Guidelines for dehydration in calves:

Committee

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Scope:

This guideline provides an overview of different types and causes of dehydration affecting calves in livestock, veterinary clinics with a focus on the clinical evaluation criteria for dehydration and its severity and its therapy.

Abbreviations:

- PCV: packed cell volume

Glossary:

Demeanour: response of the animal to external stimuli.
Hyponatremia: reduced plasma sodium concentration.
Hypothermia: reduced body temperature below normal range
Metabolic acidosis: increased lactic acid in the blood

Objectives:

1. Understand the etiology and clinical features of dehydration in claves.
2. Differentiate between different types of dehydration
3. Assess the severity of dehydration calves based on clinical parameters
4. Prescribe the correct fluid therapy and calculate the required quantity.

Introduction

Dehydration is one of the most dangerous general systemic state disturbance affecting young calves. Because water balance is vital for function of the internal organs, dehydration can lead to several organ dysfunction including brain, liver, kidney and cardiovascular system. It can occur as a result of reduction water intake as in case of severe thirst, decreased access to water or oesophageal obstruction or increased water excretion related to diarrhea, polyuria, impaction, and bleeding, management dehydration is based on evaluation of different clinical

scores, such as delayed tenting test, increased eye ball recession and elevation of PCV%. Different fluid therapy are suggested according to severity and type of dehydration.

Dehydration

Definition and etiology of dehydration

It is the decrease in the fluid part of the blood due to loss of water and electrolytes either due to increased excretion or decreased water and feed intake. Dehydration is one of the most critical issues in calf farm is to assess dehydration and its therapy by different fluids.

Causes of dehydration

• Inadequate water intake

Deprivation of water, a lack of thirst caused by toxemia, and the inability to drink water

as in oesophageal obstruction are examples of dehydration from inadequate water intake.

• Excessive fluid loss

The most common cause of dehydration is when excessive fluid is lost.

Diarrhea is the most common reason for excessive fluid loss, although vomiting, polyuria, and loss of fluid from extensive skin wounds or by copious sweating may be important in sporadic cases.

Severe dehydration also occurs in acute carbohydrate engorgement in ruminants, acute intestinal obstruction and diffuse peritonitis in all species, and in dilatation and volvulus of the abomasum.

Impact of dehydration on calves health

- Because of the haemoconcentration, there is an increase in the viscosity of the blood, which impedes
- blood flow and may exacerbate peripheral circulatory failure.
- The loss in circulating blood volume also contributes to the mental depression of dehydrated animals, which is
- The increased endogenous metabolism under relatively anaerobic conditions results in the formation of acid metabolites and the development of metabolic acidosis.

- Urine formation decreases because of the restriction of renal blood flow and this, together with the increased endogenous metabolism, causes a moderate increase
- Death may occur due to severe acidosis, electrolyte imbalance, toxaemia or septicaemia

Types of dehydration

Dehydration is classified according to the degree of loss of sodium and water into three types:

1-hypotonic (hyponatremic) dehydration

Occurs in acute diarrhea in calves due to excessive loss of sodium in feces from extracellular tissues leading to Severe dehydration.

2-isotonic (isonatremic) dehydration

Occurs when there is a parallel loss of sodium and water in case of simple enteritis, copious sweating

and nephrosis leading to mild dehydration

3-Hypertonic (hypernatremic) dehydration

Loss or deprivation of water with minor loss of sodium

Occurs in animals unable to drink due to esophageal obstruction (Mild dehydration).

Clinical signs of dehydration

- Hypothermia 35-38°C is borderline hypothermia, and anything below 35°C is considered severe hypothermia. Severe hypothermia will not be remedied by placing the calf in a hot box alone; you must gradually warm them from the inside out through feeding warm fluids. When dealing with severe cases, it is important to involve your veterinarian.
- cold skin and extremities
- Wrinkled skin
- Unable to stand
- Decreased or Loss of suckling reflex
- Lethargy and dullness
- Decreased demeanour (reaction to feeding and stimulation).

Samples and Laboratory changes in dehydration

- Whole blood samples on EDTA can be collected to measure PCV (increase in the packed cell volume)
- Serum can be used to determine the total protein: and total serum protein concentration is elevated in dehydrated calves.
- Metabolic acidosis

Evaluation of dehydration and relevant therapeutic support

The following table provides insight into how dehydration levels can be measured and what the best recommended way is to support the calf.

Dehydration %	Demeanour or behaviour	Sunken eyes	Skin Elasticity (skin tent test)	Support therapy
<5%	Normal	None	<1 sec.	None
6 – 8%	Slight depression	2 – 4 millimetres	1 – 2 sec.	Oral
8 – 10%	Depressed	4 – 6 millimetres	2 – 5 sec.	IV Fluids
10 – 12%	Unable to stand	6 – 8 millimetres	5 – 10 sec.	IV Fluids
>12%	Unresponsive or comatose	8 – 12 millimetres	>10 sec.	IV Fluids

The quantity of replacement fluid in liters is calculated by multiplying the estimated dehydration in percentage with body weight in kilograms according to the following formula:
Replacement fluid[L]=dehydration[%]×bodyweight[kg]

The fluids are usually given in two stages:

• Hydration therapy in the first 4 to 6 hours at a rate of 100 to 150 mL/kg BW intravenously.

• Maintenance therapy (a combination of continuous losses and maintenance requirements) in the next 20 to 24 hours, depending on the severity and the course of the disease, at 60 to 80 mL/kg BW per 24 hours intravenously (approximately 3–4 mL/kg BW per hour).

In some cases of profuse diarrhea, the continuous losses and maintenance requirements will be about 150 mL/kg BW over a 24-hour period.

When a calf is 8-10% dehydrated, and has a poor or no suckling reflex, fluids are provided subcutaneous instead or intravenous.

Monitor improvement of the dehydrated calf during and after fluid therapy

During the intravenous administration, the animal must be monitored for clinical and laboratory evidence of improvement or deleterious effects.

A favorable response is indicated by

1-urination within 30 to 60 minutes,

2-an improvement in mental attitude, and some evidence of hydration.

Unfavorable responses include

1-dyspnea because of preexisting pneumonia or pulmonary edema because of too rapid administration,

2- failure to urinate because of renal failure or paralysis of the bladder,

3- Tetany because of the excessive administration of alkali.

Unusual responses to fluid therapy

Sweating, trembling, and depression within several hours following the intravenous administration of electrolytes or other substances such as commercial amino acids may occur if the infusion is contaminated during administration.

The determination of PCV, bicarbonate, and blood pH will provide an excellent monitoring system during the administration of the fluids.

The fluids used for treatment of calf dehydration

Solutions are recommended for intravenous fluid therapy in dehydrated or septic calves and dehydrated adult cattle:

(1) lactated Ringer's solution and acetated Ringer's solution for dehydrated calves, although neither solution is optimized for administration to neonatal calves or adult cattle;

(2) isotonic (1.3%) or hypertonic (5.0 or 8.4%) solutions of sodium bicarbonate for the treatment of calves with diarrhea and severe strong ion (metabolic) acidosis and hyponatremia, and adult cattle with acute ruminal acidosis;

(3) Ringer's solution for the treatment of metabolic alkalosis in dehydrated adult cattle, particularly lactating dairy cattle; and

(4) hypertonic NaCl solutions (7.2%) and an oral electrolyte solution or water load for the rapid resuscitation of dehydrated neonatal calves and adult cattle.

References

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