Limitations of Present Methods of Controlling Bloat in the Field

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A SURVEY carried out by the New Zealand Dairy Board (13) indicated that in the 1953-54 season alone, more than 10,000 cows died of bloat in this country. The replacement value of these animals was conservatively estimated at £200,000. Little indication of the actual incidence of bloat is given by the number of deaths, however, since only a proportion of animals that bloat died as a result. Nor is the replacement value of dead cows any guide to the total cost of bloat to the New Zealand dairy farmer, for as well as animal losses must be included loss of production, expenses incurred in treatment and prevention, interference with pasture and animal management, dislocation of other farm work, and, not least, the very real physical and mental strain on the farmer himself.

I intend to discuss briefly some of the limitations of present methods of bloat control in the field. Before I do so, however, I should like to quote some remarks made more than 240 years ago:—

"Of clover-grass"

Feeding

"Great care must be taken of the cattle that are first put into it, lest it burst them. To prevent which, some give them straw with it, and some stint them as to quantity; but the best way is only to turn them into it the first day about noon, when the dew is off, and in a dry day, for about half an hour, the next day for an hour, the third day for two, and then for three or four days put them in as soon as the dew is off the ground, and let them stay in till four or five a clock in the Afternoon, and after that there will be no Danger especially if 'tis not too wet Weather. If 'tis, be the longer before you let them stay in all Night. However 'tis better for any other cattle than Milch Cows. But some sow Trefoil or Ray-Grass with their clover, which very much prevents it doing of injury to cattle; and as 'tis a grass that grows very very upright, it shoots through the branches of the spreading Clover, and makes the Crop much better." (II)

My purpose in reading that extract is to indicate how old are most of the preventive measures in use to-day. This conservatism is not, however, due to the dependability of these measures. It is largely the reflection of our slow progress in understanding the causes of the malady.

Bloat is the external sign of retention of the gases in the rumen. It is not a single disease entity, but a state, acute or chronic, which may have a variety of causes. Most commonly it is an acute disorder which, in this country at least, appears to be mainly due to foaming of the rumen contents—so-called "frothy bloat." Our knowledge of bloat in the field is still, however, very limited. There are other possible causes of acute bloat in grazing animals, but we don't know whether they do in fact occur in New Zealand—or anywhere else. Even in the case of frothy bloat, little is known at present about the mechanisations and factors involved. Of chronic bloat, we know almost nothing. We know it may be the consequence of certain pathological conditions such as tubercular infection of the mediastinal lymph glands; beyond that, however, our ideas are almost entirely based on the reported success of various empirical treatment (1, 17). We have no information regarding the relative incidence of acute and chronic bloat.

To the farmer, the control of bloat presents practical difficulties which often make it hard for him to decide what to do and when to do it.

First, bloat is unpredictable. There seems no infallible guide with respect to season, weather or pasture to help him foresee an outbreak.

Secondly, a large proportion of outbreaks are sporadic, involving a few animals in the herd on a few isolated days. Often the first indication the farmer has is finding a dead cow in the paddock.

Thirdly, both acute and chronic bloat may be present in an outbreak. Usually the farmer makes no distinction between one form of bloat and another, and expects the same treatment to be effective in all cases.

Fourthly, opinions differ widely as to the effectiveness of various treatments. Unfortunately, many of these opinions are based on what amount to uncontrolled experiments in which the possibility of a rapid change in pasture potency has been ignored.

The majority of outbreaks of bloat fit into a definite pattern—acute frothy bloat resulting from the ingestion of rapidly growing clover species, with seasonal peaks in spring (mainly white clover) and in autumn (mainly red clover), the ratio of spring to autumn outbreaks being approximately 3 to 1 (13). Experience has shown that a substantial degree of control of these outbreaks—under favourable circumstances amounting to virtual elimination—can be achieved. However, no single infallible preventive measure is available yet, and success with present methods depends largely on understanding their limitations. As always in farming, too, the most consistent success come with careful planning and willingness to accept compromises.

Preventive measures in current use include, singly or in combination:—

Pasture management,
Addition of roughage to the diet,
Grazing control, and
Treatment with antifoaming agents.

Pasture Management

It is not infrequently asked why, since clovers are the main species implicated, we do not dispense with them in dairy pastures. Their value as feed together with the cost of alternative sources of nitrogen make such a step impractical.

A more feasible solution lies in the use of grass-dominated pastures. In this, the aim is to reduce the intake of potent clover to safe levels by diluting it with harmless feed. The value of grass as a diluent has long been recognised, but it has always been most difficult to provide grass-dominant pastures through the dangerous periods of the year. However, the development of short rotation (H1) ryegrass (7) with its vigorous growth early in spring and its palatability when mature, has helped to overcome many of the problems involved. The establishment and maintenance of high-producing grass-dominant pastures demands the highest standards of grassland farming. Establishment may take 3 to 5 years and it cannot be achieved unless limiting factors such as grass-grub (**Costelytra zealandica**, White) are eliminated. During this period, phases of clover dominance usually occur and may occur at any time subsequently should the grass receive a check. At such times, bloat can be a serious hazard.

The use of mature, grass-dominant pastures is the best single measure of protection against bloat that we know of at the present time. When immature, however, such pastures cannot be guaranteed

to be "safe." Bloat may still occur when the clover becomes highly potent, unless the proportion of the latter in the pasture is low. Just how low this proportion has to be for safety, we don't know. Under American conditions, a figure of less than 50% is considered safe (5). In this country, however, bloat may occur on pastures containing 25-30% clover, while in the case of red clover, stall fed cows at Grasslands have bloated severely on a mixture of 33% clover and 66% perennial ryegrass. Further, under certain conditions, particularly when growing vigorously in response to artificial nitrogenous manures, the grass itself may become potent.

Under this heading may also be considered other safe feeds—rough pasture, autumn saved pasture, crops and silage. The main value of these lies in their use as alternative feed while dangerous pasture is maturing. There are obvious limitations to any extensive use of such feeds. A general disadvantage is that usually, both from the production and the pasture management points of view, the dangerous pasture **should** be grazed.

A common farm practice based on the dilution method is to graze the cows for a short period on a break of the dangerous pasture and then remove them to safe feed. This system, since it entails considerable risk to the animals, demands great care. The risk is especially great if the break is given when the animals are hungry.

The Addition of Roughage to the Diet

Bloat-inducing pastures often appear low in fibre content and it has been suggested that this is a factor in the pathogenesis of the disorder. The addition to the diet of roughage in the form of hay has been proposed, particularly by Cole in America (6) and, more recently, by Weiss in South Africa (21). The evidence on which this practice is based is by no means convincing, as has been discussed elsewhere (9). In stall feeding experiments at Grasslands, prefeeding with hay failed to protect cows against potent red clover. Further, the cows bloated on hay made from potent red clover, and it is not uncommon for cows to bloat on lucerne hay in America. These facts would seem to argue strongly against lack of fibre being a central factor in bloat. It is not surprising, therefore, that feeding out hay is generally found unreliable in preventing bloat in the field.

Grazing Control

There are two main objectives in measures involving grazing control. They are: First, to restrict selection and prevent "skimming" of the succulent clover tops, which are believed to be more potent than the remainder of the plant, and secondly, to alter the grazing pattern and reduce the rate of intake to such a level that the animal is able to cope with the potent material.

Control of selection is sometimes achieved simply by mowing the day's feed and letting the cows pick it up for themselves. This method is particularly applicable to lucerne and to pastures containing mature perennial ryegrass. It is not clear just how effective the procedure is. The majority of feeding experiments at Grasslands are carried out with cut material which certainly can be highly potent, while in an experiment in which the leaves and stems of red clover were fed separately, bloat occurred on both (12).

With the improvement of the electric fence, combination of the two objectives became a practical possibility, and the system of intensive break grazing was evolved (18,19). This system has given excellent results in the field when applied to mildly and moderately potent pastures. When applied to highly potent clover-dominant pastures, however, it cannot give full control of bloat without restriction of total intake. If continued for any length of time therefore, milk pro-

duction must suffer unless supplementary safe feed is given. The system is laborious, since the fence must be continually edged forwards, while constant supervision of the animals is necessary because of the high risks involved. It is inevitable under these circumstances that the pasture will be close grazed, which may not be to its best advantage.

Another method of altering the grazing pattern is the "on and off" system experimented with by Hancock (8). The aim is to break up the main feeding periods of the day by removing the cows from the dangerous pasture to a holding area at intervals according to a preset time schedule. In the Ruakura trials, this was found to reduce the severity of bloat, but did not eliminate it. No information is available on field trials. This system also is laborious and risky to the animals. As well, in contrast to intensive break grazing, there is an undesirable transfer of fertility to the holding area.

Antifoaming Agents

Frothy bloat can be prevented by treating the animals with antifoaming agents (9). These agents may be administered in a number of ways—as simple drenches, mixed with a small amount of dry feed, added to the drinking water, or by spraying directly on to the dangerous pasture. The use of anti foaming agents for treating bloated cows as distinct from preventing bloat, is by no means new. They were common ingredients in mixtures popular in the 18th and 19th centuries, although their use was empirical as their action was little understood. Clark in South Africa was probably the first to realise their full value, and certainly was amongst the first to use them prophylactically (2, 3, 4).

In experiments at Grasslands, we found that we could protect our stalled cows with a variety of antifoaming agents (16). Of these, the most suitable for field use were considered to be the vegetable oils, particularly peanut oil. The choice of the latter was based on its effectiveness combined with its harmlessness to the animals, its general availability, and the fact that it is a non-drying oil. Further, collaborative experiments with the Dairy Research Institute showed that, used at the levels recommended, this oil had no serious effects on milk production or quality (10). We do not maintain, however, that peanut oil is the perfect material for this purpose, and we expect that better agents will eventually be found.

To protect a cow in the field, an effective level of one or other antifoaming agent must be maintained in the rumen throughout the time the animal is grazing dangerous pasture. It was early found that a limiting factor in the case of oils and fats is the rapidity with which they are lost from the rumen by passing on down the gut. This rate of loss is such that to obtain control at economic levels, the material has to be given in small amounts at short intervals, or better, given continually. Of the two main possibilities in the field—addition of the agent to the drinking water, or direct application of the agent to the pasture—we chose the second as being the more reliable. Details of the technique that was evolved for spraying dangerous pastures, are given elsewhere (14, 20, 15).

Spraying was tried out on a small scale in spring, 1955, by farmers scattered throughout the North Island. There is no doubt that in the majority of cases good control was achieved.

Any assessment of this technique that is made now is clearly premature. However, in passing even an interim judgment, the following points should be considered:

1. Spraying is only an emergency measure most suited to major outbreaks.

2. Its greatest value lies in making it possible for the herd to remain in an otherwise dangerous paddock. This on the one hand allows the dangerous pasture to be utilised and on the other, allows other dangerous paddocks on the farm to mature, thus shortening the period of bloat.

3. Although costs are high ,in most cases they appear to be more than covered by the maintenance of production, apart from saving the lives of cows.

4. Antifoaming agents, however used, can only be effective against frothy bloat. Bloat due to other causes will not be alleviated.

Spraying is admittedly laborious, particularly on hilly country, where fence shifting alone may be a major task. However, on more level areas, only about an hour to an hour and a half a day is required for a herd of 60-70 cows.

The technique of spraying was evolved as a countermeasure to the rapid loss of oils from the rumen. It will be appreciated that should an otherwise satisfactory agent be found which persists longer in that organ, spraying would be largely unnecessary. Depending on the nature of this agent, it could be administered either in the drinking water, or fed, mixed with a suitable vehicle, in the milking bail. Such measures would undoubtedly be more attractive to the farmer than is spraying, and would be more adaptable to routine use.

Planning for Bloat Control

As was stressed in the introduction, the secret of consistent success is planning. This involves on the one hand careful planning ahead of animal and feed management, and on the other, exploitation of the strong points of the various control measures to meet the individual circumstances. In general, the following scheme appears to be the most reliable:

1. As a long term policy, grass-dominant pastures should be established.

2. While these pastures are maturing during early spring, safe feed such as autumn saved pasture should be fed if available.

3. When moderately potent pastures have to be grazed, intensive break grazing should be used.

4. If highly dangerous pastures have to be grazed, spraying should be resorted to.

These aspects have been discussed more fully elsewhere (20, 21).

I have refrained from speculation as to future control methods. It is very probable that the present intensive research will reveal new points at which the sequence of events leading to bloat may be attacked. However, it will be a number of years before any results of this work find general acceptance in the field, and it appears certain that the present methods of bloat control will continue to be used for a long time.

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Discussion

Mr. V. WILLIAMS: Is there any evidence that the gradual introduction of an animal to bloat producing pasture would give it some protection against bloat?

Mr. REID: No, and I think it unlikely that adaptation is important under N.Z. conditions. Under English conditions, the situation can be complicated by the change of diet in the spring when the animals change over from indoor feeding to grazing, and when bloat is often experienced. At Grasslands, we have not specifically experimented with gradual introduction, but in general, there has never been any suggestion of adaptation to potent clover during some four seasons of feeding cows under a variety of conditions. It is worth noting that in "feed-lot" bloat in America, there is a definite and prolonged adaptation period to the diet before bloat occurs. My aim in quoting Mortimer was to emphasise the use of straw, ryegrass and restriction of intake as control measures.

Mr. YEOMANS: As a farmer I have had 35 years' experience with bloat. Many years ago the trocar used to be an effective treatment but in recent years most farmers in my district have discarded it. They now find it necessary to cut a large hole in the side of the paunch to relieve a badly bloated animal. Would Mr. Reid please comment?

Mr. REID: Unfortunately there is no objective information on bloat in the field, on which to base comparisons. Certainly frothy bloat is not a new thing—it has been known for centuries. It is pertinent to point out that the successful use of trocars or stomach tubes does not necessarily rule out frothy bloat. There is probably always a pocket of free gas in the rumen, although it varies considerably in size. Further, in severe bloat, mechanical interference with belching may supervene, so that the animal remains bloated although the foam which started the trouble may in fact be breaking down.

Mr. LAMBOURNE: Is it possible to break the foam with ultrasonic vibrations?

Mr. REID: I don't know, although we have considered the possibility.

Dr. LOW: What estimate could be given of the cost per cow of using the methods you advocate for controlling bloat through the dangerous part of the season?

Mr. REID: I take it that you are referring to spraying. I can give no estimate of total costs. Naturally these will vary according to the circumstances, including, of course, the length of the period of bloat. However, an estimate of the cost of materials per cow per day can be given. For a dose rate of 3 fluid oz. of oil per cow per day, the cost will be 3½d.—6d. (based on oil costing 15s.—27s. a gallon and emulsifying agent at 4½d. per gallon of oil) if the farmer makes up his own emulsions, or 8d.—10d. if he buys ready-made emulsions. Suitable low volume spraying equipment may be obtained for about £40. This equipment should give service for a number of years, and, of course, may be used for other purposes, e.g., weed spraying.

Colonel DURRANT: Is there any evidence that susceptibility to bloat is inherited?

Mr. REID: Yes. John Hancock's work with identical twin cows showed quite clearly that susceptibility to bloat is in part controlled by heredity. We have been working at Grasslands with identical twins also—some of our animals came from Hancock's herd, others were obtained locally—and we have confirmed and extended his observations. I think the evidence is so definite that susceptibility of progeny to bloat should be considered in selecting sires for artifiicial breeding.

Mr. MILLS: Is it possible that the increased incidence of bloat in recent yearse is attributable to some deficiency in pasture?

Mr. REID: There is no evidence for this. More likely factors in any possible increase in the incidence of bloat are the bringing in of new land, on which severe bloat may be experienced during development, the more favourable environment being provided for clovers by drainage and development of existing farm lands, and the overall increase in the intensity of grassland farming. If the newer clover strains are involved, it is not because they have any greater bloat inducing properties—there is no evidence of that—but rather their great vigour makes them more difficult to manage.

Mr. LYNCH: Has an attempt been made to determine whether any particular climatic factors are associated with the occurrence of bloat?

Mr. REID: Yes, but no clear pattern emerged. It is possible, of course, that the right factors were not looked at. However, the general impression obtained was that if the environment favoured rapid clover growth, bloat could occur, but should any factor retard clover growth, bloat was less likely.

Mr. NIELSEN: Not many farmers have used sprays as preventative of bloat in the Waikato but those who did found it effective. Many farmers were hesitant to go to the trouble of spraying but seemed prepared to take the risk. I personally had a very trying experience yet I was reluctant to face up to the cost of spending £5 or £6 per day. Had I known the end at the beginning I would have had no hesitation in spraying at the outset.

Mr. REID: I should just like to comment on Mr. Neilsen's figures. He has about 160 cows, and I think it should be possible to spray for these at a material cost of £2 5s to £3 a day.

Mr. LAWRY: At a previous discussion with Mr. Reid, he suggested that there may be a form of bloat or foaming in the rumen which even before bloat becomes evident may affect intake and hence reduce production. Would Mr. Reid enlarge on this suggestion for the benefit of members?

Mr. REID: We have found at Grasslands that the greater part of the apparent fullness of a cow that has fed on clover but not bloated, is due to foaming of its rumen contents. Further, we have found that even mild bloat will lower the D.M. intake by 10 per cent or more. I think the routine use of antifoaming agents even when bloat is not a problem, by eliminating this frothing, will result in happier, more settled cows, which eat more and therefore produce more. This is as yet only an idea, but there is some field evidence to support it.

Mr. ROSS: Has treating of pastures at crucial times with growth retarding substances been tried as a means of controlling bloat?

Mr. REID: Yes. In an American experiment, potent clover was sprayed with 2-4-D until the plants almost wilted, but bloat still occurred. We think that any effect such sprays may have in reducing the severity of bloat is not due to the hormone and its action, but more probably to the oil in which some of these hormones are dissolved.

Mr. JEBSON: Farmers have mentioned to me that cream is an effective drench in controlling bloat. Is this so?

Mr. REID: Yes, cream given as a drench is effective both in preventing bloat (for a limited time) and treating bloat. We have also used it as a spray with success, but it is inferior to oil for this purpose as it has little resistance to weathering. Nevertheless it is a useful alternative to oil in an emergency. Dose rates are in oz. of butterfat instead of fluid oz. of oil.

Mr. JEBSON: Has the possibility of using some mechanism for slowly releasing the antifoaming agents been investigated?

Mr. REID: Yes, we have experimented with various carriers—chaffed hay, dairy ration, bran and so on—which we hoped would slowly release the oil in the rumen. So far we have not found a vehicle suitable for field use. The materials we tried had a definite effect, but it was not sufficient to be of practical value. I think that given a suitable antifoaming agent in powder form, a slowly dissolving tablet could be devised. This could be made heavy enough to stay in the reticulum.