

BIOCHEMISTRY- BP203T

UNIT: 2 METABOLISM OF CARBOHYDRATES

CLASS:7

TOPIC: HORMONAL REGULATION OF BLOOD GLUCOSE AND DIABETES MELLITUS**Hormonal Regulation of Blood Glucose and Diabetes Mellitus****I. Hormonal Regulation of Blood Glucose**

Maintaining stable blood glucose levels (typically 70–110 mg/dL fasting) is critical for normal body function, especially brain activity. Several hormones are involved in this regulation:

1. Insulin (Produced by β -cells of the pancreas)

- **Main Role:** Lowers blood glucose.
- **Mechanisms:**
 - Promotes glucose uptake by cells (especially muscle and fat).
 - Stimulates glycogenesis (glucose to glycogen in liver/muscles).
 - Inhibits gluconeogenesis (glucose formation from non-carbohydrates).
 - Promotes lipogenesis and protein synthesis.

2. Glucagon (Produced by α -cells of the pancreas)

- **Main Role:** Increases blood glucose.
- **Mechanisms:**
 - Stimulates glycogenolysis (glycogen to glucose in the liver).
 - Enhances gluconeogenesis.

3. Epinephrine (Adrenal medulla)

- **Role:** Rapidly increases blood glucose during stress or exercise.
- **Mechanisms:**
 - Promotes glycogenolysis and gluconeogenesis.
 - Inhibits insulin secretion.

4. Cortisol (Adrenal cortex)

- **Role:** Increases glucose during prolonged stress or fasting.
- **Mechanisms:**
 - Promotes gluconeogenesis.
 - Reduces glucose uptake in tissues (insulin antagonism).

5. Growth Hormone (Anterior pituitary)

- **Role:** Increases blood glucose.
- **Mechanisms:**
 - Decreases glucose uptake in cells.
 - Promotes lipolysis and gluconeogenesis.

II. Diabetes Mellitus (DM)

A group of metabolic disorders characterized by **chronic hyperglycemia** due to defects in insulin secretion, insulin action, or both.

Types of Diabetes Mellitus:

Type	Cause	Characteristics
Type 1 DM	Autoimmune destruction of β -cells	Absolute insulin deficiency, usually early onset
Type 2 DM	Insulin resistance + β -cell dysfunction	Relative insulin deficiency, usually adult onset, linked to obesity

Type	Cause	Characteristics
Gestational DM	Glucose intolerance during pregnancy	Usually resolves postpartum, but increases risk of type 2 DM later
Secondary DM	Due to other conditions (e.g., pancreatitis, Cushing's syndrome)	Treat underlying cause

Clinical Manifestations of DM

- Polyuria (frequent urination)
- Polydipsia (increased thirst)
- Polyphagia (increased hunger)
- Unexplained weight loss (especially in Type 1)
- Fatigue, blurred vision, slow healing of wounds

Long-Term Complications

- **Microvascular:** Retinopathy, nephropathy, neuropathy
- **Macrovascular:** Cardiovascular disease, stroke, peripheral artery disease

Diagnosis of DM

- Fasting plasma glucose ≥ 126 mg/dL
- HbA1c $\geq 6.5\%$
- 2-hour plasma glucose ≥ 200 mg/dL after oral glucose tolerance test
- Random plasma glucose ≥ 200 mg/dL with symptoms

Management of DM

- **Type 1:** Insulin therapy (lifelong)
- **Type 2:**
 - Lifestyle modification (diet, exercise)

- Oral hypoglycemic agents (e.g., metformin)
- Insulin (in advanced stages)
- **Monitoring:** Blood glucose levels, HbA1c, renal function, lipid profile

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