, lie mainly in the middle of each islet and secrete *insulin* and *amylin*, a hormone that is often secreted in parallel with insulin, although its function is unclear. The alpha cells, about 25 per cent of the total, secrete *glucagon*. And the delta cells, about 10 per cent of the total, secrete *somatostatin*. In addition, at least one other type of cell, the PP cell, is present in small numbers in the islets and secretes a hormone of uncertain function called *pancreatic polypeptide*.

The close interrelations among these cell types in the islets of Langerhans allow cell-to-cell communication and direct control of secretion of some of the hormones by the other hormones. For instance, insulin inhibits glucagon secretion, amylin inhibits insulin secretion, and somatostatin inhibits the secretion of both insulin and glucagon.

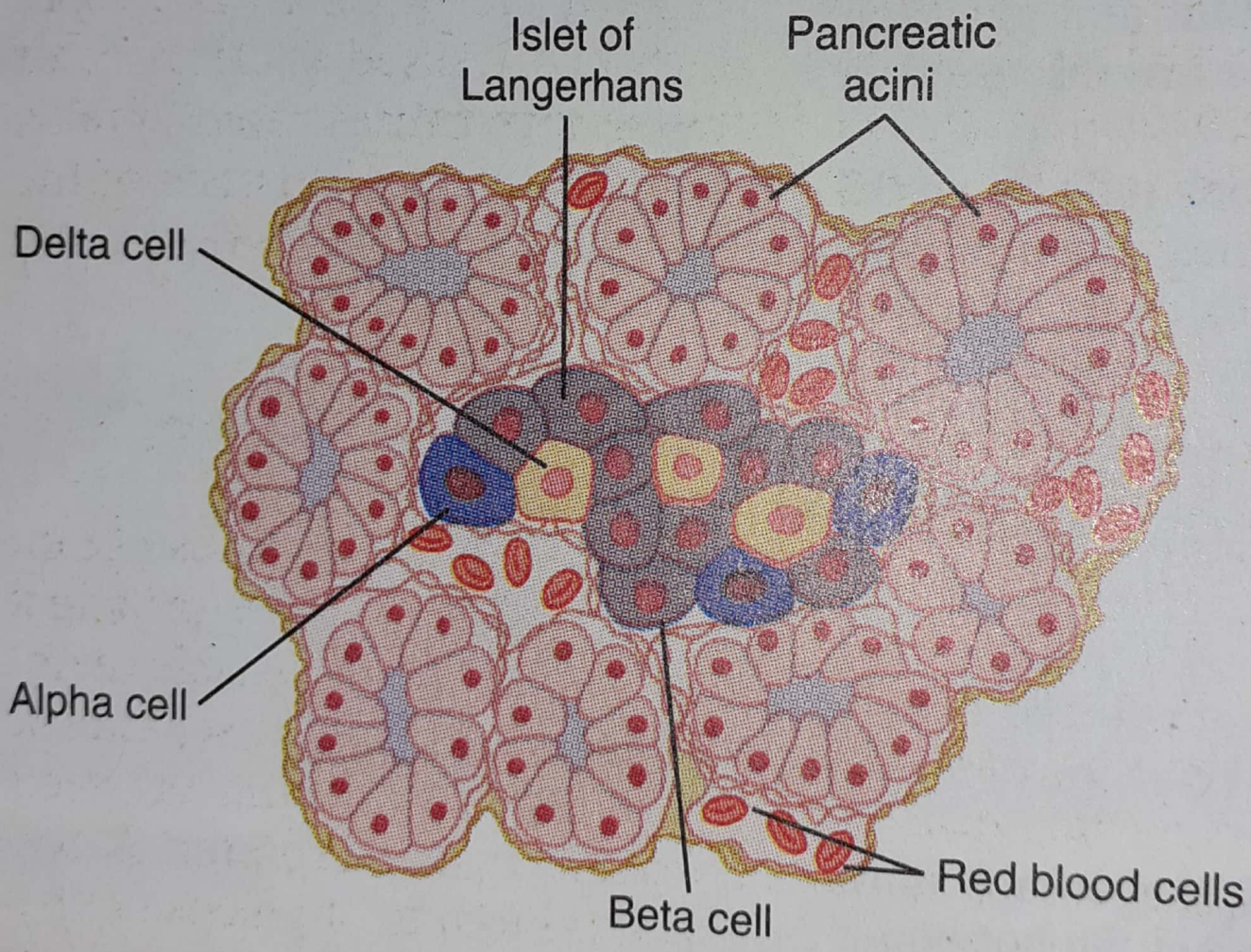

Figure 78–1

Physiologic anatomy of an islet of Langerhans in the pancreas.