Fig. 14.1. Physiologic factors that influence blood [glucose].

- Intestine: Dietary carbohydrates (CHO) are broken down to monosaccharides (including glucose) that are absorbed in the small intestine, from which they enter portal blood and then systemic blood if not removed by hepatocytes.
- Pancreas: Insulin and glucagon are released from pancreatic islet β-cells and α-cells, respectively. Insulin secretion is stimulated by increased blood concentrations of glucose, GH, glucagon, or amino acids. Glucagon secretion is stimulated by increased blood concentrations of amino acids and cortisol, or by decreased blood [glucose]. Amylase (AMS) is released from the pancreas and catalyzes the breakdown of ingested starches to form glucose.
- Liver: Hepatocytes are the primary source of blood glucose during fasting. Glucose can be obtained from glycogenolysis (stimulated by epinephrine and glucagon but inhibited by insulin) or gluconeogenesis (stimulated by glucagon and cortisol but inhibited by insulin). Insulin also promotes glycolysis. Increased glucose release from hepatocytes is promoted by increased glucagon, cortisol, or epinephrine. Insulin promotes the hepatic uptake of glucose by promoting glucokinase activity, but this glucose uptake does not require insulin.

Fig. 14.1. *continued*

- Muscle: Glucose uptake by myocytes is promoted by insulin through specific insulin receptors and glucose transporters; GH and cortisol inhibit the uptake of glucose. Insulin promotes glycogen synthesis in myocytes, whereas GH, glucagon, and epinephrine promote glycogenolysis to provide glucose for glycolysis.
- Adipose tissue: Insulin promotes the uptake of glucose by adipocytes; GH reduces glucose uptake.
- Kidney: If the renal threshold for tubular resorption of glucose is exceeded, then hyperglycemic glucosuria will develop.
- Pituitary: GH release from the pituitary is stimulated by growth hormone–releasing hormone, which is released from the hypothalamus during hypoglycemia or after epinephrine stimulation.
- Blood cells: Glucose enters erythrocytes, leukocytes, and platelets through insulin-independent processes and is used in glycolysis and the hexose monophosphate shunt.

Note: The *solid arrows* indicate the movement of glucose, and the *dashed arrows* represent the movement of hormones or amylase.