



Fluid Therapy Keeps Calves Alive:

Part 2 of a 3 part series

Bethany Lovaas, DVM, University of Minnesota Beef Team

On many occasions, as a veterinarian, I receive the complaint that calves are dying of scours, in spite of the prescribed antibiotic therapy. My response to this scenario is...fluid therapy! In many cases, it is not the bug, be it virus, protozoa, or bacteria, which causes the death of the calf, but rather dehydration and acidemia (low blood pH) from the diarrhea. Calves have been snatched from the jaws of death by aggressive and effective fluid therapy.

A calf becomes dehydrated when losses are greater than intake, simply put, the volume of the scours is greater than the amount of milk the calf is nursing from its dam. When this happens, blood volume decreases and the calf has the potential to suffer from the effects of hypovolemia (low blood volume). One of the first of these effects, is lactic acid production by the muscles of the body, because they are not receiving adequate oxygen because there is not enough blood volume for normal circulation. Secondly, the kidneys require a constant supply of circulation, and if blood volume is low, circulation to the kidney may be hampered, and lead to kidney failure. Because the kidneys are an integral component to regulating acid/base balance in the body, failure of the kidneys also creates an increase in blood acidity (acidemia).

When a calf is scouring, there are not only losses of body fluid, but also significant loss of bicarbonate, which is the buffer in all mammalian systems. The body uses bicarb to keep the pH neutral. If too much bicarb is lost, the body loses its ability to regulate pH. Bicarb is utilized

in the digestive tract to neutralize the acidic pH of the stomach contents as it passes into and through the small intestine. Typically the bicarb is resorbed and recycled as it passes into and through the large intestine. In cases of scours, the transit time through a large portion of the small intestine, and the entirety of the large intestine, is so fast that the body doesn't have time to resorb and recycle. Therefore, and very importantly, much of the calf's body supply of bicarb is lost in the feces. This leads to the fatal acidosis/acidemia that kills calves.

When instituting a fluid therapy protocol, the two main components are water and bicarb. How much of each should be administered will be addressed individually.

When determining how much water a calf needs, we must first get an estimate on how dehydrated it is. There are a few signs and tools that we can use effectively in the field. Observation of the calf's behavior and state of health are useful, as well as the 'skin tent'. A skin tent is performed by pulling the calf's hide on its neck, like you would for a subcutaneous injection. When the skin is let go, it should normally snap back down. However, in the case of a dehydrated animal, the skin will stay in the tent position for some time.

A comatose calf is in a state of severe dehydration and hypovolemic shock. This calf would be estimated at about 12% dehydrated. A calf that is depressed, has sunken in eyes, and a skin tent is estimated at 10% dehydrated. A

calf that is somewhat depressed, still difficult to catch, and has a mild skin tent is estimated at 6% dehydrated.

Now that we have an estimation on hydration status, now we can determine how much water to administer to the calf. In the case of a 50 kg (100 lb) calf that is moderately (10%) dehydrated, we will need to replace 5 liters of fluid. This is the calf's fluid deficit. When designing a fluid therapy protocol, we must also consider maintenance fluids and on-going losses. Maintenance is usually approximately 50-100 ml/kg/day, which amounts to another 2.5-5 liters/day! On-going losses are harder to estimate, because it is difficult to determine the volume and frequency of the diarrhea. When the deficit, maintenance, and on-going losses are added together, a calf may require 8-11 liters of fluid in a 24 hour period. That's nearly 3 gallons! **The important factor to keep in mind is that you cannot over-hydrate a calf, and when you think you've given too much, you might have given barely enough.**

Aggressive fluid therapy means many treatments. If each treatment (typically tubing with an esophageal feeder) involves 2 liters, four to six treatments per day will suffice. The average calf's stomach can hold one gallon with ease, so treatments can be as little as an hour apart if necessary. A schedule can and should be developed over the course of a day or two, to get the calf back to a normal hydration status.

The other key factor to fluid therapy is correction of the acid/base imbalance. There are other electrolytes that are thrown off balance in a scours situation, so inclusion of a complete electrolyte supplement is a good idea. Be very aware, when selecting electrolyte solutions, that some will not have sufficient bicarb, and can actually contribute more to the acidosis than they correct. Most of the correction can be accomplished by simply adding baking soda to the water that is being administered to the calf. The older the calf is, the more acidotic it is, and will require more baking soda to correct the acid/base imbalance. A recommendation of 2-4 tablespoons of baking soda in 2 liters of warm water works quite well.

In moderate to severe cases of scours, often the calf doesn't feel well enough to eat. Inclusion of an energy source is often beneficial. Corn syrup, sugar, or other highly and rapidly utilized energy sources will work. Milk replacer supplementation is also helpful, however, it is important not to mix the bicarb with the milk replacer, as the bicarb will neutralize the calf's stomach acid, and interfere with the normal digestion of the milk replacer. It is often best to wait 2 hours between treatments, the scouring calf is being treated with both bicarb and milk replacer.

Questions and comments about this topic may be directed to the University of Minnesota Beef Team website (www.extension.umn.edu/beef).