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College of Veterinary Medicine

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ST. PAUL, MINNESOTA  
UNITED STATES OF MINNESOTA

## **LARGE VOLUME FLUID THERAPY FOR LARGE ANIMALS**

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For some time we have all known that in clinical practice, the best supportive therapy for cattle with dehydrating conditions such as diarrhea, or toxemia conditions as a result of coliform mastitis or engorgement has been large volumes of balanced electrolytes administered intravenously. Although some have said that oral fluids and electrolytes are as effective as intravenous administration, most clinicians would agree that given a choice, intravenous administration has the best chance of effecting reversal of the toxic condition.

Large animal practitioners have a dilemma, particularly in field conditions, as to how to deliver the volumes of fluids needed to be effective. It is difficult if not impractical to carry the volumes of fluids needed for the occasional case encountered. Preparation of sterile high volume solutions, and maintaining that sterility becomes a major logistic problem in the field. We need a system by which we can deliver "no load" fluid therapy in a cost effective manner.

Let me describe a method to deliver these fluids. There is a product manufactured in Minneapolis, MN intended to be used in manufacture of human kidney dialysis solution. The product is called Nephrosol Acetate Concentrate #RS-27. The manufacturer is Renal Systems Division of Minntech Corp., 14905 - 28th Avenue North, Minneapolis, MN 55447, (612) 553-3300 or (800) 328-3340. The cost of the product as of this date is \$5.00 per gallon, plus freight. This concentrate when diluted 1:34 with purified water results in an isotonic electrolyte solution very similar to lactated ringer's solution. In our practice, we carry the concentrate in our vehicle in 100cc vials, which when added to 1 gallon of water result in the 1:34 dilution. Most commercial distilled water found in a grocery store is packaged in a relatively soft plastic gallon jug. We also carry one of those jugs full of water in our vehicle.

The administration system is constructed as follows:

- (1) 100cc of Nephrosol concentrate is added to the jug of distilled water and mixed by inversion. This solution is placed in a pail of hot water to warm while the patient is being prepared for treatment. The liquid concentrate provides a uniformly mixed solution immediately.
- (2) Perform standard clip and scrub of the area over the jugular vein prior to insertion of the catheter. Size of catheter is an option of the clinician, however if we are preparing to

administer large volumes of fluids (i.e. 10 to 15 gallons) we prefer to use a 10 ga. 3" teflon catheter (Deseret Division of Becton Dickson, Sandy, Utah, Catalogue #38-2820-2.) The catheter is placed in the vein, sutured in place using a tape butterfly, capped with a PRN adapter and flushed with sterile saline. The 10 ga. catheters have escalated in cost and have become nearly prohibitive. 14 ga. 5 1/2" catheters are available from Abbott for about \$2.00 to \$3.00. That size seems to be adequate.

- (3) The warmed solution is hung with a wire or bale string using the gallon jug handle. This will cause the jug to hang with one corner lower than the other three corners of the jug. A standard disposable IV set is punctured through the lowest corner of the jug. The warming process of the solution will facilitate this puncture. The PRN adapter is removed from the catheter, the IV set attached and flow rate adjusted. Normally, full flow will be indicated. The cap of the gallon jug is then cracked enough to allow air entry as the jug empties. Halter restraint is usually best for the animal, and it is best then to tape the IV tubing to the halter with enough slack to prevent strain on the catheter if the patient moves.
- (4) This next step is where the practitioner's conscience and judgement come into play. We leave enough 100cc vials of concentrate to make the required number of gallons of intravenous fluid. The options are a) carry enough jugs of distilled water to finish the treatment or b) use an on farm source of water. I realize that tap water can contain many impurities that might skew the sterility and isotonicity of the finished solution being administered. However, in nearly all cases, we are confident enough in the quality of the tap water on the farm that we are willing to use it as our diluent, especially given the potential gravity of the case and the alternatives offered to us. The owner is instructed to watch the solution flow and to shut it off before the last drop is gone. Another jug of warm tap water has been prepared with the concentrate. This mixture is poured into the IV jug, the cap is replaced loosely, and the flow is resumed. This procedure is repeated until the recommended volume has been administered. The process keeps the owner near the patient to monitor the patency of the system. Cows that are recumbent or cows in stanchions usually are not a problem for maintaining

the system. This system does not, however, provide for free movement of the patient in a box stall.

- (5) When the process is finished, the owner replaces the PRN cap in the catheter and flushes the catheter with a heparinized saline solution. The catheter is left in place and taped over for protection so that it may be used for repeat treatment if required.

I have been impressed by cases where the cow is recumbent, with the eyes deeply sunken, and general severe depression, where after administration of 10 to 15 gallons of fluids, often accompanied by Banamine, we have seen the patient get up a few hours later and start eating and drinking.

We have used this same system for diarrhea calves that are recumbent and/or comatose. In a field situation, I find it most convenient to make a table of square hay or straw bales and to restrain the calf by tying to the bale strings. The period of fluid administration allows time to cover the calf with blankets and to warm the calf with hot water bottles or heat lamps. Fluids warmed higher than body temperature may be indicated. Severe dehydration in calves makes it extremely difficult to place in catheter. Many times a "cut down" is required.

Previously we mentioned cost effectiveness of this procedure. The costs are approximately as follows:

|                         |                              |
|-------------------------|------------------------------|
| Distilled water and jug | \$0.85                       |
| Disposable IV set       | \$1.25                       |
| Deseret Catheter        | \$5.50                       |
| Nephrosol Concentrate   | \$0.15/gallon of IV solution |
| PRN adapter             | \$0.30                       |

### Summary

A method is described for field or hospital administration of large volumes of intravenous fluids in the bovine, using materials easily transported in a practice vehicle. Cases targeted are toxemias such as toxic coliform mastitis, and calves with neonatal diarrhea. The administration system described is reasonable in cost, is disposable, and after the original set-up, can be left in the care of the owner to supervise the remaining administration. The procedure hinges on the availability of an electrolyte concentrate which can be carried in a practitioner's vehicle, and on using a diluent usually available on the farm. With use of variable sizes of indwelling catheters The system is practical for use either in the adult or neonatal bovine.