## CLINIQUIZ

# Crystalloids and colloids

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The administration of intravenous fluids is the commonest intervention in hospital practice. Crystalloids are aqueous solutions of mineral salts or other water-soluble molecules. A colloid is a high molecular weight substance that largely remains in the intravascular compartment, thereby generating an oncotic pressure.

**Q 1. Which of the following have higher $Na^+$ concentration than plasma?**

a. 0.9% normal saline
b. Lactated Ringer's solution
c. Plasma-Lyte
d. 5%Dextrose ½ NS

**Q 2. Which of the following is true about isotonic crystalloids?**

a. They have limited ability to remain within the intravascular space
b. Edema is not a side effect
c. K+ is the main effective ion, KCl being the predominant salt
d. They are fluid of choice in end stage renal disease

**Q 3. Which of the following is an indication for use of hypotonic crystalloids?**

a. Perioperative period
b. Salt wasting nephropathy
c. Hypertonic dehydration
d. Hyponatremia

**Q 4. "Small volume resuscitation" refers to use of which of the following IV fluid?**

a. Isotonic crystalloid & hypertonic saline
b. Hypertonic saline alone/Hypertonic saline with colloid
c. Isotonic crystalloid alone
d. Colloids alone

**Q 5. Dextrans are polydispersed colloids that are biosynthesized from sucrose by the bacterium?**

a. Leuconostoc citreum
b. Leuconostoc pseudo-mesenteroids
c. Leuconostoc pseudo-ficulreum
d. Leuconostoc mesenteroids

**Q 6. The outcome following resuscitation of a cardiac arrest may be worsened on use of which of the following IV fluid?**

a. Hestarch
b. 5% dextrose
c. Whole blood transfusion
d. 0.9% NaCl

**Q 7. " Osmotic – nephrosis like lesion" in the tubular cells of kidneys are associated with use of which of the following IV fluid?**

a. Human Albumin solution (25%)
b. Dextran
c. Polygeline (Haemaccel)
d. Gelofusine

**Q 8: Which of the following is false about gelatin?**

a. They have molecular wt. of 30 -35kd
b. They carry a risk of prions transmission
c. They have highest incidence of allergic reactions
d. They are metabolized mainly by liver

**Q 9: Which of the following intravenous fluid should not to be used with citrated blood products?**

a. NS
b. $D_2W$
c. RL
d. Isolyte-P

**Q 10: Which of the following is the effective duration of plasma volume expansion on infusion of Haemaccel?**

a. 1 hrs
b. 2hrs
c. 3hrs
d. 4hrs

**Explanation**

**Ans. 1 (a):** 0.9% Normal saline & 7.5% NaCl are crystalloids which have Na concentration and osmolality more than plasma with NS having 154 mEq/l and 7.5% NaCl having 1284 mEq/l of $Na^+$ concentration. Excessive infusion of normal saline may lead to hyperchloremic metabolic acidosis, though it is usually mild in presentation.

**Ans. 2 (a):** As NaCl is the predominant salt; only 25% remain in vascular space. So, 3-4 times volume is needed for replacement. NaCl induces non-gap, hyperchloremic metabolic acidosis while RL & plasmalyte induce metabolic alkalosis as they are metabolized to HCO3. In ESRD; K+ is high; and metabolic acidosis ensues; therefore, crystalloids are best avoided or used with caution.

**Ans. 3 (c):** Hypotonic crystalloids are used to provide free water to patients with hypertonic dehydration or hypernatremia when proportionally more water than sodium is lost from the body. The extracellular fluid has increased concentration of sodium and becomes hypertonic regarding the intracellular fluid and therefore attracts water from the cells. E.g. Diabetic ketoacidosis, Pediatric diarrhea, excessive sweating as in heat stroke, diuretics and diabetes insipidus. Blood tests here reveals high serum osmolality >300mosm/l, high S. Na+>150 mEq/l and raised Blood urea nitrogen.

**Ans. 4 (b):** Small volume resuscitation the rapid infusion of a small volume (4 ml/kg BW) of hyperosmolar 7.2-7.5% saline solution for the initial therapy of severe hypovolemia and shock. Many hyperosmolar saline colloid solutions have been investigated in the past years, from which 7.2-7.5% sodium chloride in combination with either 6-10% dextran 60/70 or 6-10% hydroxyethyl starch 200,000 appear to yield the best benefit-risk ratio. Studies have demonstrated positive effects of hyperosmolar saline solutions when used for fluid loading or fluid substitution in raised ICP, neurosurgery, cardiac bypass and in aortic aneurysm surgery.

**Ans. 5 (d):** Leuconostoc mesenteroides (B512 strain) which is growing in a sucrose medium

Ans. 6 (b): Glucose containing solutions should not be used in cases with cerebral pathology as raised head injury, neurosurgery or cerebral hypoxia as hyperglycemia further increases cerebral edema and ICP and decrease the survival outcome. The fluid of choice during CPR is normal saline.

**Ans. 7 (b):** HES and dextran are associated with stasis and hyper viscous urine resulting in obstruction of tubular lumen due to high molecular weight, hence are contraindicated in patients with renal disease.

**Ans. 8 (d):** Gelatins are derived from bone collagen and carry the risk of transmitting bovine spongiform encephalopathy. The risk of allergic reactions is very low as compared to other colloids but higher than albumin solutions. Following infusion, its peak plasma concentration falls by half in 2.5 hours. More than 80% of infused gelatin is excreted unchanged by the kidneys, while a minor percentage undergoes cleavage by proteases & reticuloendothelial system.

**Ans. 9 (c):** $Ca^{++}$ present in RL can precipitate citrated blood products & drugs like Amphotericin-B & thiopental. It is suggested that a separate IV line should be used for RL infusion & blood transfusion.

**Ans. 10 (b):** Haemaccel is a urea-cross linked gelatins (e.g., Polygeline) prepared by the action of alkali and then boiling water (thermal degradation) on collagen from cattle bones. The MW ranges from 5,000 to 50,000 with a weight-average MW of 35,000 and it produces plasma volume expansion for 2 hours.