Fluid Therapy

VetTechPrep

Fluid therapy is used in the clinical setting for many reasons, including replacement of hydration deficits, maintenance of normal hydration, replacement of lost blood volume, correction of electrolyte imbalances, treatment of shock, and infusion of intravenous medications. It is important for the veterinary technician to understand the types of fluids available, appropriate routes and rates of administration, and how to assess the patient's hydration status. The main focus of this article is the most common fluids, routes, and rates used. Remember, many veterinary practices will use different formulas and rates for patients, but this will provide basic guidelines.

Crystalloids

Crystalloids are solutions that are isotonic with plasma and contain sodium as the major osmotically active particle.

Lactated Ringer's Solution, 0.9% Sodium Chloride (Normal Saline), and Normosol-R are isotonic crystalloid solutions. The most common uses of these solutions are for maintenance of normal hydration, replacement of hydration deficits (including use during anesthesia,) and treatment of shock. Crystalloids are also useful for the infusion of medications, such as potassium chloride (KCl). **It is important to remember that when crystalloids contain additives, they should never be used for fluid boluses. KCl in particular can result in arrhythmias and even death when administered rapidly.** This is due to the fact that rapid infusion of potassium can induce cardiac arrest. The most common administration routes of crystalloids are subcutaneous (SQ), intravenous (IV), and intraosseous (IO).

Maintenance Rates

There are several formulas for calculating maintenance fluid rates in dogs and cats.

The best or most accurate calculation for determining the crystalloid maintenance rate for **dogs** is the following body surface formula:
(kg x kg x kg) $\sqrt{}\sqrt{}$ x 132 ÷ 24 = ml/hr

Example: A 40-kg dog is presented to your hospital for treatment of dehydration caused by vomiting; the maintenance rate is calculated as:
(40 x 40 x 40) $\sqrt{}\sqrt{}$ x 132 ÷ 24 = 87 ml/hr

The calculation for crystalloid maintenance rate for **cats** is the following formula:
(kg x kg x kg) √√ x 70 ÷ 24 = ml/hr

Another standard formula often used is 60mL/kg/day for maintenance fluids.
For the 40-kg dog: 60 mL X 40 kg = 2400/24 hours = 100 mL/hr

While there are variations in fluid rate calculations, the fluid rate should always be determined based on the hydration status and medical condition of the patient (i.e., ongoing losses, deficits, and maintenance requirements).

Anesthetic Rates

Historically, the crystalloid anesthetic rate for dogs was 10 ml/kg/hr, and in cats the anesthetic rate was 5 ml/kg/hr. However, **updated guidelines from AAHA in 2013 recommended reduced anesthetic fluid rates of 5ml/kg/hr for dogs and 3ml/kg/hr for cats, as a starting point.** As the patient is evaluated during anesthesia, this rate can be adjusted upwards as needed. The anesthetic rate of fluids can vary for each patient, depending on factors such as hypotension, underlying heart disease, etc.

Example: A 20 kg dog is presented to your hospital for a routine OVH.
20 kg x 5 ml/hr = 100 ml/hr

Shock Doses

During treatment for shock, LRS and Normosol-R are the preferred isotonic crystalloids, administered at a rate of 90 ml/kg in dogs and 45 ml/kg in cats. Often the shock dose is given in ¼ boluses (a quarter of the patient's calculated shock dose initially) and the patient is then reassessed. Once the patient has stabilized, a new rate is calculated in order to continue to correct for fluid deficits. Typically, the goal is to stabilize and rehydrate the patient over a 24-hour period.

Dextrose Solutions

Dextrose solutions are formed when dextrose is added to a crystalloid. Dextrose can be used to provide free water to replace insensible losses or for correction of **hypernatremia** resulting from a water deficit. When added to a crystalloid, dextrose can be used to provide an intracellular carbohydrate source in septic patients and aids in correction of hypoglycemia. These solutions should not be used as maintenance fluids because their administration will lead to the dilution of electrolytes. Administration should be IV or IO. Administering dextrose solutions into subcutaneous tissues causes electrolytes to move into these tissues, leading to a decrease in circulating blood volume and resulting in tissue necrosis.

It is also important to remember that these solutions are ideal for bacterial growth; therefore, **aseptic** technique must be used. Rates of administration will vary depending on the concentration and purpose.

Synthetic Colloids

Synthetic colloids act primarily to expand plasma volume. They are useful as resuscitative or replacement fluids and can be given as a bolus if the patient has poor perfusion due to hypovolemia. **Hetastarch, Dextrans 40, and Dextrans 70** are the most commonly used synthetic colloids. Routes of administration are limited to IV and IO. The synthetic colloid maintenance rate for Hetastarch is 20 ml/kg/day. For the treatment of hypotension, 5-10 ml/kg is given as a bolus. Dextrans 40 and Dextrans 70 are given at a rate of 2 ml/kg/hr.

Colloids

Colloids are used for the relative expansion of the interstitial space in the event of a plasma volume deficiency resulting from traumatic or septic shock and for replacement of lost blood volume. Colloid solutions include human and canine **albumin, fresh frozen plasma, and whole blood.** Colloids are most commonly given IV but can be administered IO if venous access cannot be achieved. The rate of administration depends on the clinical status of the patient and the reason for the transfusion.

Signs of Dehydration

5% - 6%	Dry or “sticky” oral mucous membranes
6% - 8%	Mild to moderate decrease in skin turgor, dry or “sticky” oral mucous membranes, sunken eyes
10% - 12%	Marked decrease in skin turgor, dry mucous membranes, sunken eyes, weak and rapid pulses, slow capillary refill time, moderate to marked mental depression.

Signs of Overhydration

- Serous nasal discharge
- Subcutaneous edema
- Increased urine output
- Ascites
- Coughing / pulmonary edema
- Increased respiratory rate

References

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