BLOOD GLUCOSE

Blood glucose, often called blood sugar, is a simple sugar that supplies energy to cells. During digestion, enzymes break down starches and digestible sugars into smaller sugars, including glucose, which enters the bloodstream through the small intestine. Other sugars, such as fructose, follow different processing pathways. Fiber is not digested into glucose by human enzymes. The liver also produces glucose, helping maintain a fuel supply between meals and overnight.

INSULIN, GLUCAGON, & ENERGY STORAGE

The pancreas helps regulate circulating glucose through two hormones. Insulin, released by pancreatic beta cells, increases after meals. It signals muscle and fat cells to take up glucose and promotes storage. The liver and muscles store glucose as glycogen, a readily available energy reserve. Insulin also reduces the liver's glucose production. Some tissues, including the brain, take up glucose without depending directly on insulin. Glucagon, released by pancreatic alpha cells, helps maintain glucose when food is not entering the bloodstream. It signals the liver to break down glycogen and make glucose from substances such as lactate, glycerol, and certain amino acids. This glucose-making process is called gluconeogenesis. Insulin and glucagon coordinate with other hormones to balance immediate energy needs and stored fuel.

FASTING & POST-MEAL MEASUREMENTS

Blood glucose is commonly reported in milligrams per deciliter, or mg/dL, in the United States. Fasting plasma glucose measures glucose after at least eight hours without caloric intake. For nonpregnant adults, standard diagnostic categories are below 100 mg/dL, normal; 100–125 mg/dL, prediabetes; and 126 mg/dL or higher, diabetes range. Diabetes-range results generally require confirmation unless hyperglycemia is unequivocal. Post-meal, or postprandial, glucose describes levels after eating. A rise is normal; its size and duration depend on digestion, meal composition, insulin response, and activity. An ordinary meal measurement differs from an oral glucose tolerance test, which uses a standardized glucose drink. In that test, a two-hour value of 140–199 mg/dL indicates prediabetes; 200 mg/dL or higher is in diabetes range.

HEMOGLOBIN A1c & GLUCOSE VARIABILITY

Hemoglobin A1c, or HbA1c, measures the percentage of hemoglobin (the oxygen-carrying protein in red blood cells) with glucose attached. It reflects average glucose over approximately three months, with recent weeks contributing more strongly. Diagnostic categories are below 5.7%, normal; 5.7–6.4%, prediabetes; and 6.5% or higher, diabetes range. Anemia, altered red blood cell lifespan, and some hemoglobin variants can affect accuracy. Glucose variability describes fluctuations over time. Two people can have similar A1c results but different peaks and lows. Meals, sleep, stress hormones, illness, movement, and medications influence these patterns.

INSULIN RESISTANCE & DIABETES TERMINOLOGY

Insulin resistance means cells respond less effectively to insulin. The pancreas may initially compensate by producing more, keeping glucose normal. Type 2 diabetes develops when insulin production cannot adequately compensate. Type 1 diabetes usually involves autoimmune destruction of beta cells. Gestational diabetes develops during pregnancy. Hyperglycemia means high blood glucose. Hypoglycemia means low blood glucose. Persistently elevated glucose can damage blood vessels and nerves, affecting the eyes, kidneys, and circulation.

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