Prevention and Management of Frothy Bloat in Cattle

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Bloat has been long recognized as a major cause of death loss in cattle. Bloat is categorized as free gas or frothy. Free gas bloat, which will not be discussed in detail, occurs when gases, produced during fermentation of feed in the rumen, are not eructated. This results in distention of the rumen and death. Frothy bloat usually occurs after the ingestion of legumes which contain foaming factors. These cause gases to become trapped as small bubbles within the rumen ingesta.

Several theories have been proposed regarding this phenomenon. Nichols (3) describes a bubble as "a mass of gas surrounded by liquid skin." Foam occurs when the small bubbles of gas formed in the ingesta fail to coalesce with other gas bubbles. Normally these bubbles rise to the surface and break releasing the gas. The rate of rise of the bubbles and whether or not they coalesce with other bubbles probably depends on the viscosity of the rumen contents (1).

The high protein content found in legumes is thought to be responsible for the increase in viscosity of the rumen contents (1). As gases are formed, they become trapped in this thick fluid and form a stable foam (2).

Saponins also may contribute to the cause of frothy bloat. They are natural foam producers and are present in high concentration in legumes. When certain bacteria act on saponins, a slime is produced which might be responsible for the production of foam. Gutierrez and Davis (7) showed that much variation occurred between the ability of various bacteria to produce slime. This finding supports the conclusion that saponins are not the primary cause of bloat but may contribute to it.

Some animals show a marked tendency to bloat while others seldom do. Animal susceptibility to bloat is probably hereditary and may be related to production of saliva. Bartley and Yaclava (5) showed that the mucin present in saliva reduces foam stability. Much less saliva is produced by cattle grazing succulent legumes than by those fed hay (8). The lack of saliva production may contribute to the higher incidence of bloat in cattle grazing legumes that are wet from dew or rain.

Rumen motility may also play a role in frothy bloat. Normally the movement of the rumen and reticulum sweeps ingesta clear of the cardia just prior to eructation; this allows free passage of the gas into the esophagus. If this movement, due to rumen atony or other factors, fails to clear the cardia, gases are not eructated and this further complicates the problem when conditions are right for foam formation.

Many agents have been used in an attempt to prevent bloat. Antibiotics, silicones, oils and detergents have been administered with varying success (4). Feeding of coarse hay or straw will help prevent bloat. These roughages dilute the amount of froth-producing material present in the rumen and also stimulate rumen movements and saliva production (5). The problem encountered with most antibloat compounds is the short period of time that they remain in the rumen. Oils and other agents must be consumed many times daily to maintain effectiveness. Silicones have not been successful, possibly because of their lack of dispersion throughout the rumen contents. Antibiotics usually lose effectiveness after 15 to 30 days because of a build-up of bacterial resistance.

In 1958, Dr. E. E. Bartley, Kansas State University, began to screen test numerous agents in an attempt to find an effective and practical bloat preventative.

The criteria established for the proposed agent were to:

- Prevent bloat for at least 12 hours following a single dose.
- Act within ten minutes.
- Be palatable.
- Cause no adverse effect on health, reproduction, rumen function, feed intake, and quality or quantity of milk.

Screening experiments for evaluating potentially useful compounds were conducted with groups of rumen fistulated, identical twin calves which had shown a susceptibility to frothy bloat.

During the testing of various surfactants, much

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knowledge was obtained concerning the characteristics of rumen foam and how surfactants affected it. Poloxalene (polyoxyethylene-polyoxypropylene) tested in this screen proved to be the compound of choice. Poloxalene was developed through extensive laboratory and field trials and eventually received Food and Drug Administration approval for use in food-producing animals.

Following the initial studies with poloxalene, several field studies were conducted to further define its safety and efficacy for use in cattle. In one trial, cows in each of four Kansas dairy herds were used in crossover studies. Poloxalene was fed at 10 gms/head/day to half of the animals and the other half served as untreated controls.

All animals were allowed to graze potentially bloat-provocative pastures and after 7-10 days, the groups were reversed. A high incidence of bloat occurred in those animals not receiving poloxalene and only a few large Holsteins showed any signs of bloat in the treated groups. These animals no longer bloated after the dose was increased. Many other trials throughout the United States continued to demonstrate the efficacy of poloxalene.

In order to determine the safety of this compound, numerous tests were conducted. In one test, 90 gms/head/day of poloxalene was administered to cattle for 15 days with no adverse effect on milk production or body weight. In a long-term study, three animals were fed 180 gms/day for 91 days. One animal was reluctant to consume grain which contained this high level and also showed diarrhea several times during the test period. The other two steers in this study showed no reluctance to eat and appeared normal throughout the test period.

Investigations of the fate of poloxalene in the tissues of animals were conducted using ^{14}C labeled material. This study and other chemical studies failed to reveal any significant trace of poloxalene in meat or milk.

Studies in rats fed poloxalene at the rate of 40 or 200 gm/kg of body weight for 90 days showed no adverse effect as measured by body weight or mortality. In addition, blood studies were negative for differences between treated and control groups.

Poloxalene is marketed as 'Bloat Guard'* for prevention of bloat in three forms: Top Dressing for addition to ground grain fed to cattle on an individual basis, i.e. dairy cattle; Medicated Premix for addition to manufactured feeds; and as a Molasses-Salt-Poloxalene-Block for free-choice feeding.

Poloxalene is also available as a bloat treatment in a concentrated liquid. 'Therabloat'** for oral drench.

Additional field studies have been continued after NDA approval to further define the practicality of feeding poloxalene. Studies conducted in 1969 (6) using various levels of grain containing poloxalene show that excellent net profit can be obtained from light-weight steers grazed on alfalfa. Between one and four pounds of grain provided the best economic return.

MANAGEMENT

In the use of poloxalene, several management suggestions are appropriate:

Recently shipped or stressed cattle should not be placed directly on legumes because these cattle often will not consume grain and thus will not be protected from bloat.

Cattle should receive grain containing poloxalene for 2-3 days prior to grazing legumes so that they become accustomed to the medicated grain.

Heifers may at times refuse to eat grain during their estrus cycles and so would not be protected from bloat.

Failure to observe cattle frequently for evidence of lameness, respiratory infections and other conditions may result in morbidity or mortality from bloat since animals may fail to eat medicated grain, but continue to consume the legume pasture.

SUMMARY

A successful bloat prevention program must include good management. Poloxalene has been found to be a safe, efficacious and practical drug to use in the prevention of frothy bloat.

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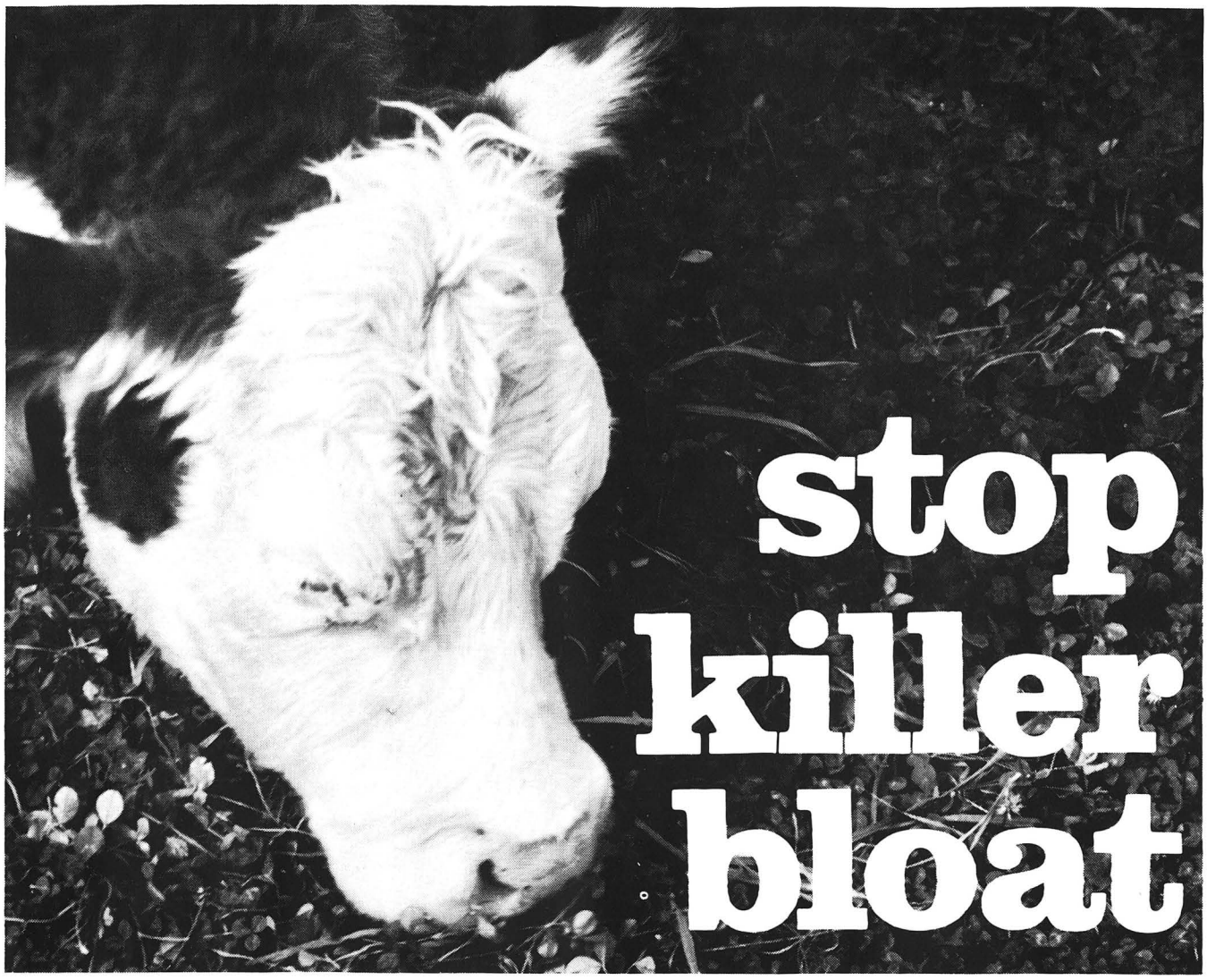

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