Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Pasture Bloat in Cattle and other Ruminants: Cause, Occurrence and Mitigation Strategies

Pasture bloat is a common digestive disorder of cattle and other ruminants. It is characterized by an accumulation of gas in the rumen and reticulum, the first two stomachs of ruminants.

There are two types of pasture bloat. Free-gas bloat is associated with obstruction of the oesophagus and is most often encountered when cattle are pastured on root crops such as beets or turnips. Frothy-pasture bloat is more common and is caused by entrapment of gas produced from fermentation of rapidly digestible forages such as alfalfa, clovers or wheat. The foam in the rumen prevents the escape of fermentation gases.

Pasture bloat – three factors

Three factors are required for the onset of pasture bloat:

- a highly digestible high-protein forage (e.g. alfalfa, clover, non-mature wheat) that results in rapid growth of rumen bacteria and gas production;
- presence of fine plant particles that promote the formation of gas bubbles that restrict the release of gas from the rumen and
- conditions favourable for ruminal bacteria to produce an excessive amount of bacterial slime that stabilizes the foam, further entrapping fermentation gases.

Physiological factors of the animal are also important. Steers with a slower rate of liquid passing through the rumen (12-17 hours) were more prone to bloat than those where liquid passed through the rumen more quickly.

PLANT-BASED STRATEGIES to mitigate pasture bloat

Taking advantage of the productivity of clover and alfalfa pastures still requires the willingness to assume a certain degree of risk.

Choice of low-bloat potential forages

Pasture bloat can occur in cattle fed most forages that are low in fibre and high in protein. Bloat is most common with immature alfalfa and clover. Some producers avoid seeding pure-stands of alfalfa because of its potential to cause bloat.

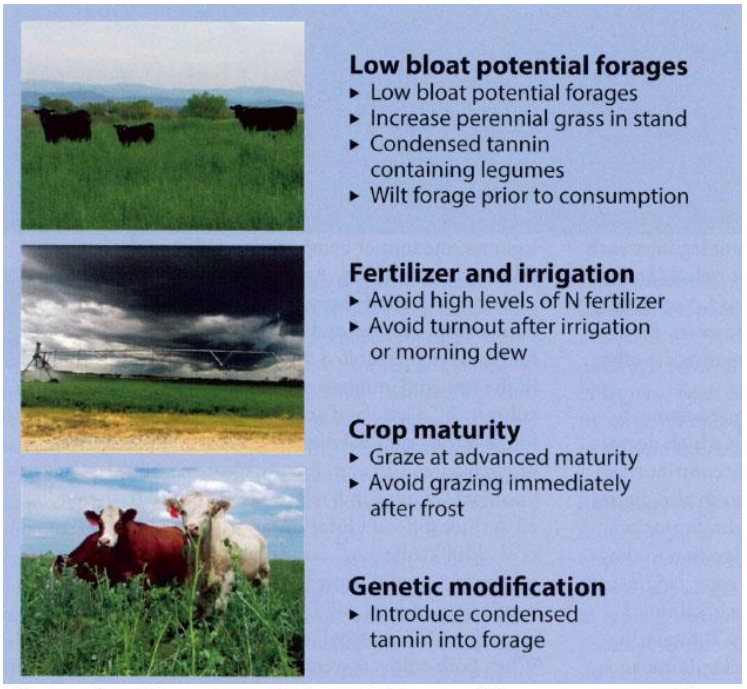


Figure 1 - Plant-based Strategies to mitigate pasture bloat

Instead, they use forage stands with a low proportion of alfalfa and more bloat-resistant legumes (Low-risk in Table 1). The agronomic properties of these bloat-resistant legumes are often less desirable than those of alfalfa or clovers.

Table 1. Bloat-causing, moderate-risk and low-risk forages used as pastures

Bloat-causing	Moderate-risk	Low-risk
Alfalfa	Arrowleaf clover	Sainfoin
Sweetclover	Berseem clover	Birdsfoot trefoil
Red clover	Persian clover	Cicer milkvetch
White clover	Spring wheat	Crownvetch
Alsike clover	Oats	Lespedeza
Kura clover	Canola	Fall rye
Winter wheat	Perennial ryegrass	Perennial grasses

Some bloat-safe legumes contain condensed tannins and that likely contributes to their bloat-safe nature. However, most tannin-containing legumes are less suited to grazing (e.g. sainfoin) or are lower yielding (e.g. birdsfoot trefoil). Thus grazing multi-legume pastures can result in increasing dominance of alfalfa/clover and, hence, an increase in the risk of cattle bloating. Agriculture and Agri-Food Canada presently has a breeding program to select for sainfoin cultivars that are more grazing tolerant and persist in mixed legume pastures with alfalfa.

Animal performance will generally improve if grass pastures are intercropped with legumes (alfalfa-grass; white clover-grass). Seeding of mixed legume-grass pastures with no more than 30% alfalfa in the stand is currently the most common approach to reducing bloat risk, but even with this approach the incidence of bloat can be significant if cattle selectively graze alfalfa.

Breeding alfalfa and clover for reduced bloat risk

Agriculture and Agri-Food Canada undertook an alfalfa breeding program that resulted in the AC Grazeland alfalfa cultivar which exhibited a reduction in pasture bloat, but to date, none of the breeding programs have successfully produced bloat-safe varieties of either alfalfa or clover and it appears that achieving such a goal is highly unlikely.

Fertilizer and irrigation

Nitrogen fertilization can increase the soluble protein content of the plant and promote the formation of the stable froth associated with bloat. Irrigation may also contribute to pasture bloat in a similar manner, promoting the lushness and increasing protein content as compared to forages grown on dryland. In western Canada, the occurrence of bloat in cattle grazing alfalfa under irrigation is higher than that grown under dry land when the crop is at the same stage of maturity

Crop maturity

Stage of growth of alfalfa is the most important factor in controlling bloat in cattle. The risk of bloat is highest at the pre-bud stage declining as the plant advances through the bud and bloom stages. In a 2-year study at Kamloops, 129 cases of bloat occurred during the vegetative as compared to only 20 cases at bud stage with no incidences after the alfalfa was in bloom. Although uncommon, bloat can occur in cattle grazing alfalfa in the bloom stage especially if they are hungry when turned into the pasture.

Wilting of alfalfa

Bloat can be controlled even in vegetative alfalfa if it is swathed and allowed to wilt prior to consumption. To minimize risk, swathed forage should be allowed to wilt for a period of 48 hours prior to swath grazing, with consideration to the moisture level and the degree of drying that has occurred over this period. If the alfalfa is in the bud or flowering state, or constitutes a

lower proportion of the stand, risk of bloat is likely minimal even after 24 hours of wilting. Wilting can be implemented in a rotational grazing system but is more laborious as the forage must be cut daily.

Genetic modification of alfalfa
Developing transgenic alfalfa or clovers that produce condensed-tannins may offer a future long-term strategy for bloat prevention.

ANIMAL-BASED STRATEGIES to mitigate pasture bloat

Feeding schedules and duration of grazing
Cattle consuming alfalfa either under grazing or confinement conditions bloated at least twice as frequently if the forage was made available earlier (07:00-08:00 am) as compared to later in the day (11:00 am – 12:00 noon).

The practice among cattlemen of delaying turnout to alfalfa pasture "until the dew has dried" was verified, but whether the dew is a causative agent is unknown.

The duration of grazing can also influence the risk of bloat. Uninterrupted grazing lowers the risk of bloat as compared to intermittent pasturing for short intensive grazing intervals (e.g. 6 hours).

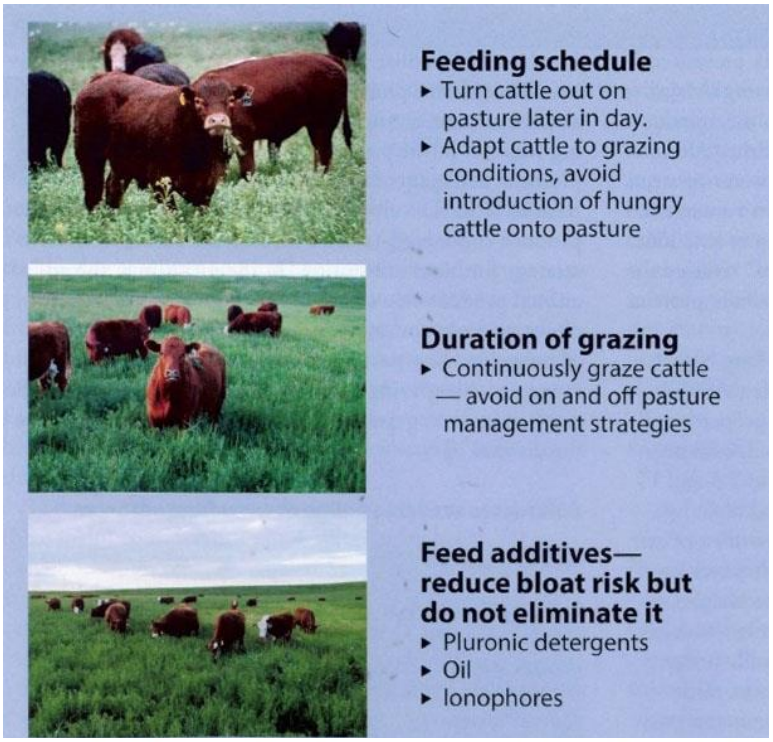


Figure 2 - Animal-based Strategies to mitigate pasture bloat

Adapt cattle to grazing conditions and avoid introduction of hungry cattle onto pasture. There is evidence that cattle "learn" to graze alfalfa and that grazing of cow-calf pairs where the cow has previously grazed alfalfa results in reduced bloat as compared to naive cow-calf pairs.

Feed additives
Feed additives reduce risk but do not eliminate it. The efficacy of a number of feed additives at preventing bloat has been studied and included ionophores such as monensin and lasalocid as well as pluronic detergents, various mineral mixes and other popular but unproven remedies. Except for intraruminal doses of the plurorlic detergent, poloxalene, none of the additives completely prevented bloat under high-risk conditions.

Inclusion of bloat-preventing additives in drinking water of grazing cattle ensures more consistent intake of the additive. A mixture of pluronic surfactants (Alfasure^{TM}) is available to producers in Canada. Bloat was prevented if alfalfa was sprayed with Alfasure^{TM} prior to grazing or if it was administered directly to the animal. A 2-year grazing study, showed that including either Alfasure^{TM} or its individual ingredients in the drinking water of steers reduced the viscosity and stability of foam in rumen fluid as well as the incidence of bloat. *In vitro* studies also demonstrated that Alfasure^{TM} reduced the stability of foam formed when an extract of alfalfa proteins was mixed with rumen fluid.

Administration of oil by stomach tube has long been recommended as a treatment for bloat in cattle. Daily supplementation of corn oil at the rate of 7.5 and 15 g/kg of dry matter intake, significantly reduced bloat by limiting foam production and stability in the rumen of cattle grazing wheat pasture. However, corn oil supplementation was found to promote the formation of bacterial slime associated with bloat. Treatment with oil is generally employed after the animal is clinically presenting bloat. This strategy of bloat control is risky as cattle are checked far less frequently on pasture than in confined feeding, making it likely that bloat in pastured animals will become fatal before any treatment can be administered.

CONCLUSIONS

Although intensively studied for over 60 years, bloat continues to be an impediment to the production of cattle on alfalfa and clover pastures.

Although a variety of management strategies have been developed to prevent pasture bloat, the most common avoidance strategy is to forgo grazing cattle on pastures that contain high levels of alfalfa or clover. This approach is often at the expense of a reduction in animal performance and an increased reliance on fossil fuel-based N fertilizer to maintain grass pasture productivity.

Management practices such as grazing legume pastures at later maturities, including condensed tannin-containing legumes in the pasture or the use of water soluble pluronic detergents can reduce or in some cases eliminate pasture bloat.

Developing transgenic alfalfa or clovers that produce condensed tannins may offer a future long-term strategy for bloat prevention. In the meantime, the added animal productivity associated with grazing alfalfa or clover pastures comes with the risk of bloat and the cost of more intensive pasture management. Attempting to manage cattle grazing pure alfalfa or clover pastures in the same manner as grass pastures is almost certainly a recipe for disaster.

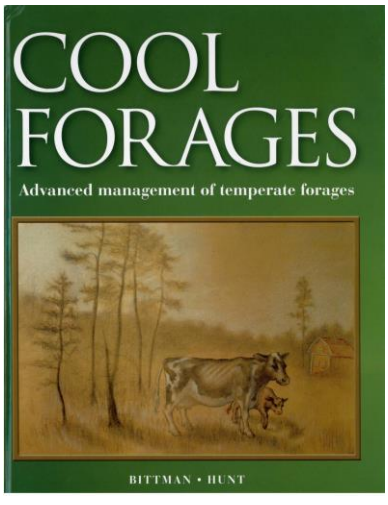
Current work

We still believe that the secret to preventing pasture bloat lies in a greater understanding of the rumen microbiome. Work is currently underway to sequence the DNA and RNA arising from the rumen of bloated and non-bloated animals. Additional team members including **Robert Forster** with AAFC and **Ehsan Khafipour** and **Elnaz Azad** from the University of Manitoba have joined the team to continue to unravel the secrets of bloat.

For more information, contact Tim McAllister at tim.mcallister@agr.gc.ca

---

For more detailed information, see Chapter 44 Pg 184-188 **by Tim A. McAllister, Yuxi Wang, Walter Majak and Surya Acharya,** and presented in "*Cool Forages – Advanced management of temperate forages*". Editors Shabtai Bittman and Derek Hunt.



http://publicentrale-ext.agr.gc.ca or http://publications.gc.ca

AAFC number: 12305E

ISBN number: 978-1-100-25409-8

Catalogue number: A59-20/2014E-PDF

Paru également en français sous le titre
Météorisation au pâturage chez les bovins et les autres ruminants : cause, fréquence et stratégies d'atténuation

For more information reach us at www.agr.gc.ca or call us toll-free 1-855-773-0241.