

Adiponectin

Adiponectin is an adipokine that is released from adipose tissue. It is an important signaling molecule that acts centrally at the level of the hypothalamus to decrease food intake, and peripherally to modify fatty acid and glucose metabolism. Low levels of adiponectin are associated with obesity and insulin resistance.

Akt-1

Akt, which is sometimes called protein kinase B (PKB), is an intracellular kinase that is important in a number of cellular functions, including regulation of glucose metabolism and cell growth. It is a kinase in the insulin signaling pathway, and insulin activation of Akt results in glucose transporter-4 (GLUT-4) translocation to the cell membrane, thereby stimulating glucose uptake. Overexpression of Akt in the heart can cause a marked hypertrophy of the muscle.

GLUT-4

Glucose transporter-4 (GLUT-4) is a protein that transports glucose across cell membranes. In insulin-responsive tissues (such as the heart), insulin will cause GLUT-4 to be translocated from inside the cell to the plasma membrane, thereby stimulating glucose uptake.

HOMA-IR

Homeostasis model assessment of insulin resistance (HOMA-IR) is a clinically utilized index of insulin resistance calculated as the product of fasting plasma glucose concentration (expressed in mmol/L) and fasting plasma insulin concentration (expressed in $\mu\text{U}/\text{mL}$) normalized to a constant, 22.5. The constant, itself, reflects the product of normal fasting plasma glucose (ie, 4.5 mmol/L) and normal fasting plasma insulin (ie, 5 $\mu\text{U}/\text{mL}$).

Insulin

Insulin is a pancreatic peptide hormone secreted from β cells of the islets of Langerhans in the postabsorptive state. Its major metabolic effects are anabolic in nature, exemplified by the ability of insulin to: increase glucose and amino acid uptake as well as glycogen and protein synthesis in muscle; increase glucose uptake and triacylglycerol synthesis in adipose tissue; and increase glucose uptake, glycogen and triacylglycerol synthesis in the liver.

Leptin

Leptin is a peptide hormone synthesized by adipocytes that plays a key role in the regulation of appetite and energy expenditure. This can occur through direct actions of

leptin on the hypothalamus or via direct actions of leptin on peripheral lipid and glucose metabolism.

Triacylglycerol

Triacylglycerol (TAG) is the major storage form of fatty acids in the body and consists of three fatty acids attached to a glycerol backbone. Fatty acid storage in adipocytes primarily occurs in the form of TAG. The heart also contains sizable TAG stores as a source of fatty acids for energy production.

Diacylglycerol

Diacylglycerol (DAG) consists of two fatty acids attached to a glycerol backbone and is the preceding intermediate in the biosynthesis of TAG. The accumulation of DAG in skeletal muscle and the liver has been linked to the development of muscle and hepatic insulin resistance.

Ceramide

Ceramides are specialized lipids that are derived from sphingomyelin and glycosphingolipids present in plasma membrane of cells. Various cytokines can release ceramides, which then act as important intracellular signaling molecules. Considerable interest has focused on ceramide as a signaling molecule in apoptosis (programmed cell death) and in the development of muscle insulin resistance.

Lipoprotein lipase

Lipoprotein lipase (LPL) is an enzyme that cleaves fatty acids from TAG contained within lipoproteins.

Pyruvate dehydrogenase kinase 2

Pyruvate dehydrogenase kinase 2 (PDK2) is an intramitochondrial kinase that phosphorylates and inhibits pyruvate dehydrogenase (PDH). As PDH is the rate-limiting enzyme for the mitochondrial metabolism of carbohydrates, activation of PDK2 will result in a decrease in the mitochondrial metabolism of carbohydrates. Maintaining mitochondrial glucose metabolism is an important therapeutic strategy to protect the ischemic heart. Therefore, inhibition of PDK2 (which is expressed in the heart) is a potential therapeutic approach to treating ischemic heart disease.

Peroxisome proliferator activated receptor alpha

Peroxisome proliferator activated receptor alpha (PPAR α) is a nuclear receptor involved in the transcriptional regulation of proteins. PPAR α has many functions, including regulating the expression of many enzymes involved in the control of fatty acid oxidation in muscle, heart and liver.