

3.06_Isotonic, Hypotonic, & Hypertonic Notes

Easy Overview of Isotonic, Hypotonic, & Hypertonic Solutions

Isotonic

Iso: same/equal

Tonic: concentration of a solution

The cell has the same concentration on the inside and outside which in normal conditions the cell's intracellular and extracellular are both isotonic.

It is important to be familiar with what fluids are isotonic and when they are given.

Isotonic fluids

- 0.9% Saline
- 5% dextrose in water (D5W)**also used as a hypotonic solution after it is administered because the body absorbs the dextrose BUT it is considered isotonic)
- 5% Dextrose in 0.225% saline (D5W1/4NS)
- Lactated Ringer's

Isotonic solutions are used: to increase the EXTRACELLULAR fluid volume due to **blood loss, surgery, dehydration, fluid loss that has been loss extracellularly.**

Hypotonic

Hypo: "under/beneath"

Tonic: concentration of a solution

The cell has a low amount of solute extracellularly and it wants to shift inside the cell to get everything back to normal via osmosis. This will cause **CELL SWELLING** which can cause the cell to burst or lyses.

Hypotonic solutions

- 0.45% Saline (1/2 NS)
- 0.225% Saline (1/4 NS)
- 0.33% saline (1/3 NS)

Hypotonic solutions are used when the cell is dehydrated and fluids need to be put back intracellularly. This happens when patients develop diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemia.

Important: Watch out for depleting the circulatory system of fluid since you are trying to push extracellular fluid into the cell to re-hydrate it. Never give hypotonic solutions to patient who are at risk

for **increased cranial pressure** (can cause fluid to shift to brain tissue), **extensive burns, trauma** (already hypovolemic) etc. because you can deplete their fluid volume.

Hypertonic

Hyper: excessive

Tonic: concentration of a solution

The cell has an excessive amount of solute extracellularly and osmosis is causing water to rush out of the cell intracellularly to the extracellular area which will cause the **CELL TO SHRINK**.

Hypertonic solutions

- 3% Saline
- 5% Saline
- 10% Dextrose in Water (D10W)
- 5% Dextrose in 0.9% Saline
- 5% Dextrose in 0.45% saline
- 5% Dextrose in Lactated Ringer's

When hypertonic solutions are used (very cautiously....most likely to be given in the ICU due to quickly arising side effects of pulmonary edema/fluid over load). In addition, it is preferred to give hypertonic solutions via a central line due to the hypertonic solution being vesicant on the veins and the risk of infiltration.