



SNS COLLEGE OF ALLIED HEALTH SCIENCE
SNS Kalvi Nagar, Coimbatore - 35
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DEPARTMENT OF OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY - II YEAR

COURSE NAME: PHARMACOLOGY

TOPIC - INSULIN

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INSULIN



- Peptide hormone from pancreatic beta cells; regulates glucose metabolism.
- Discovered 1921; 51 amino acids (A: 21, B: 30, disulfide-linked).
- Synthesized as preproinsulin, processed to insulin + C-peptide.
- Basal secretion: ~1 unit/hour; meal-induced spikes; recombinant since 1980s



DIABETES MELLITUS



- Hyperglycemia, glycosuria, hyperlipidemia; HbA1c tracks glycosylation.

Type 1:

- Beta-cell loss, autoimmune (IA) or idiopathic (IB), ketoacidosis-prone.

Type 2:

- Insulin resistance, metabolic syndrome (obesity, hypertension).

Other:

- LADA, MODY, gestational, post-pancreatectomy.

MECHANISM OF ACTION

- Promotes glucose/amino acid uptake (GLUT4), glycogen/lipid/protein synthesis; inhibits gluconeogenesis/lipolysis.
- Binds insulin receptor, activates tyrosine kinase, triggers PI3K-AKT and Ras-MAPK pathways.
- Independent tissues: Liver, brain, RBCs, renal medulla.



PHARMACOKINETICS



- **Metabolism:** Liver, kidneys, muscles;
- **Elimination:** Hepatic first-pass; C-peptide marks endogenous secretion.

Dosage and Administration

- **Indications:** Type 1/2 DM; individualized dosing.
- **Routes:** Subcutaneous, IV (regular), inhaled (Afrezza).
- **Adjustments:** Meals, exercise, illness; bedtime glargine reduces hypoglycemia.



INSULIN



- U-100 standard; concentrated: U-500 (regular), U-300 (glargine), U-200 (degludec/lispro).
- Rapid-acting:** Lispro, aspart, glulisine (onset 5-15 min, duration 3-5h).
- Short-acting:** Regular (onset 30-60 min, duration 8-10h).
- Intermediate:** NPH (onset 2-4h, duration 12-18h).
- Long-acting:** Glargine, detemir (no peak, 20-24h); degludec (>42h).

Insulin Type	Onset	Peak	Duration
Rapid-acting (e.g., Lispro)	5-15 min	30-90 min	3-5 hours
Short-acting (Regular)	30-60 min	2-3 hours	8-10 hours
Intermediate (NPH)	2-4 hours	4-10 hours	12-18 hours
Long-acting (Glargine, Detemir)	1-4 hours	No peak	20-24 hours
Ultra-long (Degludec)	30-90 min	No peak	>42 hours



INSULIN



Adverse Effects

Hypoglycemia (common), weight gain (less with detemir).
Lipodystrophy, allergies, injection site reactions.
Inhaled: Lung risks (contraindicated in chronic lung disease).

Interactions and Considerations

Interactions: Hypoglycemia risk with acarbose, beta-blockers (mask symptoms).

Special: Pregnancy (safe, adjust for GDM); renal/hepatic impairment (lower dose); travel (U-40 syringe matching).



THANK YOU