Fluid Therapy in Mature Cattle

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KEYWORDS

• Electrolytes • Fluid therapy • Cattle • Acidosis • Alkalosis • Hypokalemia • Hypochloremia

KEY POINTS

- Fluid therapy for mature cattle differs from that of calves because the common conditions that result in dehydration and the metabolic derangements that accompany these conditions are different.
- The veterinarian needs to know the problem which exists, what to administer to correct the problem, in what quantity, by what route and at what rate.
- Mature cattle more frequently suffer from alkalosis, therefore acidifying solutions containing K^+ and Cl^- in concentrations greater than that of plasma are frequently indicated.
- While intravenous therapy is critical to some patients, seldom does the entire deficit need to be administered intravenously.
- The rumen provides a large-capacity reservoir into which oral rehydration solutions may be administered, which can save time and money.

INTRODUCTION

It might be surprising to some that we've chosen to discuss fluid therapy of mature cattle apart from calves in this issue. Although there are some minor differences in technique and strategy owing to size and logistical considerations, and because mature cattle have a rumen, these are not the most important reasons to divide the discussion. Mostly when fluid therapy is administered to cattle the choice of solution, route, and so forth is based on empirical data such as signalment, history, clinical signs, and diagnosis of the primary problem. Because the most common causes of dehydration or shock, and their resulting metabolic and electrolyte derangements, differ between mature cattle and calves, the rehydration solution appropriate for most dehydrated calves is not the most appropriate solution for most dehydrated mature cattle. Therefore, it makes sense to discuss these 2 classes of cattle separately.

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The approach to fluid, electrolyte, and acid-base therapy occasionally becomes complicated by tables, charts, and formulas. Although these tools are essential for the complete understanding of principles and mechanisms, the clinical approach to fluid therapy simply requires the clinician to answer 4 questions. (1) What is the problem? (2) What solution do I administer to correct the problem? (3) How much do I administer? (4) By what route and at what rate should I administer the solution?

WHAT IS THE PROBLEM?

This question is really asking "what are the metabolic derangements in the electrolyte and acid-base status of the animal being treated?" When the definitive diagnosis is known and laboratory data are available, the answer to this question is simple and specific. For most cases, however, the veterinarian does not have the advantage of all of these data. Therefore, assumptions of these problems are made based on clinical signs and presumptive or definitive diagnosis.

Dehydration

The most frequent indication for fluid therapy in mature cattle is dehydration. In some instances, shock without substantial dehydration might occur. Shock might occur secondarily to iatrogenic or accidental hemorrhage or acute endotoxemia. Shock can be identified by a rapid heart rate, pale mucous membranes, delayed capillary refill time, and weakness or collapse. Capillary refill time is more difficult to assess in cattle than in horses and small animals. In some animals, the vulva may be a more reliable site than the oral mucous membranes. Capillary refill time of greater than 2 seconds suggests shock.

Dehydration may occur with or without accompanying shock, and is indicated by eyeball recession into the sockets, increased skin turgor, and dry or tacky oral mucous membranes. Eyeball recession is assessed by pulling the lower eyelid ventrally with the fingers to determine if there is a gap between the globe and the orbit. A gap indicates dehydration. One must be aware, however, that eyeball recession also occurs in emaciation. Therefore, very thin cows should be assessed using multiple clinical signs for hydration status. In older bulls and *Bos indicus* cattle, the skin of the neck can be fairly thick, making assessment of skin turgor difficult. Tenting the skin and measuring the time it takes to return to its normal position after release is used to determine skin turgor. Typically, longer than 2 to 3 seconds is considered delayed and suggests clinical dehydration.

Acidosis or Alkalosis?

Another fundamental consideration when approaching fluid therapy is that of acid-base status. Ideally, blood gas analysis including the base excess (BE) is used establish a diagnosis and guide therapy. A negative BE indicates metabolic acidosis and a positive BE indicates metabolic alkalosis. When blood gas analysis is not available, the measurement of serum bicarbonate (HCO_3^-) or total carbon dioxide (TCO_2) can substitute as an indicator of metabolic acid-base status. Plasma HCO_3^- and TCO_2 are decreased in acidosis and increased in alkalosis. When laboratory data are not available, the clinician can make assumptions about the acid-base status of mature cattle based on clinical signs or diagnosis. It is well documented that, unlike calves, most mature cattle with dehydration are not acidotic. Therefore, therapy aimed at correcting acidosis is not indicated. In a study of more than 500 cattle older than 1 month, blood gas and electrolyte determinations were made from venous blood samples.[1] Dehydrated mature cattle were about twice as likely to have metabolic alkalosis than