Dextrose 5% Intravenous Infusion

Dextrose, also known as **D-glucose**, is a sterile, nonpyrogenic solution used primarily for **fluid replenishment, caloric supplementation**, and the **management of hypoglycemia**. It may be administered orally or intravenously, depending on clinical necessity.**Mechanism of Action**

Glucose is the primary monosaccharide utilized by the body for energy. Each gram provides approximately **4 kcal (16.7 kJ)**. It is essential for cellular metabolism, especially in **brain tissue**, which relies heavily on glucose as an energy source.

When administered intravenously:

- Glucose rapidly enters systemic circulation.
- It is taken up by tissues and metabolized via **glycolysis** and the **citric acid cycle**, producing **CO?, water, and ATP**.
- In the presence of **insulin**, glucose uptake by cells is enhanced.
- Co-administration with **insulin** drives **potassium into cells**, making it useful in treating **hyperkalemia**.

Pharmacokinetics

- **Absorption:** Immediate (IV route)
- **Distribution:** Throughout extracellular and intracellular compartments
- **Metabolism:** Primarily in the liver
- **Excretion:** As CO? (lungs) and water (urine)
- **Max Utilization Rate:** ~6 mg/kg/min in healthy individuals

Clinical Indications

1. **Hypoglycemia** (acute symptomatic)
2. **Dehydration** with caloric deficiency (e.g., vomiting, diarrhea, starvation)
3. **Intravenous nutrition** (e.g., Total Parenteral Nutrition)
4. **Hyperkalemia** (when co-administered with insulin)
5. **Ketosis or diabetic ketoacidosis (DKA)** – as adjunctive therapy
6. **Osmotic agent** in **peritoneal dialysis**
7. **Diluent** for IV medications
8. **Diagnostic testing** (e.g., glucose tolerance tests)

Dosage & Administration

General Guidelines

- The concentration and volume depend on **age, weight, fluid/electrolyte status**, and **clinical indication**.
- **Concentrations range from 2.5% to 50%.**

Adult Dosing

- **Maintenance fluid/caloric supply:** 500 mL to 3 L/day IV
- **Hypoglycemia (acute):** 25–50 mL of 50% dextrose IV push (D50W)
- **Hyperkalemia:** 10–25 g of glucose IV + 5–10 units of insulin
- **Tissue dehydration (rare):** 20–50 mL of D50W IV (transient effect)

Pediatric Dosing

- **0–10 kg:** 100 mL/kg/day
- **10–20 kg:** 1000 mL + 50 mL/kg for each kg >10
- **>20 kg:** 1500 mL + 20 mL/kg for each kg >20

Infusion rate must be individualized to avoid volume overload or hyperglycemia.

Special Clinical Uses

Condition	Glucose Formulation	Notes
Hypoglycemia	Dextrose 50% IV push (D50W)	Fast-acting
Hyperkalemia	Dextrose + Insulin	Drives K? intracellularly
Ketosis/DKA	Dextrose 5–25%	Reduces ketone production
Osmotic Diuresis	Dextrose 50% (less common use)	Short-lived
Peritoneal Dialysis	Dextrose 1.5%–4.25% solutions	Maintains osmotic gradient

Adverse Effects

Common Side Effects

- **Phlebitis** (especially with high concentrations like D25/D50)
- **Local irritation or tissue necrosis** (if extravasation occurs)
- **Hyperglycemia** and **glycosuria**
- **Electrolyte imbalance** (e.g., **hypokalemia**, **hyponatremia**)

Serious Reactions

- **Hyperosmolar hyperglycemic state (HHS)**
- **Hypoglycemia** (rebound, especially with insulin use)
- **Volume overload** (particularly in cardiac or renal impairment)
- **Pulmonary edema** (with excessive infusion)

Contraindications

- Known **hypersensitivity** to dextrose
- Uncontrolled **hyperglycemia**
- **Diabetic ketoacidosis** without concurrent insulin therapy
- **Intracranial or intraspinal hemorrhage** (avoid hyperosmolar solutions)

Precautions

Use with Caution in:

- Patients with **diabetes mellitus**
- **Heart failure**, **renal impairment**, or **hepatic insufficiency**
- Patients on **glucocorticoids** or under **severe stress**
- **Neonates and elderly**, due to altered glucose metabolism

Pregnancy & Lactation

- Safe in pregnancy when used appropriately.
- High doses during labor may lead to **neonatal hypoglycemia** due to fetal hyperinsulinemia.

Pediatric and Geriatric Considerations

- **Neonates**: Risk of **intracranial hemorrhage** with hypertonic solutions.
- **Elderly**: Monitor for **fluid overload** and **arrhythmias**.

Drug Interactions

- No significant interactions with most drugs.
- Mild interactions:
    - **Magnesium salts** (e.g., magnesium sulfate, citrate)
    - **Electrolyte shifts** may occur when co-administered

High-Yield Clinical Pearls

- D50W is **first-line treatment** for severe symptomatic hypoglycemia.
- **Monitor electrolytes**, especially potassium and sodium, during prolonged infusion.
- In **hyperkalemia**, always **co-administer insulin** to facilitate intracellular K? shift.
- For **TPN**, dextrose is balanced with amino acids, lipids, electrolytes, and vitamins.
- Use **central lines** for high concentrations (>10%) to avoid phlebitis.