

Bloat in Calves—Some Aspects of Differential Diagnosis and Therapy

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Introduction

It is known that excessive accumulation of gas in the rumen results from a disturbance in eructation and not from an over-production of gas. Normal eructation depends on a series of interrelated physiological processes, the lack or inhibition of which can lead to bloat.⁷ Notable amongst these are the stimulation of motor receptors (gas pressure, distension, roughage, fatty acids), clearing of ingesta from the cardia, ructus contraction of the dorsal ruminal sac, relaxation of the cardia, a functional oesophagus, and gas which can be eructated (no froth). For these reasons, various diseases of differing aetiology can cause a disturbance of individual processes. Therefore recurrent bloat is not an independent disease but rather a symptom with a relatively broad spectrum of possible causes (Table 1).

TABLE 1. Possible causes of ruminal bloat in the calf.

<i>Tympany with dorsal gas pouch</i>
<ul style="list-style-type: none"> ● insufficiency of forestomach flora and motility ("hay belly") ● latent ruminal acidosis with dyskeratosis/parakeratosis/ruminitis ● rumen rotting ● primary rumen inflammations of differing origin ● compression, blockage, dysfunction of cardia and/or oesophagus ● vagal lesions

Tympany as a consequence of foam formation

Occurrence

Under the feeding conditions encountered in our area, ruminal bloat is usually due to the accumulation of free gas and not by the formation of froth. The great majority

of calves admitted to the Clinic in the past few years with pronounced bloat came from specialized bull-beef units and were aged between two and four months (Fig. 1). As a rule, they had been bought-in several weeks previously. The high prevalence of recurrent bloat in this group can be accounted for by two factors:

On the one hand, errors in feeding play a role, for example, during weaning from milk to solid food. Bull calves sold at market here at the age of four to six weeks have virtually all been fed predominantly or only on milk. Accordingly, there are difficulties in accustoming them to a new feeding system. An example of a disturbance which may occur at this time is insufficiency of forestomach flora and motility: if the ration contains too few readily digestible nutrients or if the animal preferentially consumes hay or straw the sequence of events depicted in Fig. 2 occurs.^{6,7,11} Undigested roughage accumulates in the reticulorumen, forestomachs and abdomen become increasingly distended (so-called "hay belly", Fig. 3) and due to this distension the reticuloruminal contractions are too weak to regularly and completely remove the gas from the rumen.

A second large group is made up of those animals with recurrent bloat as a consequence of subacute or chronic bronchopneumonia (Fig. 4). In this case the cause is usually an eructation disturbance due to increased intrapleural pressure, leading to an increase in pressure in the distal oesophagus,¹⁷ or the oesophageal compression resulting from enlarged mediastinal lymph nodes. Vagal interference by involvement of the nerve in an inflammatory pro-

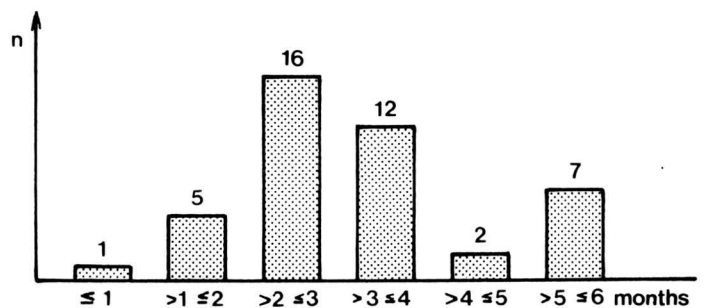


FIGURE 1. Age distribution of 43 calves with recurrent bloat.

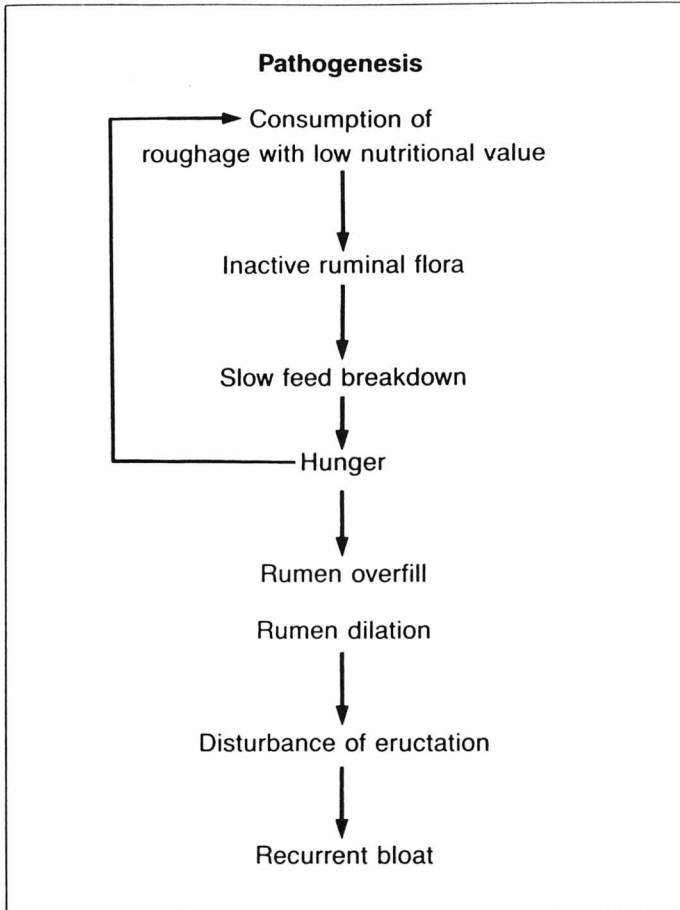


FIGURE 2. Pathogenesis of forestomach flora and motility insufficiency in recurrent bloat.^{6,7}

cess or compression also appears to have an influence. Such patients frequently have a distinct bradycardia with cardiac frequencies to below 60/min. (Fig. 5). Solid clumps of ventrally accumulated ruminal contents can usually be palpated in animals with a presumed vagus-associated reduced forestomach motility, as in similar cases resulting from incorrect feeding.

In addition, local inflammatory processes in the reticulomasal-abomasal region as well as pyloric ulcers—if they interfere with passage of ingesta and cause abomasoruminal reflux—can lead to a recurrent tympany. Lastly, a moderate or pronounced bloat can occur in association with a defect of the oesophageal groove reflex—c.f. "ruminal drinking" of milk-fed calves^{3,4,8,9a,b,16}—or with a high intake of readily-digestible carbohydrate during weaning. Presumably, in these instances the bloat is a consequence of ruminal motility becoming altered by the sometimes severe mucosal changes (parakeratosis, dyskeratosis or chronic hyperplastic ruminitis) brought about by latent ruminal acidosis.



FIGURE 3. Calf with ruminal dilation and recurrent tympany due to forestomach flora and motility insufficiency.



FIGURE 4. Young Charolais bull with recurrent bloat due to bronchopneumonia.

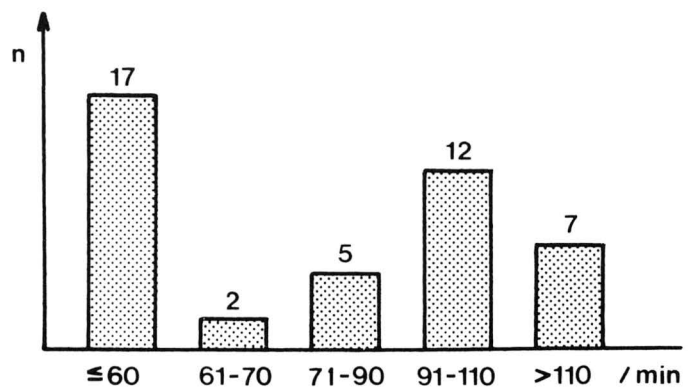


FIGURE 5. Cardiac frequencies of 43 animals with recurrent bloat.

Diagnosis and Therapy

By an initial thorough clinical examination the underlying cause of the tympany should be ascertained. A sample of ruminal fluid can give valuable information about the presence of one of the disturbances mentioned above. Mixing with milk as well as fermentation and decomposition processes lead to distinct differences in color, odor and pH value.^{6,7,8,9a,b} With abomasoruminal reflux the chloride content of the fluid from ruminating calves is above 40 mmol/l as a rule. However, there are few if any significant alterations in the gross appearance, chloride content or pH value of the fluid if the cause of the eructation disturbance is entirely functional or mechanical.

Particularly in those cases where the rumen contains little or no solid food the differentiation between a ruminal tympany and the increasingly observed left-sided displacement of the abomasum in calves can prove difficult. It should be noted that both changes may occur simulta-

neously (details in 6). Gas and fluid accumulations in the abdomen must also be considered in the differential diagnosis, the cause here frequently being a ruptured abomasal ulcer. Sometimes abdominal distension due to urinary bladder rupture or intestinal disaster is mistaken for a ruminal tympany.

The aim of the therapy should be to restore eructation by treatment of the underlying cause of the condition. Should the gas accumulation be the result of alimentary-based forestomach disease then the first and most important step is the correction of the relevant feeding error. In addition, ruminal fluid from healthy cattle can be given in order to stimulate microbial digestion. A bronchopneumonia if present should also be appropriately treated. For some years now there has been discussion about whether

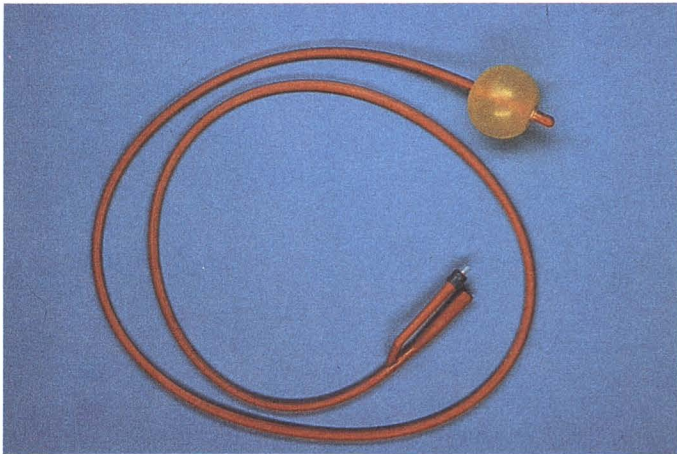


FIGURE 6. Balloon stomach tube made from soft rubber with balloon inflated.

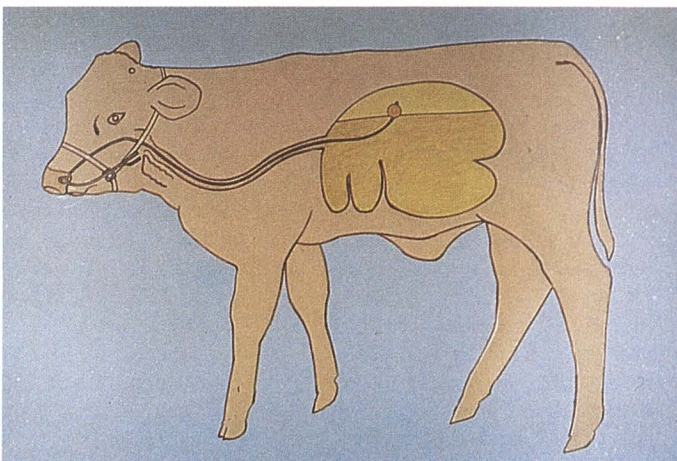


FIGURE 7. Schematic depiction of the mode of function of the balloon tube.



FIGURE 8. Balloon lying on the surface of the ruminal contents, with tube tip (photographed through a ruminal fistula).



FIGURE 9. Calf with inserted balloon tube; tube end attached to halter with adhesive tape.

an increased tone of the distal oesophageal sphincter, which contains serotonin receptors, amongst others, could possibly play a role in the occurrence of tympany.^{15,17} Serotonin causes a contraction of the distal oesophageal sphincter.⁷ However, in our own investigations into the effect of a serotonin-2 antagonist (Ritanserin, Janssen Pharmaceuticals) using 11 juvenile animals with moderate to severe ruminal bloat, only one calf showed a positive effect, in contrast to other investigations;² in the other animals neither an obvious eructation nor a decrease in the tympany could be observed.

In order to gain time for causal therapy, it is necessary in most cases to resolve the tympany; i.e., symptomatic treatment. Before a ruminal fistula^{1,5,12,13} is created, however, the gas should be released by stomach tube for several days. This conservative therapy can be facilitated by a balloon tube* of soft rubber (Fig. 6), as described in the following. It may be left in situ for up to 5 days without impeding feed or fluid intake.¹⁰ Tube length is 135 or 170 cm, depending on the size of the animal, and external diameter is 7 mm. The tip of the tube has two lateral openings and immediately behind these is an inflatable balloon which by rising to the surface of the soup-like ruminal contents ensures that the tip remains in the dorsal gas pouch (Figs. 7 and 8). The tube is inserted in the same way as a normal stomach tube and the balloon is then filled with 100–120 ml air via a special valve with a Luer-type connection. The end of the tube is then attached to the halter with tape (Fig. 9). The tube should be inserted to a length of 100 to 110 cm in an animal weighing around 120 kg, and 130 to 140 cm in one of around 250 kg. The appropriate length can easily be ascertained by laying the tube down the outside of the animal (distance muzzle-center of rumen). If the tube is too long it can be wound once around the neck of the animal and attached again. Any twists in the tube lumen can be removed by blowing through ("Janet syringe").

Experience with over 30 patients has shown that by using this balloon tube a recurrent bloat can be relieved and further bloat prevented. In addition to this indication, the tube may also be employed prophylactically to allow removal of ruminal gas in animals undergoing surgery while in dorsal recumbency or laid on their side. If, however, tympany still recurs on temporary closure or removal of the tube after five days of conservative therapy, one should not hesitate to create a temporary or permanent ruminal fistula. In all cases with uncertain aetiology, especially where there is some suspicion of intra-abdominal changes, a diagnostic abdominal exploration should be carried out.

Summary

Recurrent bloat in calves and juvenile cattle is not a single entity but a symptom, disguising a variety of quite different disturbances. The changes most significant in the differential diagnosis are discussed. Prior to the creation of a ruminal fistula (trocar, rumen needle, permanent fistula) it should be checked whether the tympany could be relieved by treatment of the causal disease. Conservative therapy is facilitated by the use of a balloon stomach tube which can be left in situ for up to 5 days and which prevents a bloat in most cases.

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* *Manufacturer: Willy Rüscher AG, Waiblingen, F.R.G.*