

# Introduction to Fluid Therapy by Stephen DiBartola

## Frequently Asked Questions

### **Q: How does one tell if it is hypotonic or isotonic fluid loss?**

A: Evaluation of the patient's packed cell volume (PCV) and total plasma protein concentration should help. With hypotonic fluid loss, the fluid remaining in the animal will be more concentrated, and the PCV and total plasma protein concentration will increase. In the patient with isotonic loss, the PCV and plasma protein concentration initially will not change (and later will decrease as fluid is drawn into the plasma from the interstitium). Evaluation is complicated by the fact that we usually do not know exactly what the patient's PCV and plasma protein concentration were before dehydration developed and must rely on relatively broad normal ranges (i.e., PCV 37–55%, total proteins 6–8 g/dL) to draw conclusions. Underlying anemia or hypoproteinemia also will complicate interpretation.

### **Q: Under what conditions should we not use LRS at all?**

A: I am unaware of clinical situations in which small animal patients have been harmed by lactated Ringer's solution. Obviously, if a dog is vomiting due to gastric outlet obstruction and has metabolic alkalosis you would choose 0.9% NaCl over LRS. Some clinicians worry about the use of lactated Ringer's in patients with liver disease because they fear the liver will be unable to extract and utilize the lactate. Remember, however, that the lactate in LRS is the salt form of the compound and cannot by itself cause lactic acidosis. In most animals with lactic acidosis, the cause is decreased tissue perfusion and improvement of tissue perfusion by fluid therapy (regardless of the fluid used) helps resolve the lactic acidosis. Many years ago, a study of dogs with lymphoma indicated that these dogs had higher blood lactate concentrations than control dogs. The lactate concentrations increased after LRS infusion in the lymphoma dogs but returned to baseline after 2 hours. There was no evidence that these dogs were harmed by the LRS infusion. For more information, see: Vail DM, Ogilvie GK et al. Exacerbation of hyperlactatemia by infusion of lactated Ringer's solution in dogs with lymphoma. *J Vet Int Med.* 1990;4:228–232.

### **Q: Because we don't currently check serum bicarbonate concentration in-house, how often would knowing (or not knowing) the patient's serum bicarbonate concentration influence one's fluid choice?**

A: That would depend on how often you see dogs with hypoadrenocorticism or vomiting of stomach contents from gastric outlet obstruction. These are situations where I would tend to use 0.9% NaCl before seeing the serum bicarbonate concentration. So, I suspect that having this information at the outset would influence your fluid choice in a minority of clinical situations. Over the years, I have adhered to the adage "When in doubt, use LRS until you figure it out." Although there have been times I've had to change from LRS to 0.9% NaCl after the laboratory results came back, I cannot remember an animal that was harmed by this approach.

### **Q: For acid base status, which is more reliable: bicarbonate level or pH determination?**

A: I would say the pH because it is a measured value whereas the bicarbonate is calculated from the pH and pCO<sub>2</sub> using the Henderson equation. However, you often will have a bicarbonate concentration on your biochemical profile, but you will not routinely have the pH. Thorough understanding and interpretation of a patient's acid base status requires consideration of all three parameters. So, if you are uncertain about the patient's acid base status and you believe it is relevant to the case, you should perform a blood gas analysis. Blood gas analysis is confusing to many people and could be the subject of another IDEXX Webinar in the future!

### **Q: When a patient is on replacement fluid therapy, is there a need to wean the patient off fluids slowly once the fluid requirements have been met? Or can they be stopped abruptly?**

A: This is a great question. Many of us were taught that patients should be "weaned" off fluids gradually over 2–3 days rather than discontinuing the fluids abruptly. Interestingly, however, there is little to no objective data to support this clinical practice. If an animal has been on a large volume of fluids for a long period of time, it seems reasonable to "wean" the animal off fluids as described. Likewise, it seems reasonable to discontinue fluids abruptly in an animal that has received a modest volume for just a few days. Actually, this may relate more to the animal's adaptation to the sodium load in the fluids rather than the water. Hormonal changes (e.g., aldosterone concentration) occur when an animal is subjected to a sodium load over a period of time, and it takes a few days for these changes to readjust to normal after the sodium load is discontinued. Thus, gradually decreasing the solute load may be more important than gradually decreasing the water load. I have to admit, however, that I am unaware of objective data to support one viewpoint versus another on this subject.

**Q: How do you rehydrate an anemic animal?**

A: Actually to be more specific, you should consider the oxygen-carrying capacity of the blood, which is related to the hemoglobin concentration and hence PCV. Crystalloids and colloids will restore circulating volume, but they will tend to decrease the PCV. You must determine whether or not the animal's PCV after fluid therapy is low enough to warrant a blood transfusion, and take into consideration both the acuteness and severity of the decrease in PCV (e.g., a PCV that has decreased suddenly from 40% to 17% is likely more cause for concern than a PCV that has slowly decreased from 40% to 12% over many months of illness). The more acute and severe the decrease in PCV, the more likely the patient is going to need a transfusion. This will always be a clinical judgment that must be made by taking into account the individual patient's circumstances.

**Q: What is your fluid choice for the DKA cat?**

A: I typically use an alkalinizing solution such as lactated Ringer's solution, Plasmalyte R, Plasmalyte 148 or Normosol R. However, you will frequently see it stated that 0.9% NaCl is the fluid of choice for diabetic ketoacidosis (DKA) patients because of their large total body deficits of sodium and chloride. Bear in mind, however, that the alkalinizing fluids mentioned have adequate amounts of sodium (130–140 mEq/L) and chloride (98–109 mEq/L). Also bear in mind that 0.9% NaCl is a mildly acidifying solution due to its high chloride content (154 mEq/L). This acidifying effect results because more sodium is reabsorbed in the kidney with chloride than with bicarbonate when a solution of high chloride concentration is infused. By definition, DKA patients already have metabolic acidosis. Thus, I prefer to use one of the alkalinizing solutions mentioned above.

**Q: How often would it be recommended to recheck the electrolytes on a patient that we were monitoring with low K+ and Cl- ?**

A: This is a judgment call that depends on the underlying clinical disease and the patient's condition (e.g., unstable or stable). In a critically ill DKA patient, you may need to recheck electrolytes every 4 hours, whereas in a stable chronic renal failure patient on IV fluids, once a day may be sufficient. One answer cannot fit all patients and it depends very much on the individual patient's situation.

**Q: If you have a hypodipsic and anorexic patient, can oversupplementing IV fluids prolong these clinical symptoms?**

A: This is another interesting question for which I cannot cite specific data. We do know that dogs and cats drink only to maintain their hydration. (This is different than the situation in humans. We drink partly for social reasons and tend to consume more water than we actually need. The excess simply is excreted in our urine.) Thus, I suspect ongoing fluid therapy in excess of bodily needs in a hydrated animal would decrease water intake. However, I don't think it would affect appetite and caloric intake. The animal's appetite, or lack thereof, more likely is a reflection of the underlying disease state. That is, ongoing anorexia would be an indication that the animal's disease process is still present and contributing to its clinical signs.

**Q: What would be an appropriate fluid choice for cats with renal failure?**

**What fluid would you choose for at-home maintenance with chronic renal failure cats?**

A: Again, an alkalinizing solution with relatively normal (i.e., 280–310 mOsm/kg) osmolality. Thus, I would choose LRS. Depending on the animal's potassium status, supplementation with potassium chloride may be needed (10–20 mEq KCl per liter). Solutions containing more than 40 mEq KCl/L are thought to be irritating when administered subcutaneously and should be avoided.

**Q: Would you want to supplement the parvo dog with any dextrose?**

A: We often do supplement the IV fluids of parvo dogs with 2.5–5.0% dextrose because of concerns about sepsis (which can contribute to hypoglycemia). I would reserve this practice for animals receiving IV fluids, because bacterial contamination and cellulitis, although uncommon, are potential concerns with subcutaneous use of fluids containing dextrose.

Practice what's possible®

**IDEXX**  
LABORATORIES

idexx.com