

HEIFER RAISING—BIRTH TO WEANING

31) NEONATAL DIARRHEA

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INTRODUCTION

Diarrhea is a disease that could be avoided by good management practices, yet it is the most common cause of death in young calves. Most fatal diarrhea occurs the first two weeks after birth. As calves grow older, their susceptibility to infections decreases rapidly but remains significant until three to four weeks of age.

Types of diarrhea

Diarrhea is often classified as nutritional (overfeeding milk, milk replacer of poor quality, or sudden change in milk composition) or infectious (Table 1). However, this distinction is somewhat arbitrary because nutritional imbalance can predispose the calf to infections. *E. coli* is the primary organism involved in diarrhea that occurs during the first few days following birth (neonatal diarrhea).

Clinical signs

Diarrhea is the excretion of feces containing excessive amounts of water. The feces of calves with diarrhea may contain five to 10 times more water than normal. In addition to being thin and watery, various

types of diarrhea may result in the production of feces that have a fetid smell, are discolored (yellow, white), or that contain mucus and blood. As the disease progresses, other signs become evident (Figure 1). The following clinical signs are listed in order of severity. The calf:

- Shows loss of interest in feeding (poor appetite);
- Produces thin, watery feces;
- Shows signs of dehydration (sunken eyes, roughened hair, inelastic skin, etc.);
- Has cold extremities (hypothermia);
- Gets up slowly and with difficulty;
- Is unable to rise at all (prostration).

Predisposing factors

The occurrence of diarrhea the first few weeks after birth increases when one or more of the following occurs:

- Poor immune status of the calf:
 - too little colostrum fed too late;
 - poor quality colostrum;
- High burden (build up) of infectious agents in the environment:
 - no housing vacancy between calves;
 - poor overall hygiene;
 - poor ventilation;
- Nutritional factors:
 - overfeeding milk or milk replacer of poor quality
 - abrupt change in milk composition;
- Stress:
 - difficult birth;
 - long distance transportation.

Table 1: Major organisms that cause diarrhea

Bacteria	Virus	Parasite
<i>Escherichia coli</i>	Rotavirus	Cryptosporidia
<i>Salmonella</i>	Coronavirus	Coccidia
<i>Clostr. perf.</i> ¹	Adenovirus	

¹ *Clostr. perf.* = *Clostridium perfringens*

Early detection

Awareness of risk factors helps in early detection of diarrhea. Chances of clinical disease and death decrease sharply when early detection is followed by adequate measures to minimize the impact of the disease.

Normally, young animals and, in particular, young calves have good appetites. The first sign that a calf is becoming sick can be detected at feeding time. A young calf that does not seem hungry is telling you that something may be wrong. Careful observation of certain signs allows the producer to anticipate the onset of diarrhea the day before it occurs. The following signs indicate impending diarrhea:

- Dry muzzle;
- Thick mucus excreted from the nostrils;
- Very firm feces;
- Lack of appetite (refusal of milk);
- Prostration and a high rectal temperature (>39.3°C).

When a calf shows any of these signs, part of the calf's milk can be withheld as a preventive measure. The diarrhea may not be entirely avoided, but the calf may recover more quickly.

PREVENTION

Management practices

As with many calthood diseases, adequate passive immunity and removal of the predisposing factors are the two primary measures that prevent diarrhea. Sound management practices and attention to details eliminate risk factors and considerably reduce the incidence of diarrhea and death (see gray box).

Vaccine

Vaccines for specific strains of *E. coli* are available. The most effective way to use these vaccines is by inoculating the dams so that resistance can be transferred by

Sound management practices eliminate risk factors and help reduce the incidence of diarrhea:

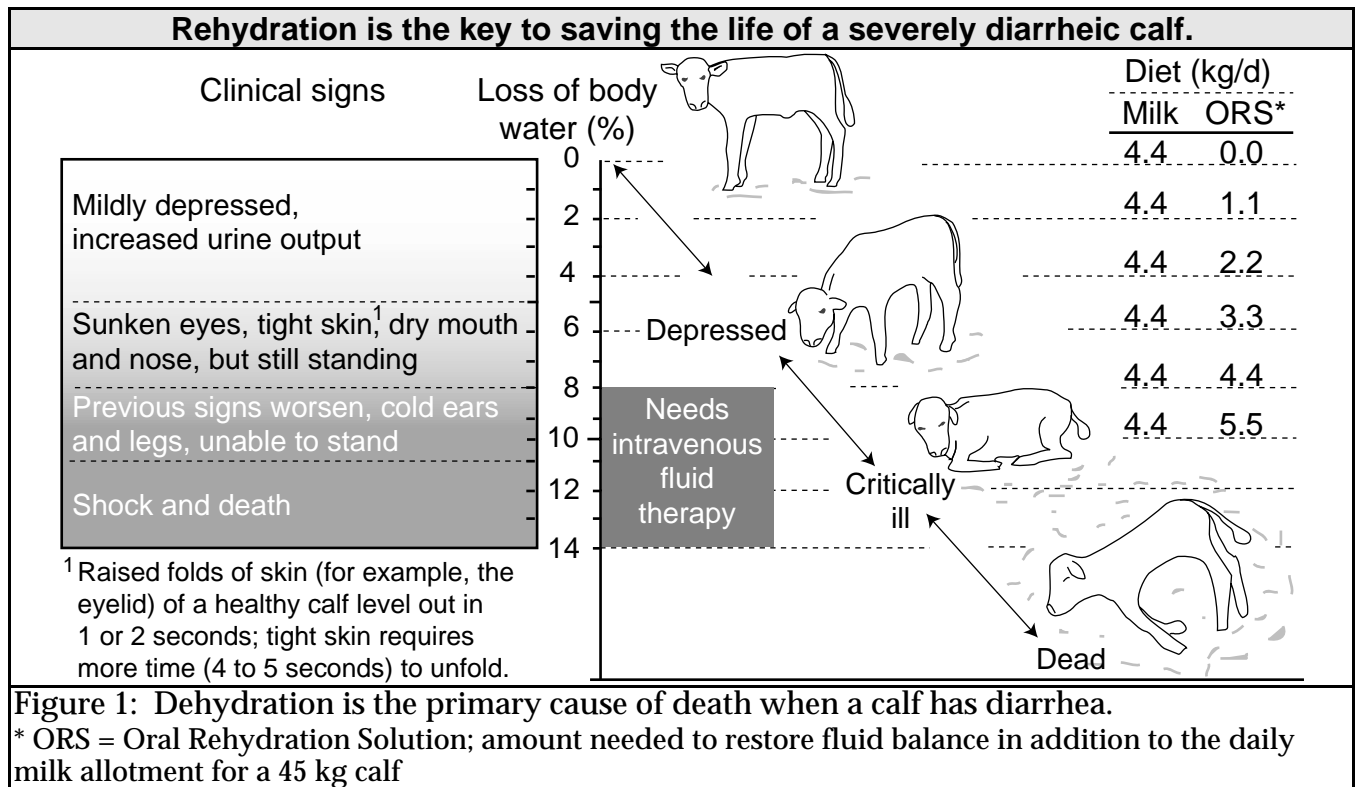
Nutrition

- 1) Feed the proper amount of high quality colostrum.
- 2) Colostrum and milk should be fed at body temperature (36-38°C).
- 3) Feeding should be done twice daily at regular times and the utensils should be scrubbed, sanitized and dried after each use.
- 4) Milk replacer must be of high quality. A high fat milk replacer (15 - 20%) is likely to give better results than a low-fat milk replacer (10-15%), provided the fat is highly digestible.
- 5) Overfeeding and sudden changes in milk composition (milk type) should be avoided.

Housing and management

- 6) Calves should be kept in clean individual pens protected from drafts. Grouping calves should be done only after weaning.
- 7) Calf buildings should be disinfected regularly and should remain vacant for three weeks. An "all-in, all out" system may be recommended in farms with a history of diarrhea problems.
- 8) Healthy calves should not be introduced in a building where other calves are suffering from diarrhea.
- 9) Calves under three weeks of age should not be brought onto the farm.

colostral immunity. The immune system of a calf usually does not respond well to vaccination until six to eight weeks of age. The use of vaccines in the lactating cow is now widely used. There are numerous strains of *E. coli* that cause diarrhea. Introduction of new or different strains of *E. coli* (for example, with the purchase of an infected calf) may start new episodes of infection.



TREATMENT OF DIARRHEA

Oral rehydration solution

As soon as diarrhoea is detected (the earlier, the better), the calf should be housed in a warm, dry place and therapy should focus on oral rehydration (Figure 1). The general principle of oral rehydration is as follows: if salt and water are presented

slowly enough to the intestine, then absorption should be complete. The various salt solutions presented in Table 2 can be prepared and fed at body temperature.

The presence of glucose in the electrolyte solution is optional. Glucose may enhance intestinal fermentation, but it may help in the absorption of electrolytes and, upon

Table 2: Electrolyte solutions used for oral rehydration of calves suffering from diarrhoea

Chemical	Formula	Solution					GGE ¹
		1	2	3	4	5	
grams / liter of water							
Sodium chloride (kitchen salt)	NaCl	9.0	--	4.0	2.5	4.8	143.4
Sodium bicarbonate	NaHCO ₃	--	12.0	--	7.5	4.8	--
Potassium chloride	KCl	--	--	2.7	1.0	--	--
Potassium dihydro-phosphate	KH ₂ PO ₄	--	--	--	--	--	68.0
Sodium lactate		--	--	5.8	--	--	--
Potassium citrate		--	--	--	--	--	2.1
Glycine		--	--	--	--	10.1	103.0
Glucose		--	--	--	12.5	20.2	675.3
Citric acid		--	--	--	--	--	8.1
pH of the solution²		Ac	Al	Ac	Ac	Ac	

¹ GGE: Glucose-Glycine electrolyte solution; 64 grams of this mixture should be dissolved in two liters of warm water and given in one feeding.

² Ac = acid; Al = alkaline.

absorption, provides energy to the calf. Commercial oral rehydration solutions are also available. These products contain a mixture of electrolytes, glucose and other salts (as indicated in Table 2) as well as micro-minerals, vitamins and gelling agents (guar gum, xanthum agar, pectin, etc.). Pectin and gums are not essential in an oral rehydration solution; however, these ingredients may help slow down the passage of milk through the intestine and improve digestion. They may also provide some protection and relief by coating inflamed, damaged intestinal cells.

Should milk still be fed?

Calves with diarrhea partially lose the ability to digest milk. Diarrhea may be worsened by undigested milk passing through the intestine because it can encourage the growth of bacteria. Thus a common recommendation has been to replace milk, partially or completely, with an oral rehydration solution (ORS). However, recent research indicates that calves receiving ORS only for two days remain dehydrated and lose weight rapidly. In contrast, calves receiving their daily allotment of milk (10% of body weight) plus an acidic ORS do not exhibit a worsening of their diarrhea and actually gain body weight throughout the rehydration treatment period (seven days).

Treatment method

At the onset of diarrhea, the calf should be fed its normal daily milk allotment; then

ORS should be fed. The acidity or alkalinity of the ORS may influence its effectiveness. Alkaline ORS may interfere with normal milk digestion in the abomasum and should not be fed until three to four hours after a meal. In contrast, acidic ORS may help protein digestion and may be fed immediately (15 - 20 min.) after a full meal of milk.

Limiting the amount of milk offered keeps the calf hungry and more willing to accept the ORS. Milk may be limited to the amount needed for maintenance: 1.8 kg/d for a 25 kg calf, 2.7 kg for a 35 kg calf, and 3.4 kg/d for a 45 kg calf. Also, the number of meals may be increased to three or four per day (and the amount offered per meal decreased correspondingly) to encourage the calf to drink more liquids. When calves refuse to take the ORS despite a reduction in milk and an increase in meal frequency, it may be necessary to use an esophageal tube to force-feed the animal.¹

Antibiotics and intravenous rehydration

If diarrhea persists and signs of dehydration worsen, a veterinarian should be called. When the calf shows severe signs of dehydration (Figure 1—water loss from the body > 8%), the veterinarian is likely to administer electrolytes and antibiotics intravenously. Dehydrated calves, even those near death, usually respond very well to electrolytes administered intravenously.

¹ Only a well-trained, properly instructed person should attempt to force feed a calf with an esophageal tube.