Insulin Overview

Overview:
Insulin is a 51-amino acid peptide hormone produced by the beta cells of the pancreatic islets of Langerhans. It is the primary anabolic hormone in the body, playing a crucial role in glucose, fat, and protein metabolism.

Mechanism of Action:
Receptor Binding:
- Insulin binds to the insulin receptor (a receptor tyrosine kinase) on target cells such as muscle, fat, and liver cells.

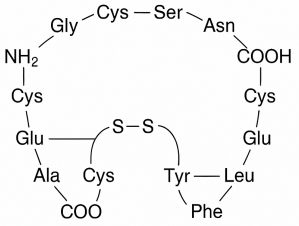
Signal Cascade:
- Activation of the PI3K/Akt pathway, leading to glucose uptake via translocation of GLUT4 transporters to the cell membrane.
- Promotes glycogen synthesis, lipid synthesis, and protein synthesis.
- Inhibits gluconeogenesis and lipolysis.

Physiological Functions in the Body:
Glucose Homeostasis: Lowers blood glucose by promoting glucose uptake and storage.
Anabolism: Stimulates glycogen, lipid, and protein synthesis.
Inhibits catabolism: Prevents fat breakdown and glucose production in the liver.
Growth Factor: Acts as a growth-promoting hormone in certain tissues.

Clinical Use:
FDA-Approved Indications:
Diabetes mellitus types 1 and 2
Hyperkalemia treatment (shifts potassium into cells)
Administration:
Subcutaneous injection (most common)
Intravenous infusion (for emergencies, e.g., diabetic ketoacidosis)
Inhaled and continuous infusion via insulin pumps (in select patients)

Dosing (FDA-Approved):
Individualized:
Depends on type of diabetes, blood glucose levels, and patient-specific factors.
Common regimens:
Basal insulin: Long-acting analogs (e.g., glargine, detemir) once or twice daily.
Bolus insulin: Rapid-acting analogs (e.g., lispro, aspart) before meals.
Emergency situations (e.g., DKA):
IV insulin infusion starting at 0.1 units/kg/hour, titrated based on blood glucose.

Conclusion:
Insulin is the cornerstone of glucose regulation, critical for carbohydrate, fat, and protein metabolism. Its therapeutic use in diabetes management has transformed patient outcomes, and ongoing research continues to refine insulin formulations and delivery methods.



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