PHARM.D • YEAR 3

Medicinal Chemistry

CHAPTER 8

Hypoglycemic Agents

PPT CHAPTER COVER

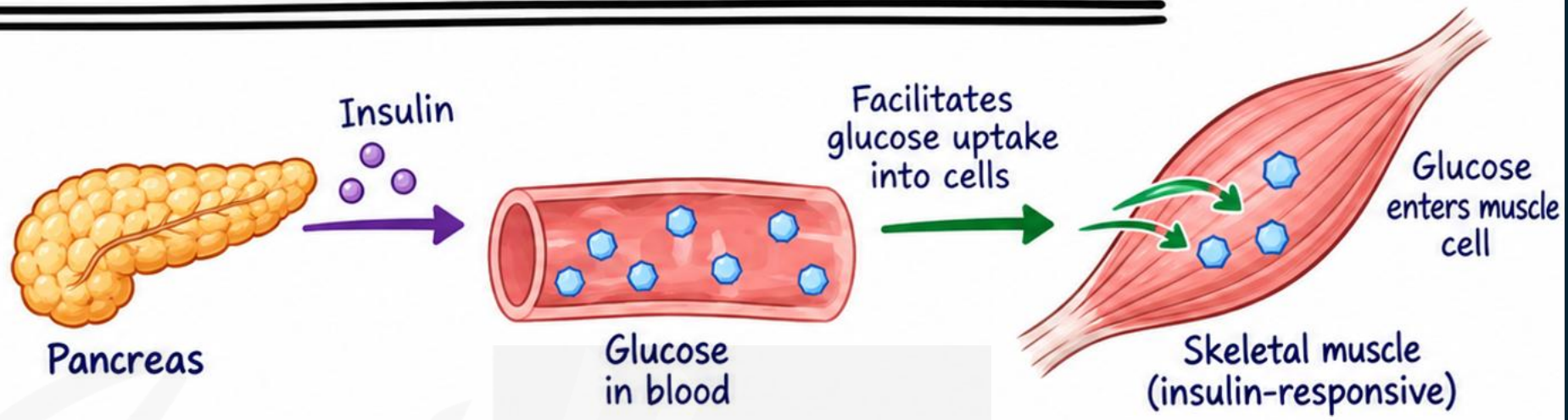


DOCTOR OF PHARMACY

DIABETES & GLUCOSE CONTROL

WHAT CHANGES?

Persistent hyperglycaemia results from deficient insulin secretion, impaired insulin action, or both.



TYPE 1

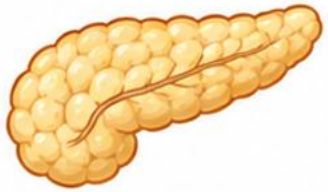
Beta-cell destruction produces severe insulin deficiency.
Insulin replacement is essential.
It can begin at any age.



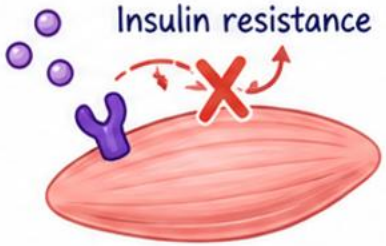
Destroyed beta-cells (no insulin)

TYPE 2

Insulin resistance combines with progressive beta-cell dysfunction.
Management may include oral agents, injectable drugs and insulin.



Reduced insulin secretion over time



Reduced response to insulin

COMMON FEATURES

Polyuria, thirst, fatigue and sometimes increased hunger.
Glycosuria can occur.

RISK FACTORS

Family history, excess adiposity and physical inactivity contribute to type 2 risk.
Diet alone does not explain every case.



Family history



Excess adiposity

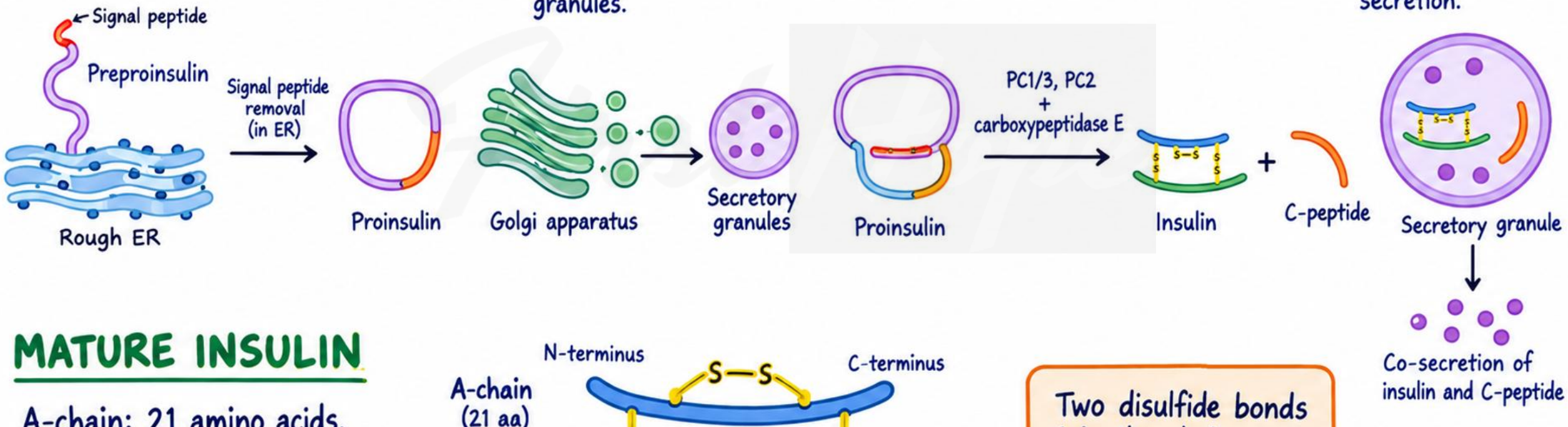


Physical inactivity

INSULIN: FORMATION & STRUCTURE

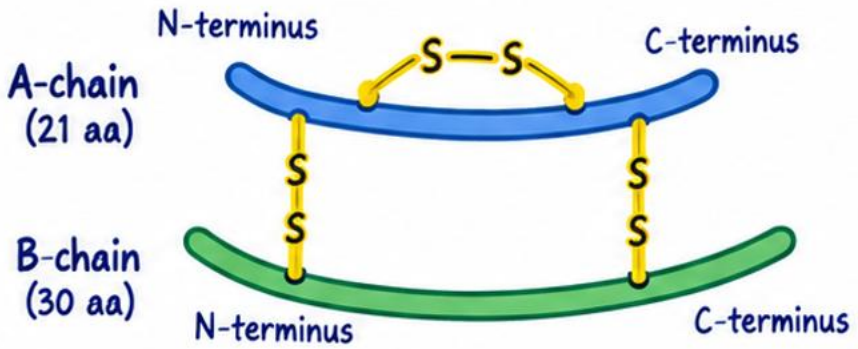
BIOSYNTHESIS

1. Preproinsulin is made in rough ER. Signal-peptide removal in the ER forms proinsulin.
2. Proinsulin folds and forms disulfide bonds, then travels through the Golgi into secretory granules.
3. Convertases PC1/3 and PC2 plus carboxypreptidase E remove C-peptide.
4. Insulin and C-peptide are released together. C-peptide indicates endogenous insulin secretion.



MATURE INSULIN

A-chain: 21 amino acids.
B-chain: 30 amino acids.
Total: 51.



Two disulfide bonds join the chains.
A third bond is within the A-chain.

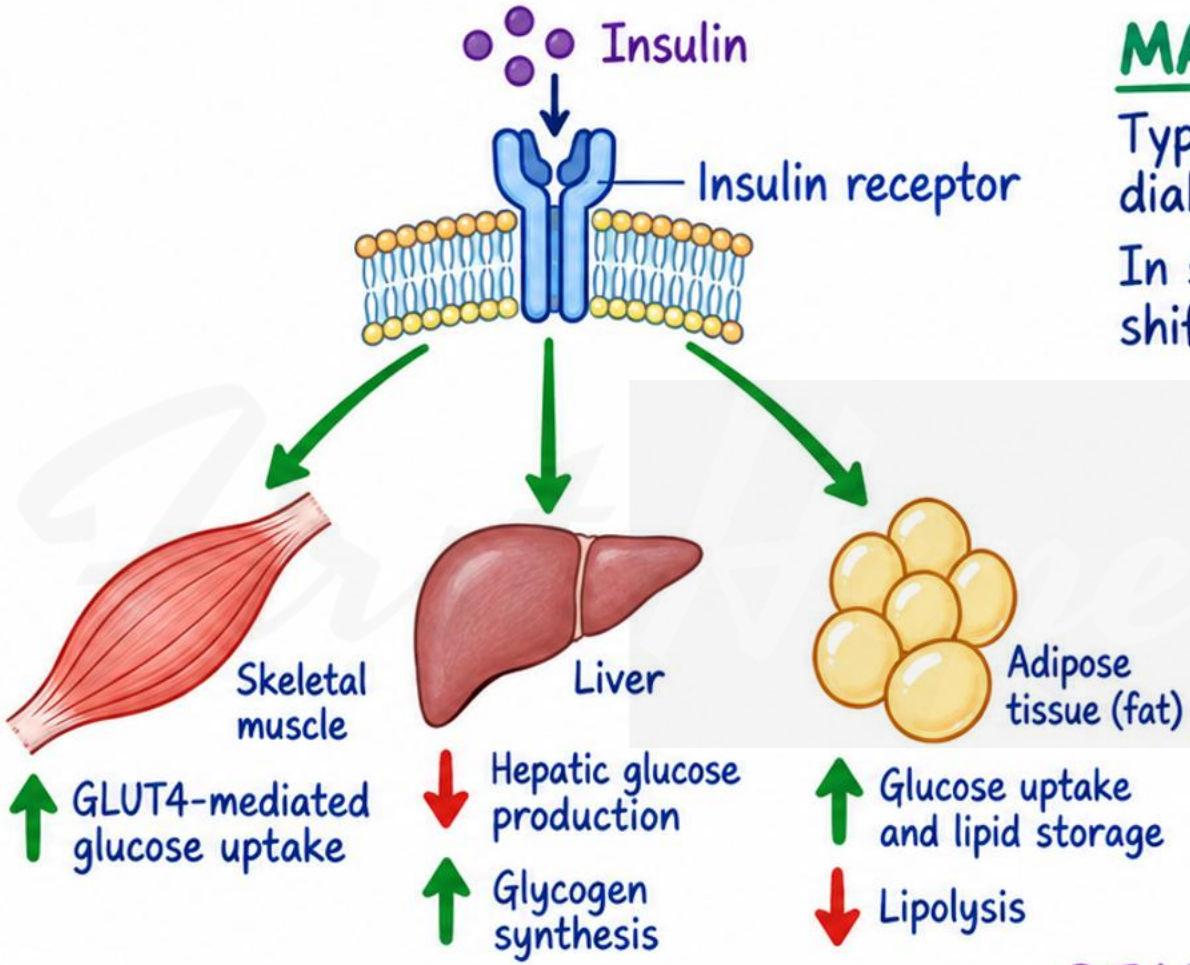
INSULIN: ACTIONS & CAUTIONS

METABOLIC ACTION

Insulin-receptor signalling increases GLUT4-mediated glucose uptake in skeletal muscle and adipose tissue.

It reduces hepatic glucose production and promotes glycogen synthesis.

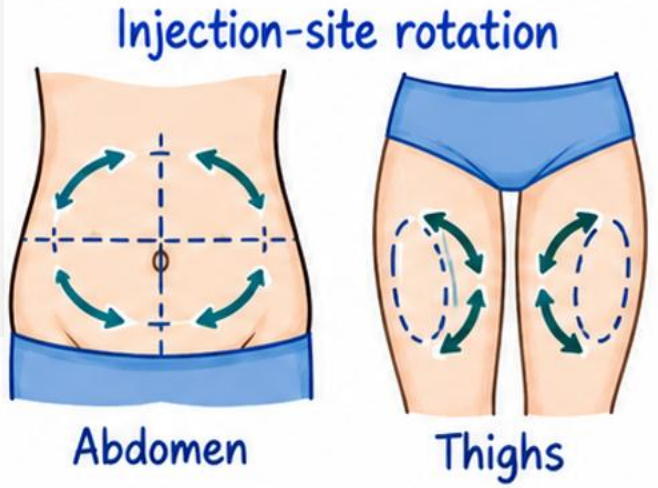
It stimulates lipid storage and suppresses lipolysis.



MAIN USES

Type 1 diabetes, selected type 2 diabetes and diabetes in pregnancy.

In supervised care, insulin also shifts potassium into cells.



IMPORTANT RISKS

Hypoglycaemia, weight gain and injection-site changes.

Repeated injections at one site may cause lipodystrophy.

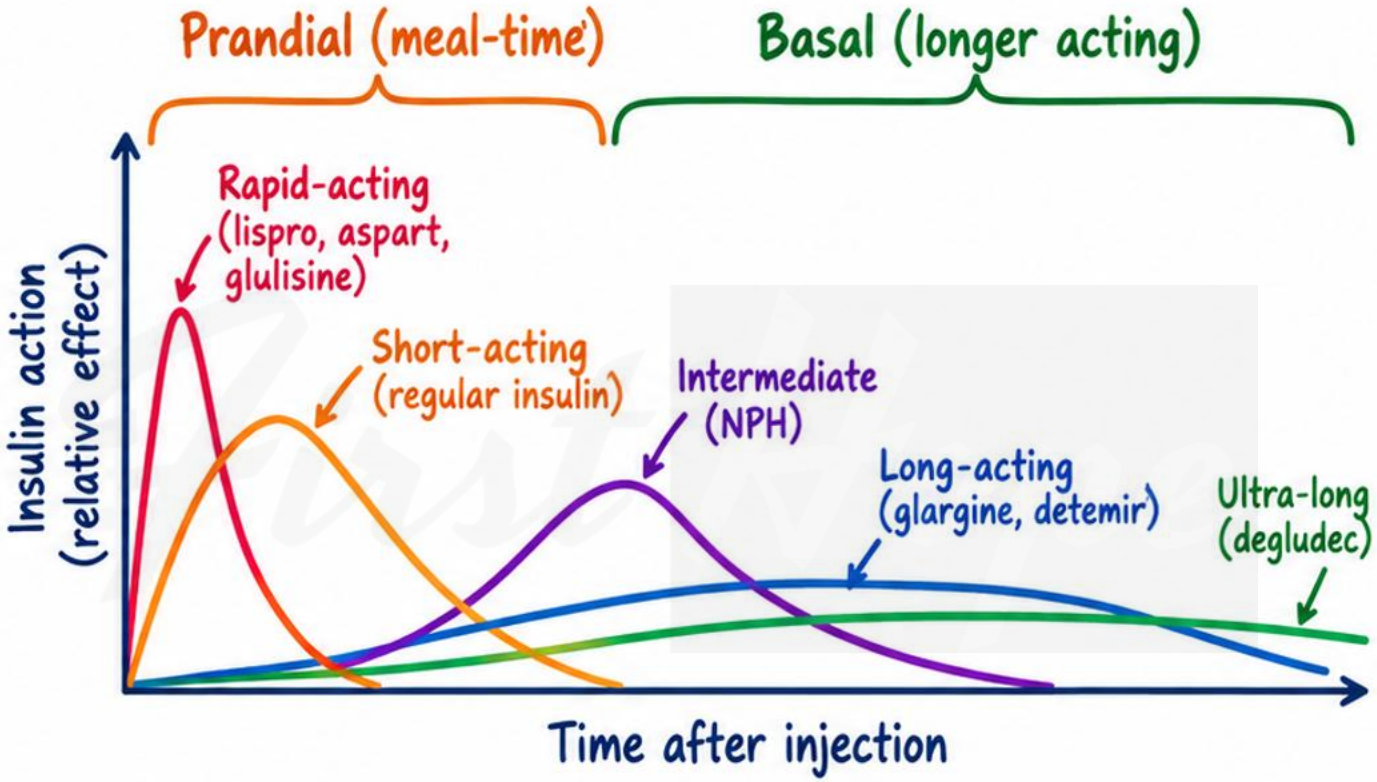
REMEMBER

Insulin has anabolic actions on carbohydrate, lipid and protein metabolism.

INSULIN PREPARATIONS

PRANDIAL INSULIN

- **Rapid-acting:** lispro, aspart and glulisine. Typical onset about 15 minutes, duration about 3–5 hours.
- **Short-acting:** regular insulin. Typical onset about 30 minutes, duration about 5–8 hours.



BASAL INSULIN

- **Intermediate:** NPH, with a clear peak and variable duration.
- **Long-acting:** glargine and detemir, with flatter action profiles.
- **Ultra-long:** degludec, with action lasting at least 42 hours in label studies.

KEY POINT

Onset, peak and duration depend on formulation, dose and individual response. These are study summaries, not dosing instructions.

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