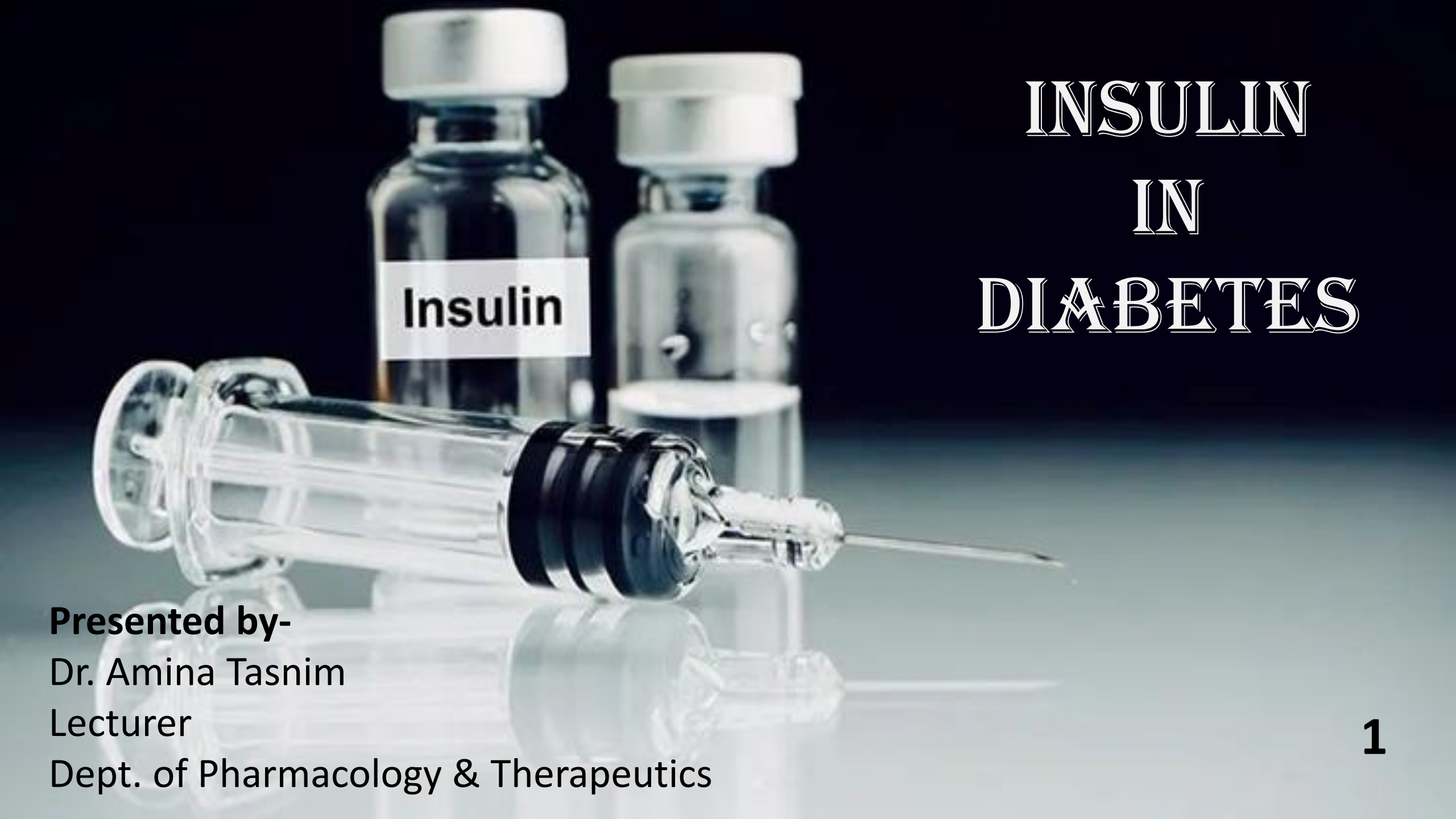

INSULIN IN DIABETES

Presented by-
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CASE 1

A 52-years old man with a 6-years history of type-2 DM attends a routine follow-up visit & is currently taking Metformin 1g twice daily & Glimepiride 2 mg once daily. He reports no significant daytime symptoms but his self-monitoring blood glucose records over the past 2 weeks show persistently elevated fasting glucose levels ranging from 8.9-10.6 mmol/L while postprandial values remain between 7.8-8.9 mmol/L & his HbA1c is 8.2%.

CASE 2

A 48-years old woman with a known case of Type-2 DM for 5-years presents for routine follow-up & is currently taking Metformin 1g twice daily. She reports occasional fatigue after meals but is otherwise asymptomatic. Her self-monitoring blood glucose records show fasting glucose level between 5.0-6.1 mmol/L while her 2-hour postprandial values are consistently elevated at 12.2-14.4 mmol/L with an HbA1c of 8.0%.

LEARNING OBJECTIVES

- History
- Structure
- Synthesis
- Source
- Insulin delivery system
- Types of Insulin for prescription
- Insulin induce hypoglycemia with management &
- Insulin resistance

INTRODUCTION

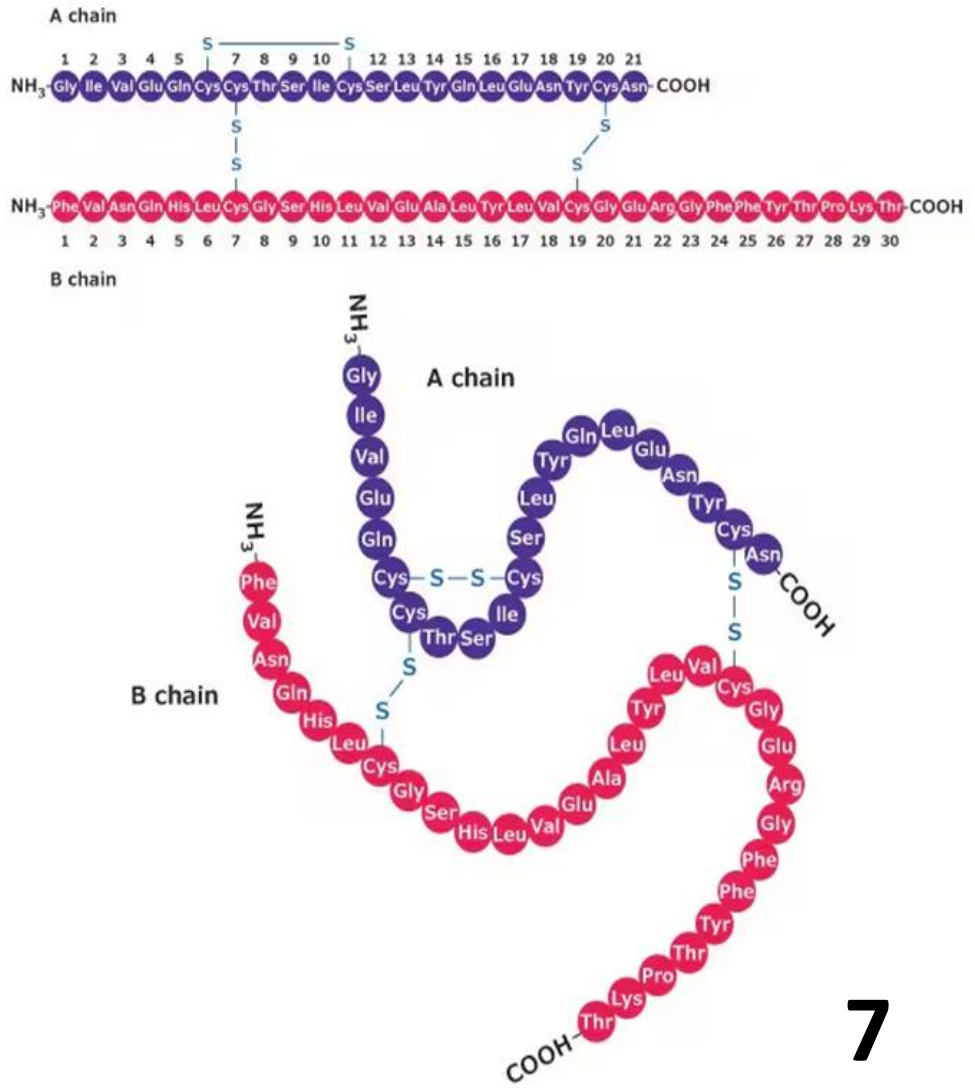
- Insulin is a polypeptide hormone secreted by β cells of pancreas (Islet of Langerhans).
- It plays an important role in regulating blood sugar levels & enable the body to process glucose for energy.

HISTORY

- In 1921, Frederick Banting & Charles Best successfully isolated insulin from the pancreas of dog.
- A 14-year-old boy (severe type 1 diabetes) received the 1st successful insulin injection, led to dramatic clinical improvement.
- Later, Fredrick Banting & John Macleod were awarded with **Nobel Prize** in 1923 for the discover of insulin.

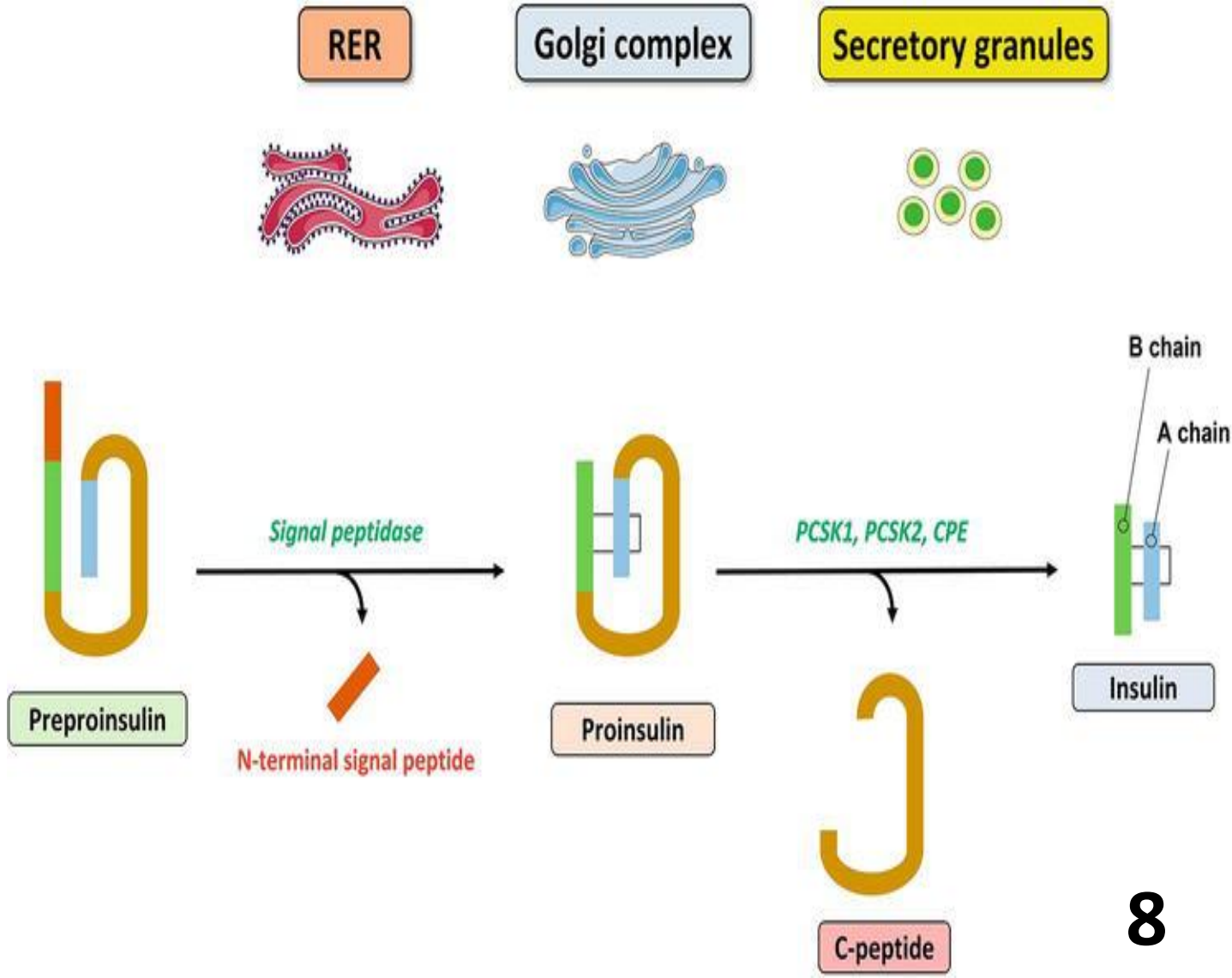
STRUCTURE OF INSULIN

- Insulin is a small globular protein hormone.
- Molecular weight :~5808 Daltons
- Composed of 51 AA.
- A chain contains 21 AA & B chain contains 30 AA.
- Two interchain disulfide bonds links A & B chains.
- A & B chain are arranged in a specific 3D conformation essential for activity.



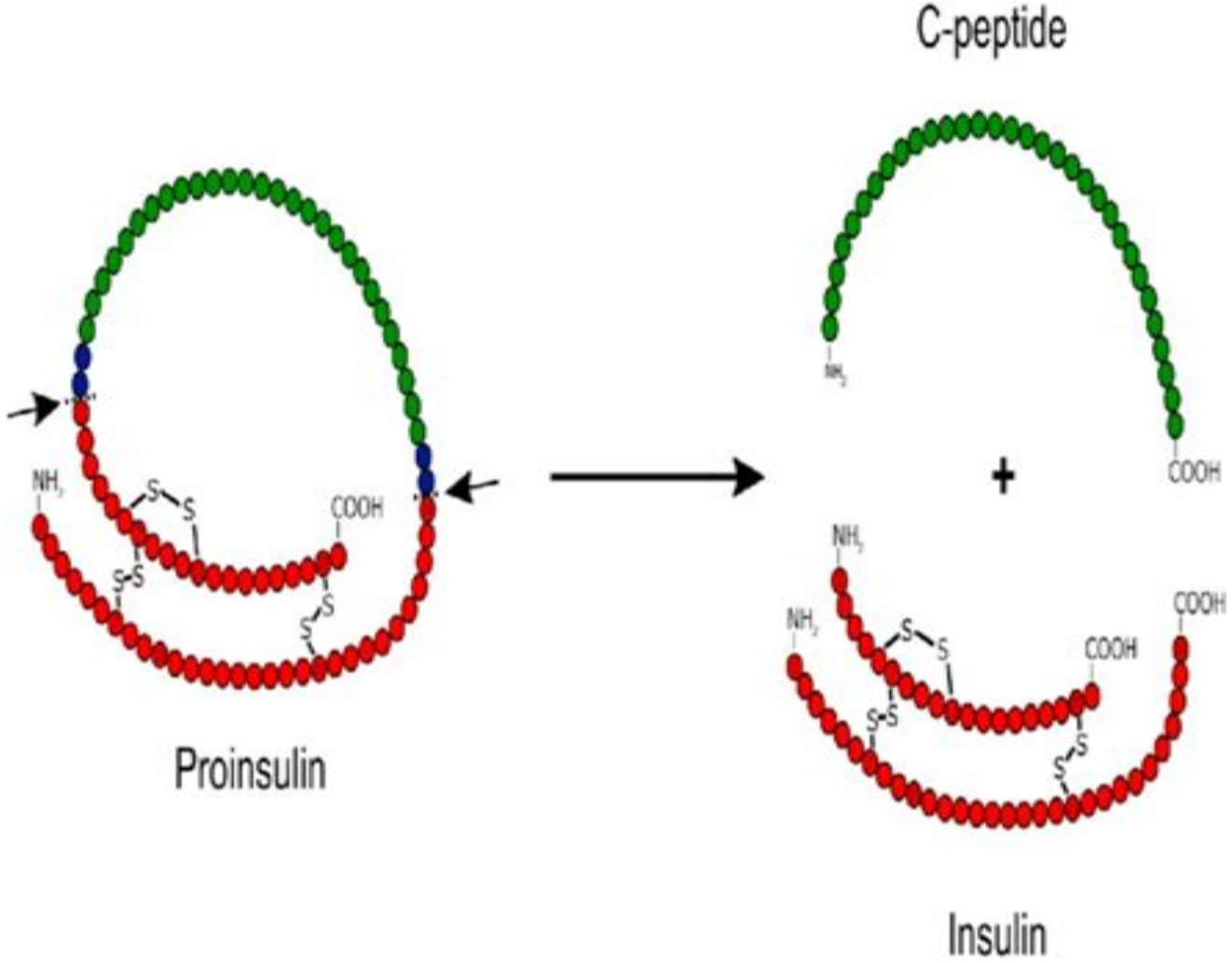
SYNTHESIS OF INSULIN

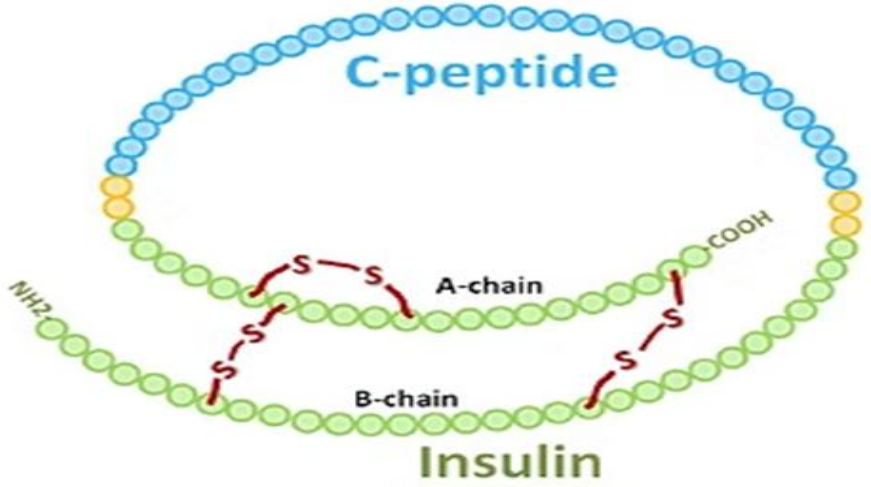
- **Step 1 :** Pre-proinsulin (110 AA) formation
- **Step 2 :** Proinsulin (86AA) formation
- **Step 3 :** Transport to Golgi apparatus
- **Step 4 :** Conversion to Insulin.



C-PEPTIDE

- C-peptide (connecting peptide) is a 31 AA peptide.
- Release as byproduct of proinsulin cleavage in equimolar amount with insulin.
- Best marker of endogenous insulin secretion.





- Helps differentiate types of diabetes-

Condition	C-peptide
Type 1 DM	Low or absent
Type 2 DM	Normal or high
Exogenous insulin user	Low

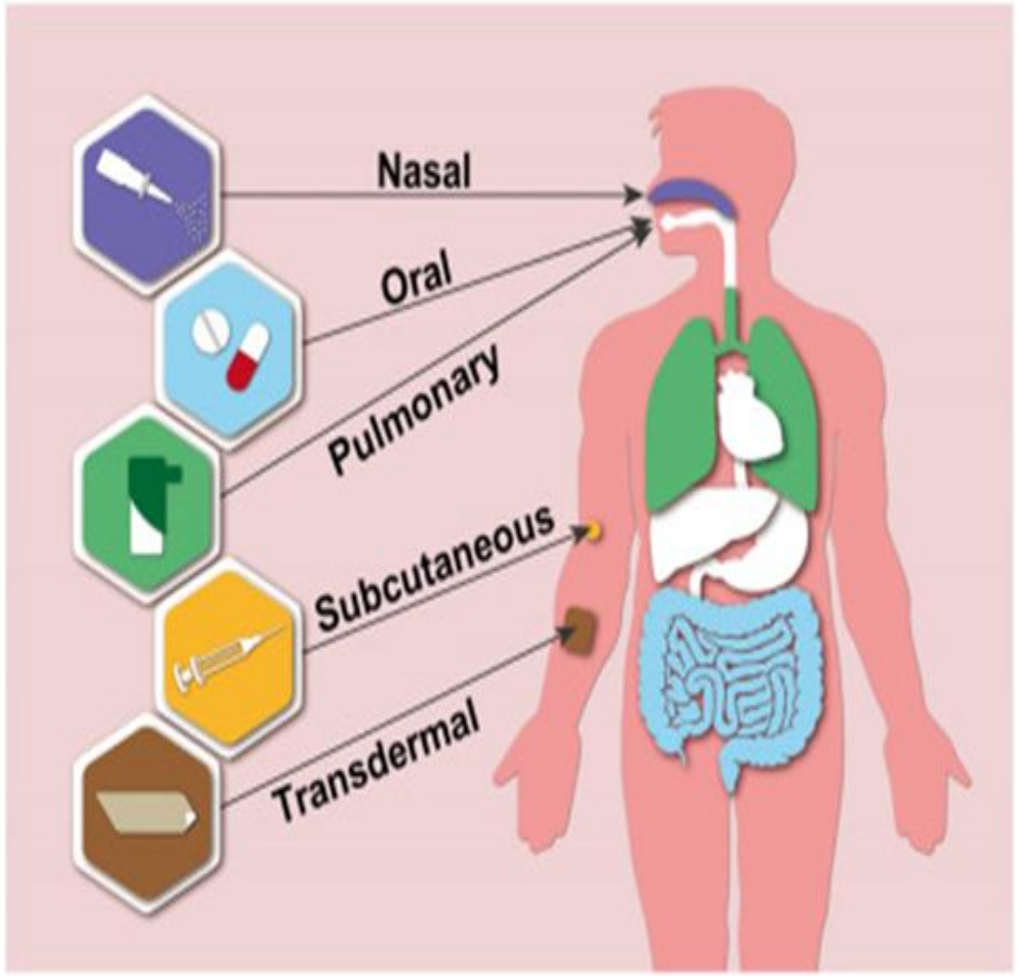
SOURCES OF INSULIN

- **Human insulin :** Is made by using recombinant DNA technology from E.Coli by inserting human proinsulin gene.
- **Animal source :**
  - ❑**Bovine insulin :** Differs from human insulin by 3 AA.
  - ❑**Porcine insulin** : Differs from human insulin by only 1 AA.

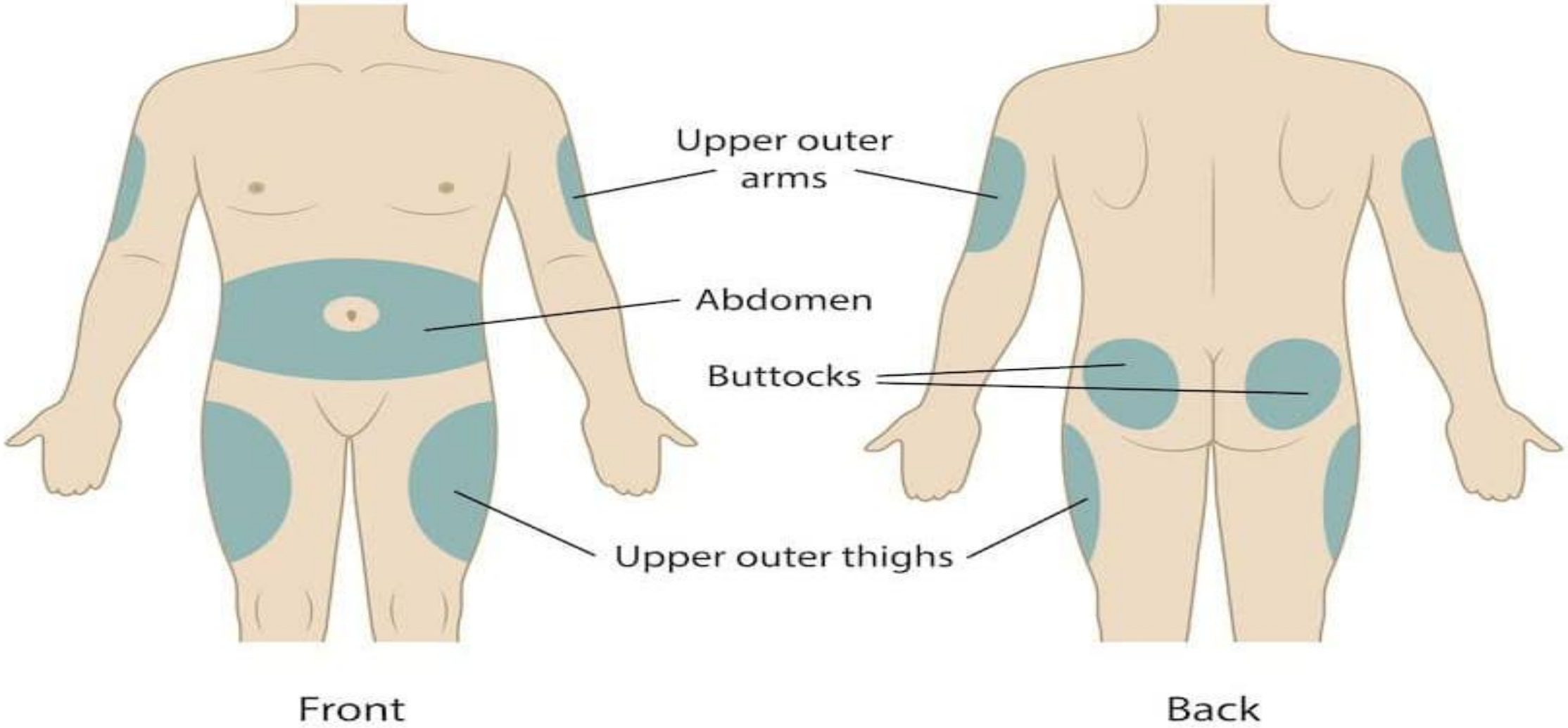
❖**Both Bovine & Porcine insulin is largely replaced by human insulin due to their antigenicity.**

INSULIN ADMINISTRATION

- Usual route is S/C
- In hyperglycemic emergency – soluble regular insulin is given I/V
- Peritoneal infusion & intranasal administration.
- Can’t be given orally.



INSULIN INJECTION SITES



INSULIN DELIVERY SYSTEM

- Standard delivery / Insulin needle & syringes.
- Portable pen injectors.
- Continuous subcutaneous insulin infusion device (Insulin pump)
- Inhaled insulin

Inhaled insulin

Insulin syringe

Insulin pen

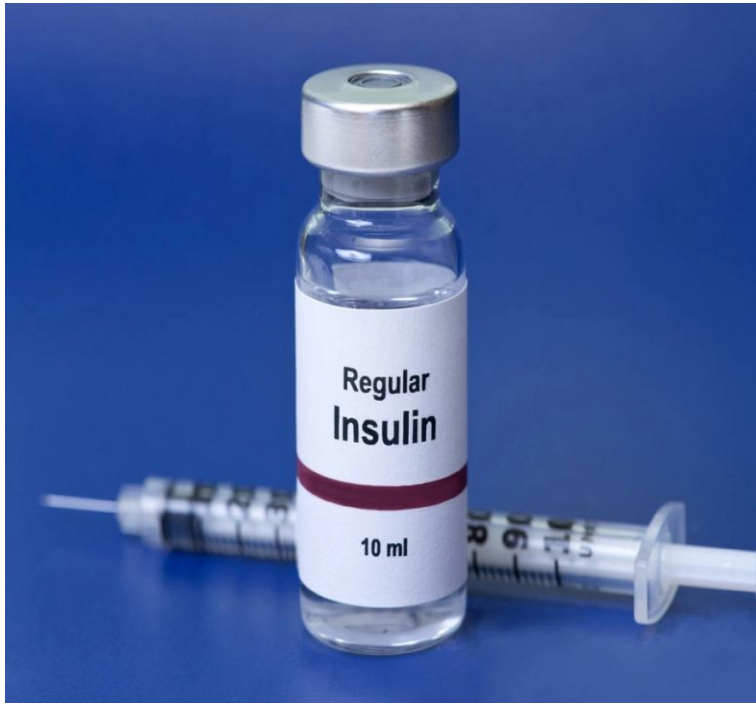
Jet injector

Insulin pump

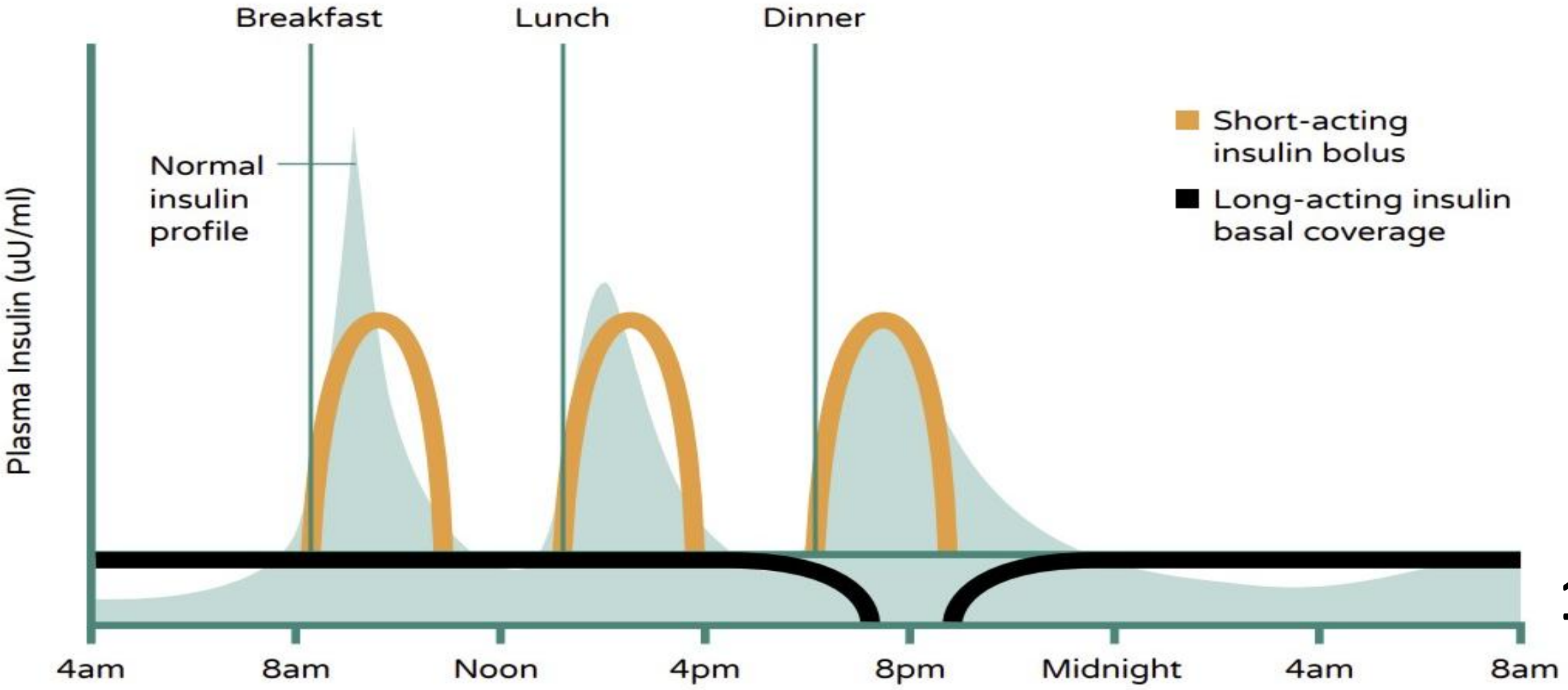
TYPES OF INSULIN FOR PRESCRIPTION

- **Basal Insulin (Long acting or Intermediate acting)**
  - ➢ Control blood glucose through out the day& night continuously.
  - ➢ Typical starting dose: 10 units once daily or 0.1-0.2 units/kg/day.
  - ➢ Adjust based on fasting blood glucose (FBG) reading.

- **Bolus Insulin (Rapid acting or Short acting)**
  - ➢Controls mealtime (Prandial) blood glucose.
  - ➢Typical starting dose: 4-6 units or calculated based on carbohydrate intake (1 unit per 10-15 gram carbs).



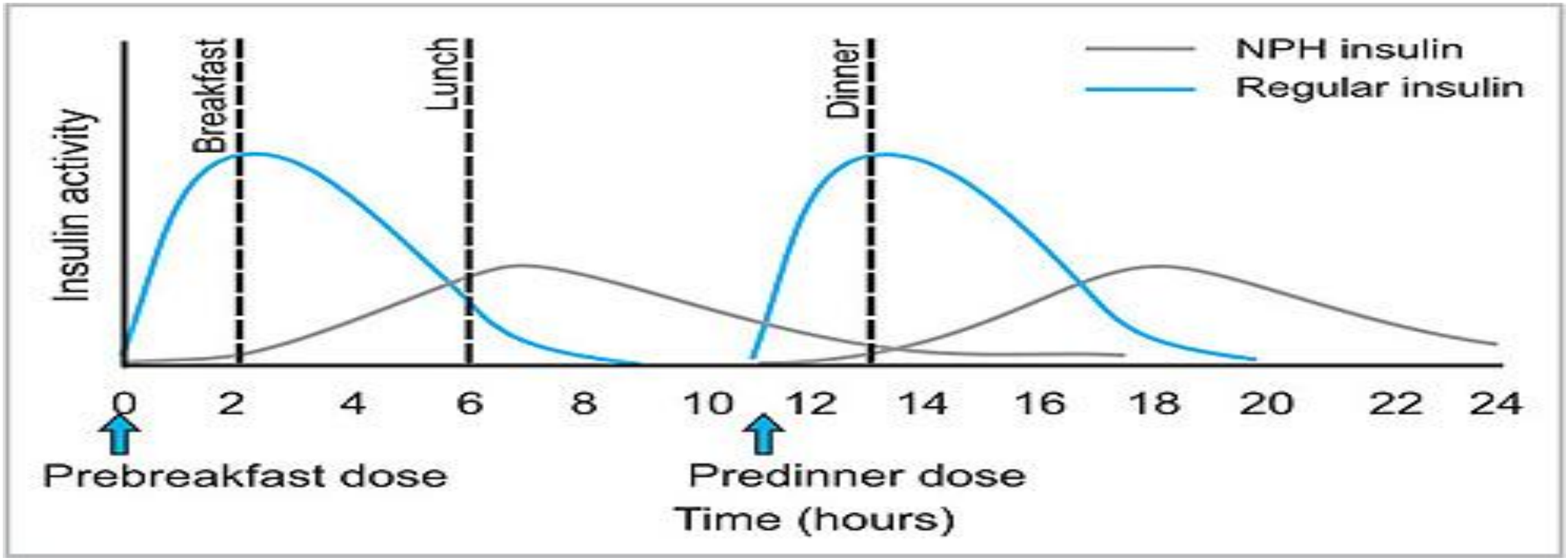
BASAL-BOLUS INSULIN REGIMEN



- **Premixed Insulin**

  - Combines short & intermediate acting insulin.

  - Administered twice daily before breakfast & dinner.

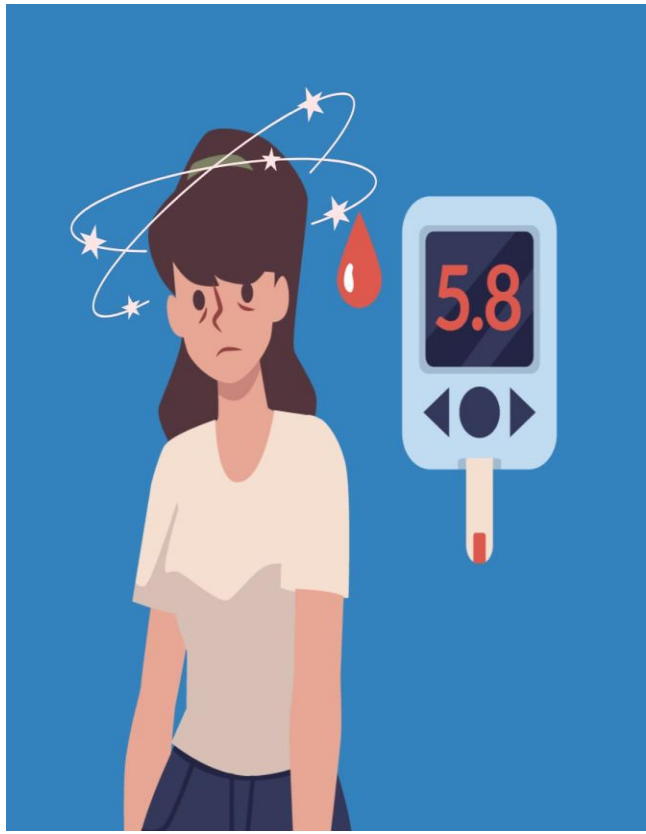


INSULIN INDUCE HYPOGLYCEMIA

- **Cause :**
  - ✓Missed meal.
  - ✓Excess dose of insulin
  - ✓Unusual physical exertion
  - ✓Too low carbohydrate intake

TREATMENT

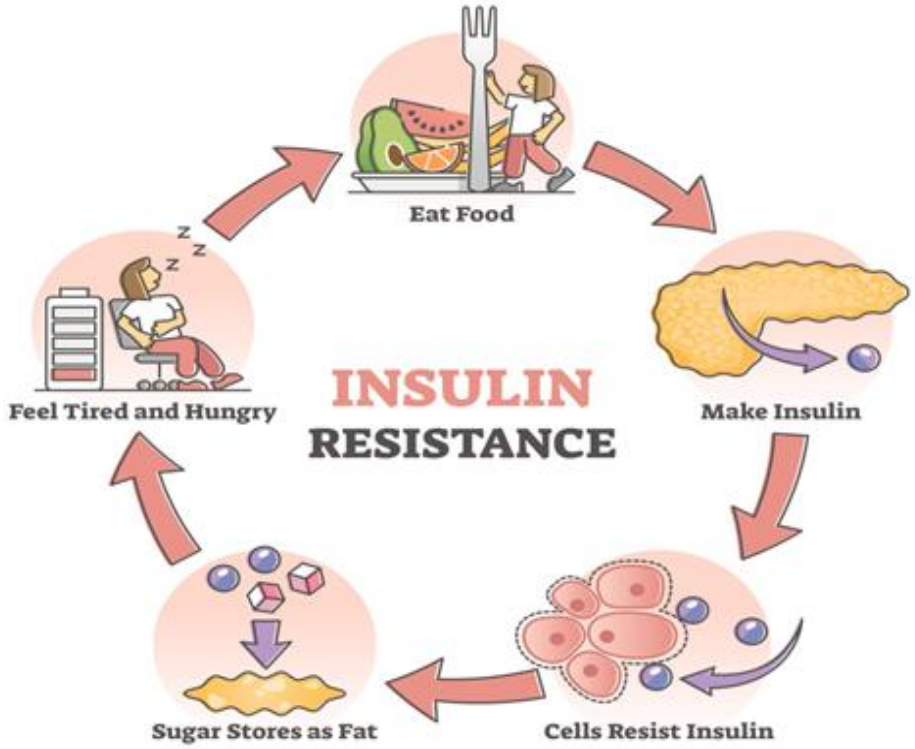
- All the features of hypoglycemia are subsided by using glucose administration.
- To treat mild hypoglycemia with conscious patient – Dextrose saline, glucose gel & sugar containing beverages (cocacola, drinks,fruit juice) & food should be given.



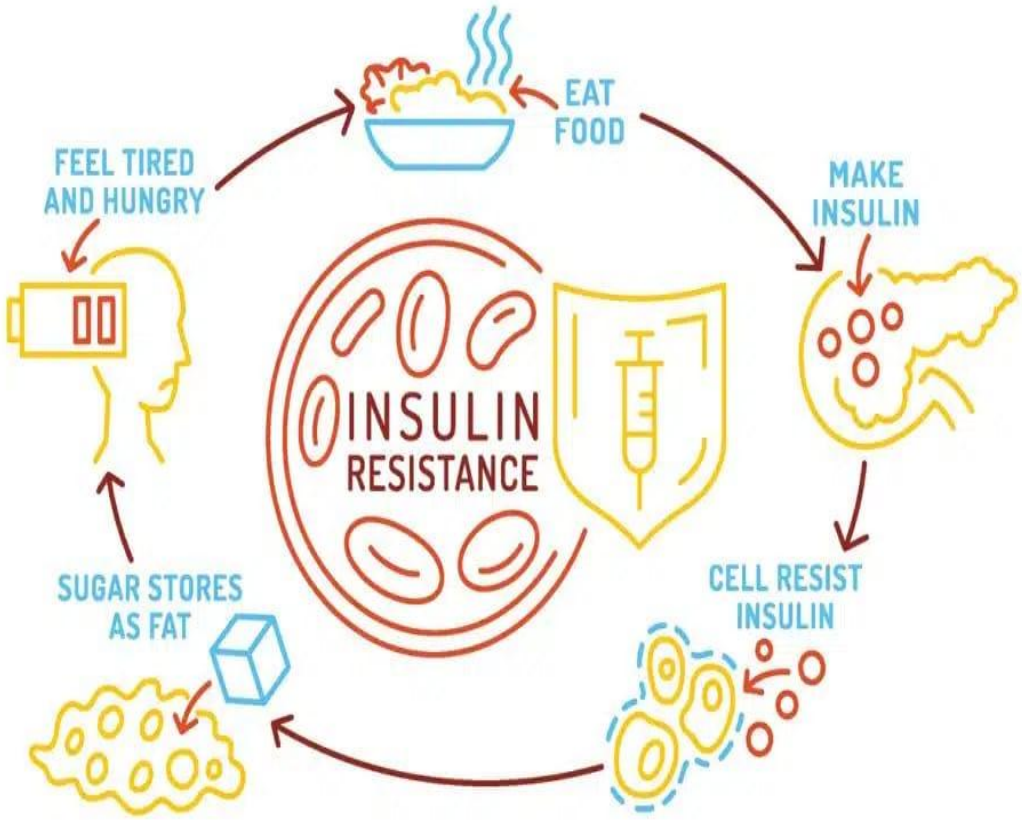
- If severe hypoglycemia with unconscious patient – (20-50) ml of 50% glucose solution by intravenous infusion for 2-3 minutes.
- If not available then give 1 mg of I/M Inj. Glucagon.
- If Glucagon is not available then give honey or sugar containing syrup into his buccal pouch.

INSULIN RESISTANCE

- Decreased tissue responsiveness to insulin.
- Required more than 200 IU
- Due to IgG anti-insulin Ab that neutralize the action of insulin.
- Commonly associated with obesity & leading to type 2 DM.



- **Treatment :**
  - ➢Change the brand of insulin.
  - ➢Use Metformin that increase insulin sensitivity to peripheral tissue.
  - ➢Corticosteroids to suppress the autoantibody.



CASE 1

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DIAGNOSIS

Uncontrolled Type-2 DM due to fasting hyperglycemia despite of oral therapy.

MANAGEMENT PLAN

Add Basal (Long-acting) insulin with continuation of oral drugs.

CASE 2

A 48-years old woman with a known case of Type-2 DM for 5-years presents for routine follow-up & is currently taking Metformin 1g twice daily. She reports occasional fatigue after meals but is otherwise asymptomatic. Her self-monitoring blood glucose records show fasting glucose level between 5.0-6.1 mmol/L while her 2-hour postprandial values are consistently elevated at 12.2-14.4 mmol/L with an HbA1c of 8.0%.

DIAGNOSIS

Uncontrolled Type-2 DM with isolated postprandial hyperglycemia.

MANAGEMENT PLAN

Add Bolas (Short-acting) insulin before meals & continue Metformin therapy.


Thank
You