



# Cattle Producer's Handbook

Animal Health Section

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## Fluid and Electrolyte Therapy in Calves

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### Fluids and Electrolytes in Health and Disease

Fluids and electrolytes are necessary nutritional and functional components for all mammals and are required for normal cellular and organ function and for maintaining the acid:base balance with a blood pH >7.35 to 7.45. The normal animal maintains the balance of fluid, electrolytes, and acid:base (blood pH) within narrow limits by consuming water, minerals from supplements, feedstuffs, and salt.

Many diseases cause fluid, electrolyte, and acid:base imbalances that can result in death. Appropriate fluid and electrolyte therapy (rehydration, electrolyte, and acid:base balance) is necessary to restore normal activity (Table 1).

**Table 1. Goals and treatments for fluid therapy.**

Goal of fluid therapy	Treatment
Correct hydration and circulating blood volumes	Fluids
Correct acid:base balance to normal pH	Bicarbonate fluids
Correct mental depression	Fluids and electrolytes
Correct electrolyte imbalances	Electrolytes
Facilitate intestinal repair	Fluids and electrolytes
Restore suckle reflex	Glucose, fluids, electrolytes

### Fluid and Electrolyte Requirements

Water represents the liquid portion of the fluid components of mammals and is one of the five major nutrients. Water provides the fluid medium in which the chemical reactions of the body take place. It also has an ability to absorb and give off heat with a relatively small change in its temperature; therefore, it is an ideal temperature-buffering system for the body.

Water is also the medium for transportation of nutrients and wastes within the body. *Fluid requirement for maintenance for cattle is approximately 45cc/lb/day; therefore, a 100-pound calf needs approximately 1 gallon of water a day, at 60° to 70°F, just to maintain normal bodily functions.*

Electrolytes are dissolved in both intracellular and extracellular fluid compartments of the mammalian system. Electrolytes are required for normal cellular metabolic functions. *The electrolytes of note in calf health are sodium ( $Na^+$ ), potassium ( $K^+$ ), hydrogen ( $H^+$ ), chloride ( $Cl^-$ ), and bicarbonate ( $HCO_3^-$ ).* Electrolyte needs are generally met through consumption of feed and salt and mineral supplements (Table 2).

### Causes of Fluid and Electrolyte Imbalances

Fluid and electrolyte imbalances are characteristic of scours, intestinal blockage (LDA), kidney disease, blood loss, salivation (VSV/FMD), persistent fever, or water deprivation. One of the most common causes of fluid/electrolyte/acid:base imbalance is diarrhea (scours). Fluid loss results in dehydration that results in decreased temperature, increased pulse and respiration, and other changes, such as sunken eyes and loss of skin elasticity. Loss of body fluid causes changes in the electrolyte and acid:base balance of the body.

Fluid loss routinely includes the loss of bicarbonate resulting in acidosis (blood pH <7.35). Clinically, dehydration, electrolyte imbalances, and acidosis are presented as weakness and downer animals. The body's mechanisms to correct dehydration can also result in electrolyte imbalances. Diseases such as scours can alter the integrity of the intestine resulting in further loss of fluids and electrolytes as well as decreasing the intestine's ability to absorb water and electrolytes.

Fluid and electrolyte deficits and imbalances require specific treatment protocols to correct imbalances. Oral and/or intravenous fluid therapy can be used to quickly correct imbalances often with favorable outcome. Any disease or environmental situation that results in fluid loss and/or decreased intake requires the lost volume (deficit) to be added to the maintenance needs when formulating a treatment program.

For example: *a scouring 100-pound (maintenance requirement: 45cc/lb x 100 lb = 4500cc [approx 1 gallon]) calf that is 7% dehydrated needs an additional*