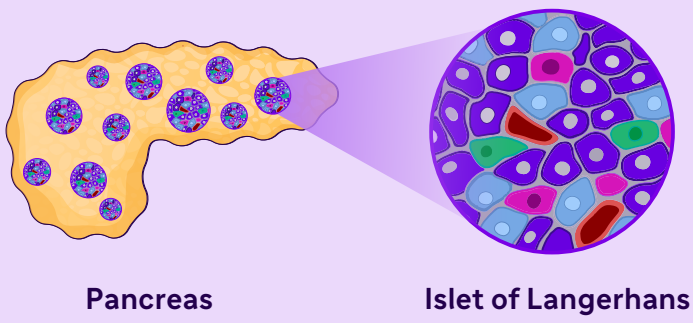
Autoimmune Type 1 Diabetes (T1D): The Role of Beta-Cell Function and C-Peptide Assessment

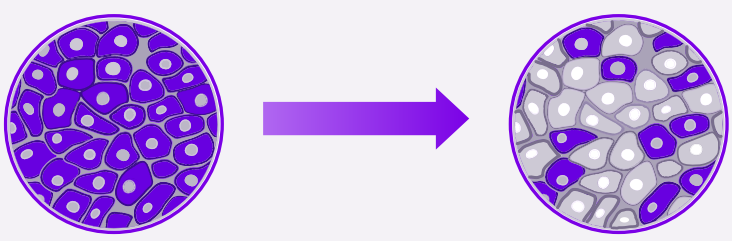
Beta cells are the body's insulin-producing cells. In T1D, autoimmune loss of beta cells leads to metabolic dysfunction and reduced glucose-responsive insulin secretion. Measuring C-peptide provides a way to assess remaining beta-cell activity.[1-3]

Beta Cells Are a Crucial Piece of the Islet Network[4-7]

- The islet is a coordinated network of endocrine cells and supporting tissue that maintains glucose homeostasis
- Beta cells comprise the majority of cells in the islet and secrete the hormones insulin and amylin to promote glucose uptake and storage, delayed gastric emptying, and satiety



Beta-Cell Loss Occurs Before a Stage 3 Clinical Diagnosis of T1D[1,2,8-11]



- Beta-cell loss leads to the need for exogenous insulin, which cannot fully replicate natural signaling within the islet
- Autoantibodies against beta-cell proteins can identify T1D prior to symptom onset

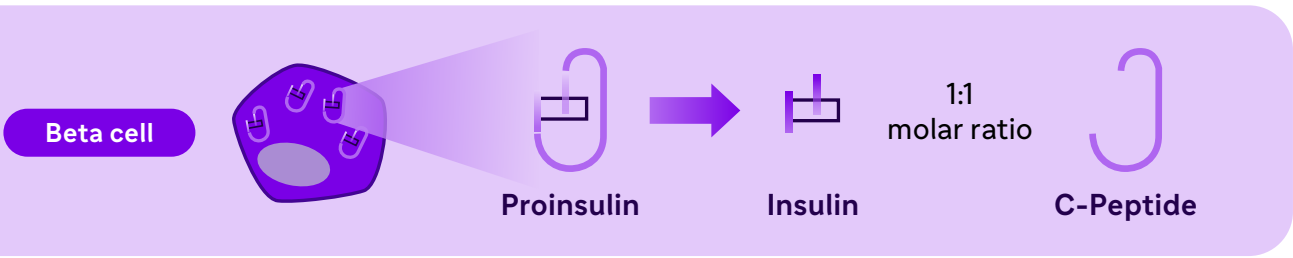
Patients in Stage 3 may still have remaining beta-cell function[12]

Beta-Cell Loss May Result In Clinical Complications[1,12-17]

- Glycemic variability and risk of hyperglycemic burden
- Susceptibility to hypoglycemia, including severe episodes
- Risk for DKA, particularly with insulin interruption
- Risk of microvascular complications, including retinopathy and albuminuria

Evaluation of C-Peptide: A Biomarker of Beta-Cell Function[3,18-21]

- C-peptide is co-secreted with insulin in a 1:1 ratio
- C-peptide reflects endogenous, glucose-stimulated insulin secretion, and is not affected by exogenous insulin
- C-peptide has a longer half life than insulin making it a preferred biomarker of beta-cell function



Random (non-fasting) C-Peptide Is the Simplest Method for Measuring C-Peptide[21,22]

C-peptide measurement	Fasting	Random (non-fasting)	Stimulated (90-min MMTT)
Advantage	Simple, quick, correlates with diabetes type	Simple, quick, correlates with diabetes type	Sensitive, specific, reproducible, correlates with diabetes type
Disadvantage	Insufficient to detect subtle rises in C-peptide	If indeterminate, requires confirmation with stimulation testing	Time-consuming, liquid mixed meals not widely available for MMTT

Random C-peptide (non-fasting) strongly correlates with the gold-standard 90-min C-peptide MMTT measurement

Threshold for clinically meaningful beta-cell function is ≥0.6 ng/mL or ≥0.2 pmol/mL[21]

α-cell=alpha cell; β-cell=beta cell; δ-cell=delta cell; DKA=diabetic ketoacidosis; MMTT=mixed meal tolerance test; PP-cell=pancreatic polypeptide cell.

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