



Figure 24-27 Hormone production in pancreatic islet cells. Immunoperoxidase staining shows a dark reaction product for insulin in β cells (A), glucagon in α cells (B), and somatostatin in δ cells (C). D, Electron micrograph of a β cell shows the characteristic membrane-bound granules, each containing a dense, often rectangular core and distinct halo. E, Portions of an α cell (left) and a δ cell (right) also show granules, but with closely apported membranes. The α -cell granule shows a dense, round center. (Electron micrographs courtesy Dr. Arthur Like, University of Massachusetts Medical School, Worcester, Mass.)

children who subsist on “junk” food and lack adequate exercise.

The mortality rate from diabetes varies across countries, with middle- and low-income nations accounting for almost 80% of diabetes-related deaths and nearly double the mortality rates observed in developed nations. Nonetheless, diabetes continues to be one of the top 10 “killers” in the United States. The total yearly costs related to diabetes in the United States are estimated to be an astounding 174 billion dollars, including \$116 billion in direct medical costs and the additional \$58 billion in indirect costs such as disability, work loss, and premature mortality.

Diagnosis

Blood glucose is normally maintained in a very narrow range of 70 to 120 mg/dL. According to the ADA and WHO, **diagnostic criteria for diabetes include:**

1. A fasting plasma glucose ≥ 126 mg/dL,
2. A random plasma glucose ≥ 200 mg/dL (in a patient with classic hyperglycemic signs, as discussed later),
3. 2-hour plasma glucose ≥ 200 mg/dL during an oral glucose tolerance test (OGTT) with a loading dose of 75 gm, and

4. A glycated hemoglobin (Hb_{A1C}) level $\geq 6.5\%$ (glycated hemoglobin is further discussed under chronic complications of diabetes)

All tests, except the random blood glucose test in a patient with classic hyperglycemic signs, need to be repeated and confirmed on a separate day. If there is discordance between two assays (e.g., fasting glucose and Hb_{A1C} level), then the result with greater degree of abnormality is considered the “readout.” Of note, many acute stresses, such as severe infections, burns or trauma, can lead to transient hyperglycemia due to secretion of hormones like catecholamines and cortisol that oppose the action of insulin. The diagnosis of diabetes requires persistence of hyperglycemia following resolution of the acute illness.

Impaired glucose tolerance (prediabetes) is defined as:

1. A fasting plasma glucose between 100 and 125 mg/dL (“impaired fasting glucose”),
2. 2-hour plasma glucose between 140 and 199 mg/dL following a 75-gm glucose OGTT, and/or
3. A glycated hemoglobin (Hb_{A1C}) level between 5.7% and 6.4%

As many as one-fourth of individuals with impaired glucose tolerance will develop overt diabetes over 5 years,