

Fluid Therapy in Treating Dehydration

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More calves are lost annually from scours than from all other calf diseases combined. The known etiologic agents are many and have been extensively described. Whatever the etiology of scours, the dehydration resulting from the disease probably stands out as the single major cause of death.

Administration of fluids is not only the professional approach to the problem of calf scours but also the most rewarding to clients. Although most large animal practitioners are aware of the need for fluid therapy, they often feel that the approach is impractical because of the time required to administer the necessary volume.

This paper deals with the practical aspects of fluid therapy to combat dehydration in baby calves. The technic to be described has been used successfully in our practice. Of over 1000 calves (representing 180 herds) treated by this method through the past three calving seasons, over 70% were able to return and be put back on the cows.

Review of Fluid Compartments

In order to appreciate the quantity of fluid necessary for treating dehydration, a review of the fluid compartments of the body is helpful. Water, the most common body substance, comprises about 70% of the total body weight. The percentage is higher in young animals and somewhat lower in older and fatty animals. The starving animal can lose nearly all of its glycogen and fat, half of its protein, and two-fifths of its body weight without dying. However, loss of 10% body water results in serious metabolic disturbances, and loss of 20% nearly always results in death.

Body water is divided into intracellular and extracellular water. Intracellular water constitutes approximately 50% of body weight and provides a diffusion medium for the complex molecules and enzyme systems characterizing intracellular protoplasm. Extracellular body water approximates 20% of body weight and contains 5% plasma and 15% interstitial fluid. This water, which functions as a transportation system for movement of nutritive and waste substances to and from the cells, also adds plumpness to the body.

A young animal has considerably less extracellular water reserve and greater metabolic requirements than an adult. For this reason, water or electrolyte disturbances have a profound effect on the young. As dehydration increases, blood volume decreases. Eventually, all compartments share in the water deficit. Thus, the solution used in treating dehydration, whether given intraperitoneally or by stomach tube, must reach both the interstitial fluid and the intracellular compartment via the blood.

Clinical Signs

The following signs may be helpful in determining the percentage of dehydration and electrolyte imbalance of affected animals.

A calf with about 5% dehydration may appear thirsty and drink readily. The eyes should be bright and skin and extremities warm. Dehydration of 10% will render the animal more lifeless and unwilling to stand. The body may be warm but the extremities cold, and the skin will begin to lose elasticity. Rectal temperature will range from 90°F to 94°F. If a finger is placed in the mouth, the calf will not suck.

As the condition becomes critical (i.e., dehydration exceeds 10% body weight) circulation deteriorates and the extremities and mucous membranes become cold. Eyes are sunken, the corneas often appearing dry and dull. The calf is usually comatose and a wet area is apparent around the mouth. (Many calves seen in our clinic had rectal temperatures of 88°F or less. One calf responded to treatment in spite of a temperature of 86°F when presented.)

Quantity and Type of Fluid Required

Three factors must be considered before fluids are given: 1) the existing deficit; 2) the continuing abnormal losses; and 3) the amount of fluid required for maintenance.

For example, an 80 lb. calf with an existing water deficit of 10% would need at least 8 lbs. of fluid during the next 12 to 24 hours to meet the deficit. The amount of fluid needed to compensate for the continuing abnormal losses would depend

on the severity of the diarrhea. Minimum maintenance requirements would be roughly 20 cc/lb. Thus, for an 80 lb. calf with a 10% water deficit, a minimum of 4000 ml. would be required in addition to the fluid needed to counterbalance the continuing loss from diarrhea. (Most of the calves we treated had approached or exceeded the 10% water deficit stage.)

Unless laboratory tests indicate otherwise, the product of choice for rehydration is a balanced electrolyte solution. These solutions contain the main electrolytes in approximately the same concentration as plasma. However, considering the volume required, the cost may be prohibitive.

One product we found to be effective and economical was Eltrad-IV^R (Haver-Lockhart), a balanced electrolyte solution containing 5% dextrose.

One 8 oz. packet makes 4000 ml. of solution, so gallon jugs were used (obtained from a local drive-in) and wire bales were made to hold these jugs in an inverted position for administration of the fluid. Hot tap water is used to dissolve the powder and then the jug is filled with warm water.

Routinely, we add 10 cc of Multibex-C^R (Elanco) to the first gallon of electrolytes. Antibiotic can also be added but in view of the subnormal temperatures these would be of questionable value. We have used various antibiotics and found little advantage to using them. As much as 1000 cc of whole blood were given 38 calves, but results were poor. Although we have also administered amino acids, in limited quantities, the basic treatment has been balanced electrolyte solution.

Equipment

1. *Cages*—These are 2 ft. x 3 ft. cages constructed of welded steel with tubular steel frame and sides of 2" x 8" heavy steel wire mesh. The bottom consists of a double layer of the wire mesh overlapped so that the openings are 1" x 8". The cages are set off the floor on 12" legs. In one corner a steel pipe extends upwards with a cross bar on it from which the fluid bottle and a heat lamp are suspended.

2. *Thermometer*—To obtain an accurate reading of subnormal temperatures, the thermometer from a portable incubator is used. This device provides an instant reading but must be read while in the rectum.

3. *Catheters*—For successful intravenous feeding the Venocath-16^R (Abbott) catheter pack has been found most satisfactory. This outfit consists of a 16-gauge, thin-wall needle; an 11½" plastic

catheter with an 18-gauge bore; and a stainless steel wire stylet.

4. *Simplex IV Outfit.*

5. *Heat lamp.*

6. *Gallon jug.*

Method of Administering Fluids

Most calves are brought to the clinic in a weakened or comatosed condition. Calves are placed in lateral recumbency and will usually remain in that position until at least one gallon of fluid has been administered. Little restraint is used, but occasionally a calf will need his feet tied together and constant supervision is not required.

After the calf is placed in the cage, the temperature is taken and the fluid deficit evaluated. All information is recorded on a 5" x 8" index card which is fastened to the cage with a metal paper clamp. An identification tag is attached to each calf.

With the calf in lateral recumbency, the head is extended and the area over the jugular furrow is clipped. Routinely, an incision one-half inch long is made in the skin over the jugular vein with little resistance from the animal. It is possible to make a venipuncture without making the skin incision but if this is done it was found that the catheter was more inclined to be pinched off in the skin and more problems were encountered in keeping the fluid flowing into the calf.

The needle is inserted into the vein and the catheter is then passed through the needle. As soon as the adapter on the catheter is secured into the needle hub, the needle is withdrawn from the vein and skin. The protective guard wings are closed over the needle and locked into position with a sliding plastic ring. The needle part of the catheter is then taped to the neck. One strip of ¾" adhesive tape is extended around the neck behind the ears. A second strip is wrapped around the forehead between the ears and the eyes.

After the wire stylet has been removed, a Simplex^R intravenous set is used to connect the catheter to the gallon jug. The intravenous tubing is secured to the calf's head by use of metal paper clamps placed over the tubing and fastened to a flap of tape on each of the head wraps. The IV apparatus should be flexible enough to allow the animal to stand or move its head.

The gallon jug is suspended about 2-3 ft. above the calf. The height can be adjusted to regulate the flow of fluid by using a piece of light chain for suspending the jug. A control device is unnecessary when a catheter of small diameter is used.

Approximately four hours are required to administer a gallon of fluid. Generally no more

than two gallons of fluid are given in 24 hours. If calves are going to respond they will generally show much improvement after two gallons of fluid and then an evaluation can be made as to whether more is needed.

When a bottle is empty, venous pressure will cause a backflow of blood into the catheter. To flush out the catheter, a 1 cc tuberculin syringe, filled with saline solution, works well.

Sometimes a calf will flounder during the night and damage the catheter. When this happens and more fluid is required, the calf is again catheterized.

A heat lamp is suspended over the calf and is important in stimulating circulation and helping to restore normal temperatures.

Intravenous fluids may or may not be continued after the calf begins to show an interest in sucking, depending on its general appearance and vigor. If the calf will accept a nipple bottle and appears to have overcome the fluid deficit, IV fluids are discontinued. The calf is then fed one pint of a dilute commercial milk replacer three or four times daily until claimed by the owner. The owner has been advised to milk the cow at least once a day while the calf is gone. Before the calf is returned to the cow, the cow is partially milked to prevent the

calf from overeating. Since the calves are in the clinic for an average of only 48 hours, all cows are still willing to reclaim their calves when they are returned.

Discussion

As is true of any fluid-therapy program, the success of the method described here depends to a large extent on the effort exerted. Office staff members can play an important role in this program and can be trained to do a great amount of the work, including catheterizing the calves.

The method requires no elaborate equipment. During the first year the program was employed in our practice, we used handmade cages over wood slatted floors. The second year over 500 calves were treated in 21 steel cages and in a 12 ft. x 25 ft. area in one corner of the large animal clinic. Catheters may be obtained from a hospital supplier or directly from the manufacturer. Because fluids are prepared only as needed, storage requirements are not great.

The practicality and success of the program have been gratifying to us and to our clients. We believe other practitioners will find the method a rewarding approach to the treatment of scours in baby calves.