Fluid Therapy in Small Ruminants

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Abstract

Methods for fluid therapy in adult and neonatal sheep, goats and camelids are presented, as well as catheters and key formulas. Fluid therapy regimes for common clinical situations, such as diarrhea and sepsis, are provided.

Résumé

Des méthodes de fluidothérapie chez les ovins, les caprins et les camélidés nouveau-nés et adultes sont présentées, de même que les cathéters et les principales formules en usage. Des préparations de fluidothérapie pour parer à des situations cliniques courantes comme la diarrhée et la sepsie sont proposés.

Introduction

Timely administration of fluids can improve the outcome of many diseases and is sometimes the difference between recovery and death. The main indications for fluid therapy are shock, dehydration and electrolyte abnormalities. Sheep and goats are usually predictable when it comes to electrolyte abnormalities, so bloodwork is rarely necessary before instituting fluid therapy for most conditions. Camelids, however, are less predictable, and practitioners are urged to use clinicopathological data to guide fluid therapy decisions. The following information is provided in outline form for use as a quick reference for small ruminant fluid therapy.

Basics

Catheters:
- Adult sheep/goats/llamas/alpacas and crias: 16 G 3.25” in jugular
- Kids/lambs: 18G 2” in jugular
- Intraosseous in neonates if can’t get catheter in
- Always make a stab incision completely through skin with #15 blade, which will save time and catheters.

Dehydration deficit:
- BW(kg) x % dehydration = deficit in liters (careful with small ruminants)
- Example, an 88 lb (40 kg) goat that 8% dehydrated needs
  \[88 ÷ 2.2 = 40 \times 0.08 = 3.2 \text{ L}\]

Maintenance:
- 1 mL/lb/hr (2 mL/kg/hr)

Bicarb deficit:
- Neonate: BW(kg) x base deficit x 0.6 = mEq bicarb
- Adult: BW(kg) x base deficit x 0.3 = mEq bicarb
- Can substitute (normal bicarb - measured bicarb) for bicarb deficit (BD)
  - mEq bicarb/12 = grams bicarb

Lambs and Kids

Following dystocia:
- May look normal initially, but crash 2-4 hours later, be aggressive with therapy
- If depressed: Measure bicarb and correct deficit or use BD of 10
- Consider SoluDelta-Cortef (1 mg/lb; 2.2 mg/kg)
- Consider oxygen even if no respiratory difficulty and normal color

Dehydrated non-diarrheic (septic, hasn’t nursed, etc.):
- May be hypoglycemic
- If < 8% dehydrated, mild depression, still walking: 150-250 mL oral calf electrolytes without bicarb
- If > 8% dehydrated, depressed, recumbent:
  - Correct fluid deficit with balanced electrolyte solution
  - Add: 20 mEq KCl/L and 20-40 mL 50% dextrose/L (will = 1-2% dextrose in solution)
- OR
  - 2 mL/lb (4 mL/kg) hypertonic saline solution (administer over 5 min) followed by oral calf electrolytes without bicarb
  - -if no response consider acidosis and treat like dystocia above
  - -may need more glucose if severe hypoglycemia
  - -follow up with milk

Diarrhea:
- Dehydrated, acidotic, hyperkalemic, whole body depleted in K (not usually hypoglycemic)
For deficit:
If < 8% dehydrated, mild depression, still walking:
150-250 mL calf electrolytes without bicarb (if available; if not, use with bicarb)

If > 8% dehydrated, depressed, recumbent:
bicarb: calculate bicarb needs if bloodwork available or use BD of 10
8.4% bicarb = 1 mEq/mL
fluid: make up fluid deficit with balanced electrolyte solution
add: 20 mEq KCl/L and 20-40 mL 50% dextrose/L (will = 1-2% dextrose in solution)
give half first hour then other half over 2 hours

OR
2 mL/lb (4 mL/kg) hypertonic saline solution (administer over 5 min) followed by oral calf electrolytes with bicarb
(do not use HSS if suspect mixing error of oral electrolytes administered by owner)

-follow up with oral calf electrolytes without bicarb (if available; if not, use with bicarb) per day as long as severe diarrhea continues
-leave on milk or milk/milk replacer unless chronic diarrhea and use of total parenteral nutrition (TPN)
-always mix electrolytes according to directions with water, not milk
-always refrigerate unused calf electrolytes and discard after 3 days

Adults
Usually alkalotic, mild hypokalemia, mild hypocalcemia
If < 8% dehydrated, mild depression, still walking:
correct deficit with oral fluids unless rumen disease or GI obstruction
can add KCl and calcium gel to oral fluids

If > 8% dehydrated, depressed, recumbent:
IV isotonic fluids with 20 mEq KCl/L and calcium solution at 25-50 mL/L

OR
-2 mL/lb (4 mL/kg) hypertonic saline solution (~ 2 L per adult cow)—administer as fast as possible through 14 G catheter
-follow with oral fluids (will usually drink following HSS) if no GI disease or IV if GI disease

If grain overload:
-calculate bicarb deficit if bloodwork available or use BD of 10 and administer IV
-follow up with IV fluids (do not give large amounts of oral fluids, already have rumen distension)
can give some bicarb orally but probably no use if severe (need rumenotomy)
-DO NOT USE hypertonic saline solution (may be already hyperosmolar)

Llamas/Alpacas:
-unpredictable electrolyte and acid/base status, so always run bloodwork, esp. in crias
-adults commonly get fatty liver when off feed so consider partial parenteral nutrition (PPN) if anorexic for more than a few days
camelids get hypoproteinemic easily

TPN/PPN
-use formula in back of Smith’s Large Animal Internal Medicine
-for neonates use TPN
-for adults use PPN since fatty liver is a concern if negative energy balance (just leave out lipids in formula)
-start at 1/4 target rate (in Smith under formula), if glucose 150-200 in six hours leave at current rate, if > 200, slow rate slightly, if < 150, increase rate by another 1/4 (these are basic rules, try not to change rate drastically and give time for insulin to increase
-keep increasing until get to target rate (I have never gotten to target rate, but always see benefits even at low rate)
-monitor glucose/PCV/TP q 6 hours, electrolytes/acid/base status daily (watch out for hypokalemia)
-wean off slowly
-MUST BE administered with fluid pump

OR
-5L Normosol + 500 mL 50% Dextrose + 1 L Aminosyn + K and Ca as needed + 20 mL B vitamins at rate of 5% body weight per day

Insulin is recommended in camelids with TPN or above fluid regimen (0.4 u/kg ultralente SQ q24hrs). Stop insulin 24 hours before stopping fluids.

Tips
-If on continuous fluids consider bolusing q 3 hours. (have better control of rate in animals with long necks and thick skin that cause kinking of catheters)
-NOT appropriate if glucose content is > 2% or for PPN/TPN

-1 level teaspoon is approximately 5 grams of most salts
-NaHCO₃: 1 gm = 12 mEq so 240 mL = 20 grams or ~ 4 tsp.
- Isotonic saline: 9gms/L non-iodized table salt, 
  ~ 2 tsp NaCl/L water is isotonic saline
- Supplement potassium: 10-20mEq/L or 1gm/L (14mEq/L) 
  ~ half a tsp. lite salt/L water (lite salt is half NaCl and half KCl).