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Popular Article

Advances in Fluid Therapy and Drug Therapy for Downer Cows

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Fluid therapy in Downer Cow

Fluid therapy in adult ruminants is often difficult to accomplish because large volumes are needed, animals must be restrained, proper therapy can be very time consuming, and monitoring is often impossible. For these reasons, fluid therapy is often avoided in adult ruminants, however there are clinical situations where either oral or intravenous fluids are necessary and cannot be avoided.

The fluids are usually given in two stages

1. Hydration therapy in the first 4-6 hours at a rate of 100 to 150ml/kg intravenously.
2. Maintenance therapy (a combination of continuous losses and maintenance requirements) in the next 20-24 hours, depending on the severity and course of the disease, at 60-80 ml/kg/24 hours intravenously (approximately 3-4 ml/kg/hour).

Assessment of dehydration status in cows (Smith, 2005)

S.No	Dehydration (%)	Clinical observation
1.	Mild dehydration (6-8%)	Slight eyeball recession, skin tent slightly prolonged (2-4 seconds), mucous membranes moist
2.	Moderate dehydration (8-10%)	Eyes obviously sunken, skin tent obviously prolonged (4-8 seconds), mucous membranes tacky
3.	Severe dehydration (10-12%)	Eyes severely sunken into orbits, skin remains tented, indefinitely, mucous membranes dry

When treating dehydrated cattle, the practitioner must not focus solely on correcting the degree of dehydration, but must also consider the animal's maintenance fluid requirements. Non-lactating cattle require at least 50 ml/kg of water per day for maintenance and lactation adds to the requirement depending on the cow's production level (Roussel, 1999).

1) Saline or Ringer's solution: In cases of severe dehydration, these isotonic, non-alkalinizing solutions are generally recommended for replacement of large fluid volumes in adult ruminants (Roussel, 1999).

2) Hypertonic saline: Saline - Over the past 10 years we have discovered that hypertonic saline (2400 mOsm/L) can be used to rapidly expand plasma volume in a severely dehydrated animal. When combined with oral electrolyte solutions or oral water (without added electrolytes), this approach can be extremely effective in rehydrating dehydrated cattle and is much easier to administer than volumes of isotonic fluids. Hypertonic saline solutions can be purchased commercially in 1000 ml containers and should be given to ruminants at 4 to 5 ml/kg administered slowly over a 4-minute period (approximately 2 liters for an adult cow).

3) Dextrose: Glucose as a 5% solution can be administered at a slow rate for several days, however this delivers free water and can cause dilution of serum electrolytes.

4) Isotonic potassium chloride: Only used for severe hypokalemia in cattle (serum K⁺ concentration <2.3 mEq/L) with severe muscle weakness or recumbency. Recommended treatments involve the intravenous administration of isotonic potassium chloride (11.5 grams of potassium chloride per liter of sterile water) at a rate of 4 ml/kg/hour. Combined with large doses of oral potassium salts (ie. 200 grams of KCl per day), the hypokalemia can be rapidly corrected.

How Intravenous fluids work ?

When we give this solution directly in the jugular vein of cattle, it dramatically increases the blood osmolality. The body really wants to maintain normal osmolality. So what happens is that water is sucked from the rumen and intestines into the blood. This works to rapidly rehydrate the cow.

Cows are very good candidates for hypertonic saline because they have a large water reservoir (rumen). So basically, we are raising the osmolality of blood (by giving hypertonic saline) and lowering the osmolality of the rumen (by pumping it with water). The two treatments together will cause a large movement of water from the rumen into other parts of the body.

After the fluid administration is complete, you should give the cow a supply of fresh water immediately. Most cows will drink 5 to 10 gallons over the next 10 minutes. Cows that do not drink water within 10 minutes of hypertonic saline should have 5 gallons of water pumped into



their rumen.

Never give hypertonic saline alone without providing the cow fresh water to drink or pumping the rumen with water. This protocol has been shown to be very safe and is effective for the correcting dehydration in adult cattle. If necessary, it can be repeated for 2 to 3 days in a row.

Why oral fluid therapy is indicated in cows?

Oral electrolyte solutions have classically been used to replace fluid losses and correct electrolyte abnormalities in adult ruminants because they are cheap and easy to administer on-farm. Since most dehydrated cattle have a metabolic alkalosis, it is important to use a non-alkalinizing oral electrolyte solution that does not contain bicarbonate, acetate, or propionate. We generally don't attempt to correct an alkalosis by administering acid; instead our goal is to provide extracellular anions in relative excess to cations.

In practice, this is accomplished with chloride-rich, high potassium solutions.

Fluid formulation: what to add and how much to give?

- ✓ Sodium chloride (NaCl) - 7 gm/L,
 - ✓ Potassium chloride (KCl) - 1.25 gm/L and
 - ✓ Calcium chloride (CaCl₂) - 0.5 gm/L
 - ✓ Magnesium sulphate 7-hydrate 0.2gm in 20 liters of water
- Or
- ✓ Sodium chloride (NaCl) - 140 gm,
 - ✓ Potassium chloride (KCl) - 25 gm and
 - ✓ Calcium chloride (CaCl₂) - 10 gm
 - ✓ Magnesium sulphate-hydrate 4gm in 20 liters of water
 - ✓ This type of non-alkalinizing oral electrolyte solution for adult ruminants can be created that will effectively rehydrate animals without alkalinizing the blood pH.

Guidelines for Oral Nutritional Supplementation of Dairy Cows (G. R. Oetzel, 2007)

S.No	Treatment Category	Diagnostic Criteria	Oral Nutritional Supplement
1.	Stage II milk fever Just after calving Usually 2+ lactation	Lateral recumbency Flaccid paralysis Just before or just after calving	Ideal: IV calcium, 500 ml calcium borogluconate administer over >4 minute period. Ideal: Also include oral calcium propionate or calcium chloride (paste, gel, or liquid) to prevent relapse; wait until cow is standing and swallowing before giving the oral dose. Subcutaneous calcium, 500 ml calcium



			borogluconate, spread over several sites. Contraindicated: IV or subcutaneous solutions containing added glucose (probably hyperglycaemic already; IV dextrose causes diuresis and electrolyte loss)
2.	Hypophosphatemia	Alert downer Confirmed low blood phosphorus (<2 mg/dl); blood	Ideal: Drench 220 grams sodium monophosphate in 5+ gallons of warm water. Optional: Add 100 g potassium chloride to the drench Optional: Add 200 g magnesium sulfate to the drench Optional: Administer IV phosphorus (phosphate forms only). Contraindicated: IV or subcutaneous solutions containing added glucose. Contraindicated: Hypophosphite sources of phosphorus.
3.	Hypokalemia	Confirm by blood K <2.2 mEq/l.	Ideal: Drench with .5 lb (220 g) potassium chloride in 5 gallons warm water; repeat once every 12 hours until the cow gets up or dies. Optional: IV potassium solutions (requires careful monitoring of blood potassium!) Contraindicated: IV glucose or oral glucose precursors (will drive potassium into the cells)
4.	Grass Tetany (hypomagnesaemia)	Aggressive, belligerent downer	Ideal: IV or subcutaneous magnesium sulfate solutions (e.g., 250 ml 20% magnesium sulfate) Optional: Magnesium-containing enema Optional: Oral magnesium supplementation by commercial paste, or 200 g magnesium sulfate in 5+ gallons of warm water (provide after IV or subcutaneous treatment to prevent relapse)
5.	Dehydration treatment: Any stage of lactation, Severe toxemia	Confirmation of source of the toxemia. Moderate to severe dehydration (skin	Ideal: Drench with 5 to 10 gallons of a balanced oral electrolyte solution (provides sodium potassium, chlorine, bicarbonate, and possibly other electrolytes) Optional: IV fluids (balanced electrolytes,



(mastitis, metritis, etc).	tent test, sunken eyes)	isotonic or hypertonic). Provide free access to water if hypertonic solutions are given IV
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Medications for the Downer Cow:

1. Intravenous Calcium Fluid Therapy:

Downer cows are often hypocalcemic. If an apparently hypocalcemic cow does not respond to calcium therapy, potassium, phosphorus, and magnesium should be given as additional treatments pending results of laboratory tests. Monitoring blood mineral status is an important part of downer cow management.

- 1 gram per 45 kg bodyweight (about 8 grams for adult 350kg cow)
- 1 bottle (450ml) of 1.86% Calcium borogluconate contains 8.4g calcium
- **One bottle (450ml) should be given over 10-20 minutes or longer**

Other options

Subcutaneous (SQ) administration

Large water buffalo (difficult to access jugular vein)

2. Monitoring during Intravenous Calcium Therapy:

- **Excessive Calcium dosage or very rapid IV fluid rate can cause heart arrhythmias and death of cow!**
- Listen to heart for arrhythmia and bradycardia (very low heart rate), If heard, stop the IV drip, wait for heart rate to return to normal, then resume IV fluids at a slower rate

Post-Treatment

- Positive signs of IV Calcium Therapy

Eructation (burping), increased rumen sounds, skin twitching, decreased heart rate and stronger heart sounds, brighter mentation

Offer water and feed immediately

Some Calcium Bottles contain Dextrose, which will encourage drinking post-treatment

- Oral Calcium

Given by farmer after initial IV treatment

3. NOT SUITABLE for primary treatment:

Poor oral absorption of Calcium and low gut motility for cow showing signs of clinical hypocalcaemia (if not already combined with IV Calcium bottle)

4. Pain and Inflammatory condition drugs may be given for 3 days or longer if indicated for Nerve Injuries include confine to dry, softly bedded box stall (sand stall is best), and reduce



perineural swelling by administering dexamethasone (0.05 mg/kg, IM, every 1-2 days preferred) or flunixin meglumine (1 mg/kg, IM, q 12 h). Meloxicam 0.4 mg/kg once a day; Intramuscular (IM) or Oral (PO) OR Ketoprofen 2.2 mg/kg once a day; Intramuscular (IM) or Intravenous (IV) can be given.

5. Antibiotics (duration and choice depends on condition)

- Respiratory Infection
- Oxytetracycline 10 mg/kg once a day IM/IV; Oxytetracycline LA 10 mg/kg once every three days IM/IV
- Trimethoprim 3 mg/kg Sulphonamide (TMS) 15 mg/kg IM/IV once a day
- Mastitis
- Trimethoprim 3 mg/kg Sulphonamide (TMS) 15 mg/kg IM/IV once a day
- Ceftiofur 2.2mg/kg IV/SQ once a day
- Diarrhoea or Gastrointestinal infection - Oxytetracycline **or** TMS
- Open Fracture - Oxytetracycline
- Other medications
- Treat other concurrent diseases as appropriate

6. Follow up (Recheck) for the Down Cow:

- Revisit every 2nd day
- Additional IV Calcium and Dextrose therapy may be indicated
- Review nursing care with farmer

References

- Oetzel, G. R. (2007). Preconference Seminar 7C: Dairy Herd Problem Investigation Strategies: Transition Cow Troubleshooting American Association of Bovine Practitioners, 40th Annual Conference, September 19, 2007 – Vancouver, BC, Canada.
- Roussel, A.J. "Fluid Therapy in Mature Cattle," *In: VCNA: Food Animal Practice*, 1999: 15(3): 545-557.
- Smith.G 2(005). Fluid therapy in adult cattle proceeding of the NAVC, North American Veterinary Conference, Jan. 8-12, Orlando, Florida

