Diagnosing 'ruminal drinking' with ultrasound technology

What is 'ruminal drinking' and what are the consequences? In lactating calves, the milk, or milk- replacement, should bypass the rumen and enter the abomasum directly, thanks to closure of the oesophageal groove; otherwise, 'ruminal drinking syndrome' occurs.

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This is usually due to a failure of closure of the groove, although it can also occur when administering the milk by nasogastric or orogastric tube, or if the milk refluxes from abomasum to rumen.

When the milk remains in the rumen for a long time, it undergoes a bacterial fermentation process involving lactobacilli and includes the transformation of lactose into lactate, causing both ruminal and metabolic acidosis.

This lactic acidosis caused by ruminal drinking is responsible for clinical signs such as depression, ataxia and decreased appetite. Due to the accumulation of lactic and butyric acid in the ruminal and reticular epithelium, this syndrome results in a parakeratosis and a severe reticuloruminitis accompanied by loss of epithelium, erosions and necrosis.

In addition, this fermentation of milk in the rumen reduces the availability of nutrients and their efficiency for use in fat and protein retention, thus stunting the growth rate of calves.

Aetiology of ruminal drinking

Until the 1980s it was believed that the only cause of metabolic acidosis was ruminal acidosis caused by excess dietary carbohydrate in adult cattle.

In calves it was believed to be due to the loss of bicarbonate ions in diarrhoea, or lactate formation during anaerobic glycolysis caused by hypoperfusion in dehydrated calves.

Nowadays, ruminal drinking syndrome is known as one of the most common causes of metabolic acidosis in milk-fed calves. This syndrome in beef calves was described as a chronic process characterised by decay, decreased appetite, stunted growth, dull coat and clay-like stools.

In these cases, failure of the oesophageal groove to close, which occurs in initially healthy animals, is caused by stressors.

In dairy calves, this syndrome has been described as an acute process characterised by weakness, depression, prolonged recumbency, refusal to move, lack of appetite, dehydration, cardiocirculatory collapse and even death.

In these acute processes there is usually a primary cause such as neonatal diarrhoea, anorexia, forced feeding or painful disease conditions (coughing, otitis, etc).

Why is early diagnosis important?

It is vitally important to diagnose the presence of milk in the rumen early in order to avoid milk absorption and the occurrence of metabolic acidosis and all

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Fig. 1. Healthy rumen. Ultrasound of the left flank in which the abdominal wall (A), rumen wall (R) and gas content in rumen (C) are visualised.

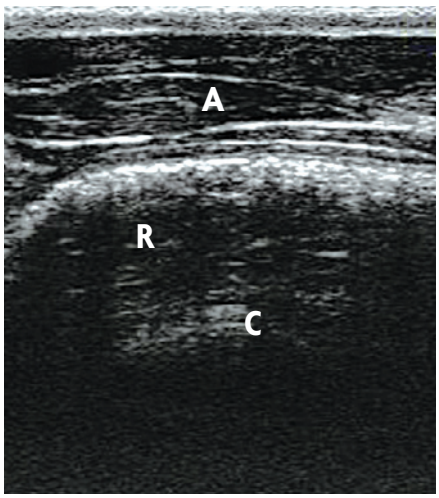


Fig. 2. Ruminal drinking. Ultrasonography of the left flank in which the abdominal wall (A), the wall of the rumen (R), the heterogeneous and echoic ruminal content (C) and a milk clot (Cg) are visualised.

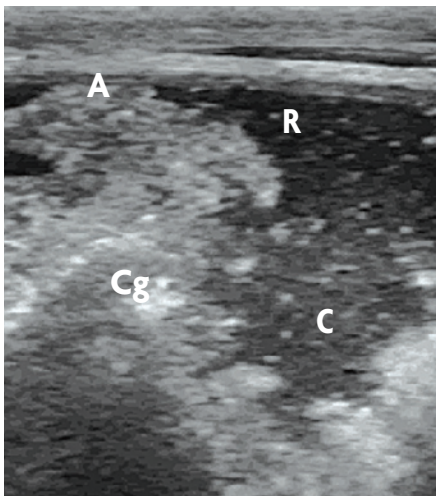
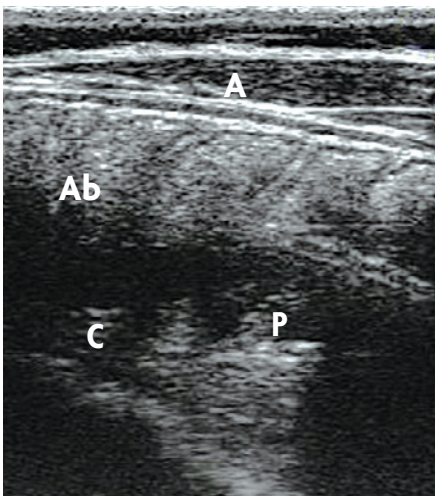


Fig. 3. Abomasum full of milk. Right-sided ultrasonography in which the abdominal wall (A), the abomasal wall (Ab), the heterogeneous and echoic abomasal content (C) and the abomasal folds (P) are visualised.



Images are taken by Easi-Scan, BCF Technology - Please note images are taken from a video, therefore the image quality is low.

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other subsequent complications discussed above. Once the presence of milk or milk-replacement in the rumen is confirmed, lavages with warm water should be performed with the aid of a nasogastric tube, the longer this procedure is delayed, the more complicated it will be to stabilise the animal again.

How is it diagnosed?

For the diagnosis of ruminal drinking in the field, the accepted method is the 'auscultation-succussion' method, which consists of agitating the left flank of the animal manually, via the body wall, whilst auscultating simultaneously.

The auscultation of a splashing sound during this procedure is consistent with the presence of milk in the rumen. This test is quite specific, but its sensitivity will vary depending on the experience of the technician who performs it.

Another method useful in the field for the diagnosis of ruminal drinking is the placement of a naso- or orogastric tube. Diagnosis is based on the output of an acidic odour and white or yellowish-coloured liquid with a pH of 4-5.

This test would be definitive, but the process can be uncomfortable for the animal, and requires time and an assistant in most cases. Finally, the diagnostic technique on which this article focuses, is ultrasound. This method of imaging has been used in bovine reproduction for years, but is increasingly being used to diagnose pulmonary pathologies, joint and, in this case, digestive pathologies.

How to diagnose ruminal drinking with ultrasound

To perform ultrasound of the rumen the calf should be shaved from the seventh rib to the caudal abdomen (including flanks), and from the dorsal to the ventral extent of the abdomen. Then apply alcohol and ultrasound gel. To avoid the length of the process mentioned above, the ultrasound can also be done applying oil directly on the coat.

To locate the rumen it is necessary to explore from intercostal space 7-12 and the two flanks, running from dorsal to ventral with the transducer parallel to the ribs.

The wall of the rumen is seen as an echogenic line, and if it is healthy, gas is identified in its dorsal sac, causing a reverberation artefact (Fig. 1).

If the calf undergoes an episode of ruminal drinking, echoic heterogeneous fluid corresponding to milk will be observed, and sometimes the formation of a clot can be visualised (Fig. 2).

The ventral sac of the rumen should be explored since contents will not always be observed in the dorsal sac. The rumen is not always visible from the right side, and when it is normally observed it is only in intercostal spaces 11 and 12 and in the cranial region of the flank.

The abomasum is immediately visualised caudal to the xiphoid on both sides after ingestion. The intercostal spaces 7-12 and the flanks will be explored, with the transducer parallel to the ribs and moving towards the dorsum, from the ventral midline.

The average expansion towards both sides after ingestion can vary in centimeters. Thus, it is important to distinguish whether the content is in the rumen or abomasum. Ingestion is usually heterogeneous and usually hypoechoic or echogenic, but what really sets the abomasum apart from the rumen are the abomasal folds (Fig. 3).

Conclusion

Ultrasound is a very sensitive and specific test in the diagnosis of ruminal drinking and is quick and easy to perform once the technique is learned.

It is a non-invasive procedure causing minimal discomfort to the animal and it is economical. ■

References are available from the authors on request