

Glucagon actions

Stimulates:

- **Blood glucose levels:**
 - By promoting glycogenolysis (breakdown of stored glucose) in the liver.
 - By stimulating gluconeogenesis (production of glucose from non-carbohydrate sources) in the liver.
 - By increasing lipolysis (breakdown of fat) and ketogenesis (production of ketones) for energy.
- **Cardiac contractility:** Increases the force of heart muscle contractions.
- **Bile secretion:** Increases the production and release of bile from the liver.
- **Release of certain hormones:** Stimulates the release of insulin, growth hormone, and somatostatin.

Inhibits:

- **Peripheral glucose utilization:** Reduces the uptake of glucose by muscle and other tissues.
- **Triglyceride storage:** Inhibits the storage of triglycerides (fats) in the liver.
- **Inhibit gastric acid secretion**

Glucagon: control of secretion

Stimulate Glucagon Secretion:

- **Primary factor:**
 - **Hypoglycemia:** Low blood glucose levels are the primary trigger for glucagon release.

Other Stimulating Factors:

- **Amino acids:** High levels of certain amino acids, especially alanine and arginine.
- **Gastrointestinal hormones:**
 - CCK-PZ and Gastrin (released after a meal)
 - Exercise (strenuous)
- **Autonomic nervous system:**
 - Beta-adrenergic stimulation (sympathetic)
 - Vagal stimulation (acetylcholine)

Inhibit Glucagon Secretion:

- **Primary factor:**
 - **Hyperglycemia:** High blood glucose levels are the main inhibitor of glucagon secretion.

Other Inhibiting Factors:

- **Hormones:**
 - Somatostatin
 - Insulin (indirectly, by stimulating somatostatin)
- **Autonomic nervous system:**
 - Alpha-adrenergic stimulation (sympathetic)



Insulin Actions: Sorted

Stimulates:

- **Glucose Metabolism:**
 - Glycogen synthesis (glycogenesis)
 - Glucose uptake in liver and muscles
 - Glycolysis
- **Protein Synthesis:**
 - Amino acid uptake
 - Muscle protein formation
- **Cellular Uptake:**
 - Magnesium (Mg⁺⁺)
 - Potassium (K⁺)
 - Phosphate ions
 - Increases cell membrane permeability to glucose

Inhibits:

- **Glucose Metabolism:**
 - Gluconeogenesis
- **Fat Metabolism:**
 - Lipolysis
- **Other:**
 - Somatostatin release (indirectly)

Additional Notes:

- Insulin secretion is primarily controlled by blood glucose levels.
- Insulin deficiency leads to diabetes mellitus and its associated symptoms.

Insulin: control of secretion

Stimulators:

- **Blood Glucose:**
 - Rise in blood glucose concentration is the primary stimulator.
 - Triggers a biphasic response:
 - Initial rapid surge within 3-5 minutes.
 - Delayed and sustained increase after 15-20 minutes.
- **Gastrointestinal Hormones:**
 - Enteroglucagon (released during glucose absorption).
 - Glucagon (directly stimulates beta cells).
 - Vagal stimulation.
 - Gastrin, Secretin, CCK-PZ, and GIP.
- **Amino Acids:**
 - Arginine and lysine.

Inhibitors:

- **Somatostatin:** Inhibits beta cells.
- **Sympathetic Stimulation:** Mediated by alpha receptors.

Additional Notes:

- Insulin secretion is a complex process influenced by multiple factors.

Blood glucose levels have the most significant impact.

