Aspen Meadow Veterinary Specialists kicked off the summer season with a blast!

*Saturday, June 9th was Erie's Bark in the Park Event*

This event featured a lot of fun four legged activities including the world's shortest parade, a demonstration by the CO Frisbee Dog Club and a discussion by our very own Dr. Robyn Read on common orthopedic injuries. We look forward to seeing some of you there next year!
*Saturday June 23rd was Left Hand Brewery's fundraising event for the Longmont Humane Society "Paws in the Park"

Left Hand sponsored events are always fun, including this one. Although it was a very hot day Left Hand made this event beerable with great people, good music, and of course a good chill from a cold one.

*Wednesday, June 27th was the "Osteosarcoma: Updates on Definitive and Palliative Treatment" CE

There was a great turnout for this CE led by our very own Jim Perry, DVM, PhD, DACVIM.

To learn more about Jim Perry, and our Oncology department
Visit our website by clicking the link below:

*Visit Our Website*

**Upcoming Events!**

Archives of our past newsletters containing timely and useful medical information are on our website.

At AMVS we like to put smiles on faces through random acts of kindness.

*Just by opening June’s issue of the Veterinary Voice you will be entered into a drawing to win random restaurant gift cards!!!*
Fluids or Colloids - Which One To Choose and Why?

By: Wendy Yaphe, DVM Dipl ACVIM, Internal Medicine Specialist

Practice Points For Your Next Case:

- ECF-like fluids (such as Norm R and Plasmalyte A) form the cornerstone of fluid therapy in most sick and dehydrated patients.

- L/R's solution and 0.9% NaCl are other types of ECF-replacement solutions that may be indicated in particular situations.

- Maintenance type of fluids (Norm M) should be considered in patients with underlying cardiac disease, systemic hypertension, and renal disease.

- Colloids (Hetastarch, Dextran, VetStarch) are beneficial in the management of acute hypotension as well as third spacing of fluid associated with low albumin or vasculitis.

- 5. VetStarch is a new colloid recently released by Abbott that is similar in action to Hetastarch.

Background

The cornerstone of fluid therapy for most patients typically consists of the administration of an electrolyte containing solution. The type of fluid chosen is most often an ECF (extracellular fluid replacement) type of fluid. ECF solutions are designed to mimic the electrolyte composition of fluids lost from the ECF space (eg, interstitium and blood) and hence have an electrolyte composition similar to that of blood (Na+ 145 E/L, K+ 5 E/L, Cl- 110 E/L).
blood (Na+ ≈ 145 mEq/L, K+ ≈ 5 mEq/L, Cl− ≈ 110 mEq/L and bicarbonate = 24 mEq/L). A fluid closely resembling ECF composition is the optimum choice in the dehydrated and hypovolemic patient. Examples of ECF-like fluids include Norm R, Plasmalyte 148, and Plasmalyte A (which closely resemble ECF) and L/R’s and 0.9% NaCl (less closely resemble ECF). Other types of fluids available for administration include maintenance electrolyte solutions, dextrose-containing solutions, and colloids.

**Chart of electrolyte composition of fluid types**

**Common ECF Fluids**

1. Norm R, Plasmalyte A and Plasmalyte 148 have the same electrolyte composition as follows:
   - Na+ 140, Cl− 98, K+ 5, Ca2+ 0, Mg2+ 3, pH 6.6 (7.4)
   - acetate 27, gluconate 23, 294 mOsm/kg

2. 0.9% NaCl: Na+ 154, Cl− 154, K+ 0, Ca2+ 0, Mg2+ 0, pH 7.4 (5.7) buffer none 308 mOsm/L

3. L/R’s: Na+ 130, Cl− 109, K+ 4, Ca2+ 3, Mg2+ 0, pH 6.5 lactate 28, 272 mOsm/kg

**Maintenance Fluids**

- Norm M: Na+ 40, Cl− 40, K+ 13, Ca2+ 0, Mg2+ 3, glucose 50 g/L (5%), buffer acetate 16
- 0.45% NaCl + 2.5% dex: Na+ 77, Cl− 77, K+ 0, Ca2+ 0, Mg2+ 0, pH 4.5 280 mOsm/L Hypotonic

How do ECF-like solutions compare to each other? Is there a superior choice?

Plasmalyte 148, Plasmalyte A, and Norm R are nearly identical to the electrolyte composition of plasma and an ideal choice to administer.
1. 0.9% NaCl: less ideal as a replacement fluid (higher in sodium, lack of potassium, and lack of buffer), however, it is a commonly available solution with a low cost.
is often a good choice (in conjunction with other measures)
for the patient with hyponatremia and hyperkalemia.
2. L/R's: works okay, but it has no Mg (acutely ill animals
may be deficient in Mg), it contains lactate (may not be
ideal if significant hepatic dysfunction or lymphosarcoma is
present), and sodium levels are a bit lower than ECF. On
the flip side, L/R's is a good choice for SQ fluids (as lower
in sodium), and does not sting as much as NormR (acetate
and gluconate buffered solutions more likely to sting).

**How do maintenance fluids differ from ECF fluids?**

ECF fluids are designed to replace existent losses (eg,
dehydration deficits, hypovolemia), while maintenance
fluids serve to provide an ongoing source of electrolytes
and water in a patient that is not eating or drinking but has
ongoing electrolyte losses via urine, stool and respiration.
Maintenance needs are roughly 50-65 ml/kg/day and
derived from the following obligatory losses (urine: 20-25
ml/kg/day, stool: 5-10 ml/kg/day, and respiration 10-15
mls/kg/day). If you collected in a bucket all the urine,
feces, etc. lost on a daily basis and had it analyzed for
electrolyte composition, it would resemble the following:
Na+ ≈ 40 - 60 mEq/L, and K+ of ≈ 20 mEq/L. This is the
electrolyte composition of maintenance solutions. Available
maintenance fluids include Norm M, and to a lesser extent
0.45%NaCL/2.5% dextrose.

**What happens if you give ECF solution for
maintenance needs?**

In most cases, this works out fine as the kidneys eliminate
the extra sodium load and potassium can be added to the
fluid bag as needed. However, patients with heart disease,
chronic renal failure, systemic hypertension, liver disease,
and other diseases predisposing to sodium overload should
be ideally moved to maintenance fluids once rehydrated.

**What about dextrose solutions (5% Dextrose in
sterile water)?**

Dextrose 5% in water is a hypotonic solution, contains no
electrolytes, and should not be used as a stand alone
solution for either a replacement or maintenance solution.
However, it is an invaluable addition to other fluids, as
needed for the hypoglycemic or hypernatremic patient.

**How do colloids work?**

Colloids contain large negatively charged molecular weight
particles that are osmotically active, drawing sodium
around their core structures. By drawing sodium, colloid
molecules hold water within the vascular space (water
follows sodium). The average molecular weight of
hetastarch is 430KD (vs albumin with a MW of 69KD) with
a range of sizes from 10KD to 1 million.

**When should you reach for a colloid (Hetastarch**
When should you reach for a colloid (Hetastarch, VetStarch)?

Colloids are very effective for the treatment of hypotension and are given in conjunction with ECF fluids to rapidly expand the plasma space. As colloids replace intravascular fluid deficits only, and thus should always be given with crystalloids to restore both intravascular and interstitial fluid volume. Colloids are also indicated in the treatment of hypovolemia or vasculitis associated with low albumin (the large particle size helps to hold fluid in the vascular space).

What is the dose of colloids? How does administration change your fluid rate?

When administered as a bolus, hetastarch (HES) is typically given IV at 2-5 mls/kg IV over one hour in the cat, and 5-10 mls/kg over 30 mins in the dog (giving too fast can result in histamine release). Smaller doses are given first and only repeated if necessary. HES can then be continued as a CRI with a total daily dose usually not to exceed 20 mls/kg/day. As a rough guideline, crystalloid fluid rates should be decreased by 25-40% when giving colloids. The average length of time hetastarch lasts in circulation is about 36 hrs.

Are there any adverse effects associated with the administration of colloids?

If colloids are overdosed, they can cause volume overload (as they draw water around them and are trapped in the vascular space). There is also the potential for the development of a coagulopathy due to the dilutional effect on coagulation factors (thought to be more theoretical than actual by most with appropriate dosing of colloids).

How does the new veterinary colloid solution VetStarch compare to Hetastarch (HES)?

As Hetastarch is reportedly soon to come off the market, options for alternatives are being considered. VetStarch is a new product released by Abbott. It is identical to the human product Voluven (available in Europe) and very similar to HES (both contain 6% HES in 0.9% NaCl solution). The mean MW of VetStarch (130KD) is slightly smaller than the mean MW of HES (430KD), with a range of 110-150KD. Available in 250 and 500 ml bags. The suggested dose range is 20 mls/kg/24 hrs as a CRI, although some suggest that total higher daily doses can be considered due to lower average MW of VetStarch in comparison to HES. In humans, the reported dose range is up to 50 mls/kg/day. VetStarch has a shorter duration of effect (average length of time in circulation is 4-6 hrs) and is thought to be less likely to cause a coagulopathy than HES (due to lower MW).