The Pre-service Anestrous Syndrome in New Zealand Dairy Cattle

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New Zealand dairy farming is based primarily on a seasonal system of management whereby the calving pattern of the herd is concentrated so that maximum milk production coincides with the greatest pasture production for grazing. Normally high energy supplements play no part in the system of feeding. In order to maintain this concentrated seasonal calving pattern, herd owners must successfully mate or inseminate their cows within a limited mating period. Submission rates (the percentage of cows mated or inseminated during the first four weeks of a herd's mating program), as well as conception rates, are key factors in achieving this objective (1).

That a high submission rate is not always being obtained was indicated in a preliminary investigation carried out during the 1971 breeding season, where it was noted that among 14 dairy herds, 21% of two-year-old cows were not inseminated during the first four weeks of mating even though most of them had postpartum intervals which were more than adequate for cycling to have recommenced (2). The majority of these two-year-olds had ovaries showing no evidence of cyclical activity. An extensive field survey involving 294 herds of varying sizes (3) clarified this situation further and established the fact that a major reason for cows' not being submitted for mating during the first four weeks of the breeding period was that they showed the syndrome of pre-service anestrus; the problem was more likely to be encountered in the young lactating animals but was by no means confined to them.

Additional investigations have been undertaken by the authors in an attempt to further define the syndrome, and a number of procedures which may help resolve the problem have been tested.

The Anestrous Syndrome

Anestrus simply means an absence of the signs of overt estrus; it is not necessarily synonymous with inactive ovaries, although this may be so. For convenience it is useful to consider "anestrus" as occurring before mating has commenced (pre-service anestrus) or after mating has taken place (post-service anestrus). It is the former problem that is considered in this paper.

1. Conditions associated with arrested cyclic function

a. Pregnancy: A number of methods of treating anestrus may interrupt pregnancy; hence it is essential that the pregnancy status of the animal be assessed before any treatments are undertaken.

b. "Disease" conditions of the reproductive tract: These may be developmental abnormalities, e.g., the "freemartin," ovarian hypoplasia, some segmental aplasias, or acquired conditions such as ovarian cysts, tumours and infections of the genital tract.

c. Post-parturient ovarian inactivity: After calving, a certain time period must lapse before an animal begins to cycle again. During this time the uterus is repairing itself so that it can sustain another pregnancy. Present evidence in New Zealand indicates that mature dairy cows recommence cycling on average 5-6 weeks after calving, while heifers take about 10 days longer (4). There is considerable variation between animals.

d. "Stress" phenomena: The stress may result from a number of factors acting independently, or more often in combination; e.g., undernutrition (either deficiencies in quantity or quality), intercurrent disease such as parasitism, social factors in the herd, growth demands as well as the demands of high milk production. The young growing animal undergoing its first lactation appears particularly vulnerable to these pressures. Lack of exercise, low temperatures, and insufficient sunlight can all contribute to the effect, although they appear to have greater significance in the northern hemisphere where wintering in barns occurs. Where stress anestrus occurs, the ovaries are usually inactive. This could be regarded as a self-

preservation response by the animal at this time, since a further pregnancy would only add to her difficulties.

2. **Where cyclical activity is taking place but overt heat is either not occurring or is not being recognised**

American investigations (5) indicate that follicular development followed by ovulation, but without signs of overt estrous behaviour, is common in cattle in the early post-parturient period. This is often called "silent heat." The reverse (overt estrus but without ovulation) also occurs but with a much lower frequency. The reasons for these responses are not really understood, and in practice it is difficult to determine whether the situation is really one of "silent heat" or one of either a short or weak heat display which is not observed.

Failure to observe heat occurs for a variety of reasons. Considerable variation occurs in the length and intensity of overt estrus between individual animals. Where this is compounded by observer problems (disinterest of hired help, shed design, inadequate frequency, time and length of observation periods, herd size, etc.), the fact that heat is missed can be readily understood. Many herdsmen regard detection errors as a direct reflection of their own abilities. Thus, considerable tact is usually required in dealing with this particular aspect of an anestrous problem!

With these possibilities in mind, a first step was to determine the relative importance of the various conditions outlined above in a group of thirty herds having pre-service anestrous problems. The findings are illustrated in Table 1.

Although this information demonstrates the trend found from the thirty herds examined, there were often big differences between herds in both the extent and nature of the problem. Findings within an individual herd usually gave an immediate indication of the levels of management and nutrition that either had been or were operative before and during the breeding period. In very few instances were animals found to be pregnant, while "disease" conditions of the reproductive tract were detected in less than three per cent of the examinations made. The possibility that the animals examined had not had sufficient time to recommence cycling after calving was excluded by timing the investigation so that the majority had been calved fifty days or more at the time the examinations took place.

Table 1

Ovarian Status of Cows Showing "Pre-service Anestrous Syndrome"*

Age at Calving (years)	Number Examined	% Inactive Ovaries
2	1028	85
3	438	74
4 and over	808	47

*Data from co-operating herds in Manawatu/Wairarapa districts during 1971/2, 1972/3, 1973/4 seasons. The cows were classified as having inactive ovaries when no evidence of cyclical activity was present. Percentage of cows with active ovaries within each age class is the reciprocal of the figure in the table (pregnant cows and cows with recognisable "disease" of the reproductive tract have been excluded).

Clearly, a disproportionate number of two-year-old animals was seen, and it is evident that they constitute a problem group; moreover, the greatest single cause of their not being submitted for service was lack of cyclical activity (inactive ovaries), whereas "silent heat" and/or failure to recognise overt estrus were significant problems in the older animals. It is likely that factors contributing to this observed age difference are associated with stage of physical maturity, with nutrition, and with social stresses within the herd. The younger lactating animal is at a disadvantage in this respect because she is continuing to grow and, generally, being at the lower end of the social dominance scale, may not receive her share of available pasture. It is quite possible that many of these animals, by a process of natural selection, eliminate themselves from the herd and are thus found to a much less extent in older age groups. This aspect awaits further investigation.

Fortunately this condition of anestrus is temporary as, given time, most of these animals cycle and become pregnant. Indeed many of them must be in a "pre-estrus" state at the time of examination since many conceive within a few weeks of the veterinary examination's taking place (see pregnancy rates for controls in Table 3). Whether the ovarian and uterine manipulations at this time contribute in any way to this response cannot be effectively determined.

Management of Pre-service Anestrus

1. The initial step is to define the problem in the herd in question. This means careful examination of herd calving and breeding records and clinical examination of problem animals. Pregnancy must be protected, if present, and obvious "disease" recognized.

"Disease" and pregnant cases excluded (each to be dealt with on its merits), the animals under examination will resolve themselves into two groups–those with active ovaries and those with inactive ovaries at the time of the investigation.

2. **Where ovarian activity exists:**

This generally means the presence of a corpus luteum with no pathology of the genital tract, or cows which are approaching, in, or just going out of, estrus. The prognosis is favourable and nothing need be done except make the client aware that these cows are cycling; one should endeavour to predict when each will be in estrus. Once alerted, the client generally takes more care with detection

procedures; moreover, since the incidence of "silent" heat diminishes as the postpartum period lengthens, the next estrus is likely to be more easily observed at any rate! If many of these animals are noted in the herd, estrous detection procedures will need to be checked.

Apart from the use of injectable prostaglandin analogues where circumstances warrant, we see no value in instituting any other form of treatment with this group of cattle; indeed, some treatments may be deleterious (2). Where injectable prostaglandin analogues (Estrumate - ICI) are used on animals with active corpora lutea, estrus is synchronised and prediction of heat becomes a simple matter (6). Fixed time insemination procedures may be successfully used, thus dispensing with the need for estrous observation altogether. Under these circumstances the problem is one of whether the benefit gained justifies the cost, keeping in mind the results likely to be obtained if no treatment at all, apart from the rectal examination of the cow, is carried out.

3. **Where ovarian inactivity exists:**

Four approaches have been considered and are dealt with in what we believe to be their descending order of importance.

a. Preferential treatment of potential problem animals: Although factors other than nutrition do influence return to postpartum cyclical activity (e.g., the frequency of suckling or milking, sequelae to difficult birth, etc.), management of food intake and of intercurrent disease are two variables over which a reasonable degree of control can be exerted. The objective is to ensure that production, including reproductive performance, leads to satisfactory economic returns. Since costs and benefits are in a constant state of flux, and since there are many other variables on the farm unit which interact to affect productivity in different ways, this concept is more easily stated than achieved, and neither single, nor simple, "recipes" have yet been found to meet all situations.

As far as reproductive performance is concerned, short term alteration of feed input, at least in quantitative terms, has remarkably little effect on return to cyclical activity if the animal concerned is in a "reproductively unfit" state to recommence the reproductive process again. Expressed in another way, this simply means that the heifer calving in poor condition will generally divert her intake to meet the needs of milk production and growth rather than reproduction; even if *ad libitum* feed is made available, there is likely to be a considerable lag before a reproductive response in the form of return to cyclical activity occurs. The heifer (or cow) calving in good condition, on the other hand, has the potential to "survive" this initial lactation period and will respond by cycling much more rapidly unless very severe nutritional deprivation supervenes.

If this first concept holds true, then the idea of a target weight at first breeding for maiden heifers, and at calving for animals already in the herd, offers a suitable goal for which the herdsman can aim. One of us (K.M.) has examined this proposition and has based some preliminary recommendations on the data outlined in Table 2. While more information is yet required to define the appropriate target within any given situation, the message is clearly there that the poorly developed animal at the time of first breeding, or the animal in poor body condition at the time of calving, needs a longer period before she is able to breed, compared with her better developed and/or conditioned herd mate. If too many animals in the group fall below this target weight, high submission rates cannot be achieved.

To reach this target, maiden Jersey heifers need to grow at a rate of about 0.40 kg/day from birth to weaning, crosses and Friesians (for which no data is at present available in New Zealand) at slightly greater rates. Such gains are possible on commercial farm units. For two-year-old and mature Jersey cattle, weight increases of a similar order

Table 2

Relationship Between Body Weight and 28-Day Submission Rate (S.R.)

*Jersey yearling (heifers)			Friesian x Jersey yearlings (heifers)		
n	Wgt. (kg)	28 day S.R.	n	Wgt. (kg)	28 day S.R.
42	<180	76%	16	<200	81%
34	180-190	82%	20	200-210	95%
44	191-200	93%	26	211-220	96%
**Jersey 2 years (heifers)			Friesian x Jersey 2 years (heifers)		
87	<275	72%	28	<300	57%
96	275-300	85%	62	300-350	74%
212	>300	93%	26	>350	81%
**Mature Jersey cows			Mature Friesian x Jersey cows		
179	<325	78%	27	<350	70%
229	325-375	87%	89	350-400	84%
313	>375	88%	77	>400	90%

*Body weight measured just prior to mating period beginning.

**Body weight measured just before calving for the herd began.

From this data suggested target weights are as follows: Jersey yearlings at start of mating: 190 kg.; FxJ yearlings at start of mating: 200 kg.; Jersey 2 year just before calving: 300 kg.; FxJ 2 year just before calving: 350 kg.; Jersey (mature) just before calving: 375 kg.; FxJ (mature) just before calving: 400 kg.

are necessary from mating until the following calving; heavier crosses and the Friesian breed again need to make greater daily increases than those required for the Jersey breed.

b) Early mating of heifers: Where a submission rate problem exists with the two-year-old heifers, a useful management technique is to commence mating the incoming maiden heifers about 12 days before the breeding season for the remainder of the herd begins. If this is done, and provided the maiden heifer group has been sufficiently well reared to have reached puberty by the time this breeding begins, the mean calving date for the group is likely to be about 16 days before the remainder of the herd when they calve at the age of two years (K. Moller–unpublished data).Since two-year-old heifers require a longer postpartum period than their older herd mates before they begin cycling again (approximately 10 days longer in the New Zealand environment), this earlier calving is to their advantage when the time arises for their second breeding.

Initially the technique may result in a small increase in calving spread but this is short-lived as the late calving problem, which is so often a result of low submission rates of two-year-old heifers, is overcome.

c) Shortening gestation length: This technique, using long-acting corticosteroids such as dexamethasone trimethyl acetate to induce premature delivery, has been well tried in New Zealand; although improved treatment regimes have led to more predictable responses, considerable variation appears still to be a problem between districts and between years. Used with discretion, and in situations where the standard of stockmanship is high, there is little doubt that the induction of premature parturition can be a useful method of overcoming the problem of too many late-calving cows, at least in the short term. If it is to be effective in improving submission rate, however, the decision to induce must be taken early–about six weeks before the herd breeding season is to begin. Cows successfully induced to calve will then have a reasonable opportunity of returning to overt estrus before the first month of mating has elapsed.

d) Use of drugs: Clearly a simple solution to the problem of inactive ovaries would be the initiation of a fertile estrus using drugs. In our herds the results obtained have been singularly unsuccessful (see Table 3).

Two further treatment regimes were followed in 1975. In the first, a group of animals with inactive ovaries was given 1500 i.u. of PMSG i/m; 85% showed intense estrus 3-5 days later. At Day 12 they were examined and found to have hyperstimulated ovaries. 0.5 mg prostaglandin analogue (Estrumate-ICI) was given and inseminations carried out at 72 and 96 hours later. 3/60 only were seen to be in heat following the injection and only 1/60 treated became pregnant. There followed a considerable delay before normal ovarian cycles developed again.

With the second treatment, 40 mg progesterone was injected i/m into a group of animals with inactive ovaries and was followed 48 hours later by 2 mg estradiol benzoate i/m. Most showed estrus 24-72 hours later, but only 3/36 inseminated at this heat conceived.

Table 3

Response to Treatment of Cows with Inactive Ovaries*

Treatment	Total No.	% confirmed in calf 1971	1972	1973	1974
Control	856	40	15	21	34
Uterine infusion	170	35	–	19	–
Estradiol cypionate	380	31	17	24	–
Benestrin + PMSG	65	–	–	–	29
PMSG	225	–	27	34	26
Progestagen (sponge)	81	–	–	25	38
Progestagen + PMSG (sponge)	50	–	–	–	38
Vit. E/ Selenium	83	–	16	–	–

*Animals were allocated to the different treatments on a within herd, within year, within age, basis. They were confirmed in calf by pregnancy diagnosis. A positive response was noted where the animal became pregnant within a three-week period following treatment in 1972 and within a four-week period in 1971, 1973 and 1974 respectively.

Uterine infusion = Lugol's iodine as a 20 ml intra-uterine infusion of either 0.1% or 0.2% solution.

Estradiol cypionate = i/m injection of 2-4 mg depending on age of cow.

Benestrin + PMSG = i/m injection of 300 i.u. serum gonadotrophin and 3 mg estradiol monobenzoate (Willowes Francis) plus an additional dose of 500 i.u. of serum gonadotrophin (Folligon-Intervet).

PMSG = i/m injection of 1000 i.u. serum gonadotrophin (Folligon-Intervet).

Progestagen = intravaginal tampons containing 300-500 mg of progestagen.

Progestagen + PMSG = as above plus 1000 i.u. serum gonadotrophin i/m on the day the tampons were removed (12-14 days after insertion).

Vit. E/Selenium = i/m injection of 20 mg sodium selenate and 272 i.u. of vitamin E (Veterinary Ethicals).

Summary

Present evidence indicates that lack of cyclical activity associated with inadequate levels of nutrition is an important cause of low submission rates in many New Zealand dairy herds. This is particularly so in the younger lactating animals, whereas "silent heat" and/or failure to recognise overt estrus contribute

significantly to the problem in older members of the herd. In summary, therefore, management of the "anestrous syndrome" in the New Zealand environment involves:

1. Careful analysis of herd records and examination of the problem cattle.
2. Immediate correction of any estrous detection problem as well as treatment of cases involving reproductive pathology according to the condition involved.
3. Where cows with active ovaries are found and there is no clinical evidence of disease, attempt to predict estrus; offer no other form of treatment unless circumstances warrant the use of injectable prostaglandin analogues.
4. Where the problem is one of inactive ovaries,
   a. deal with any intercurrent disease
   b. rely on *time* rather than *drugs* but consider shortening gestation length in cows which will calve late in the calving period as a means of overcoming the likely problem of a low submission rate with these animals at the next breeding.
   c. commence breeding maiden heifers about 12 days before breeding of the main herd begins, if low submission rates in two-year-old cattle are a problem.
   d. arrange a grazing management program which will permit all individuals within each age group to achieve an appropriate target weight at breeding (maiden heifers) or at calving (two-year-old and older cattle). This will involve both the use of scales and a management program that will permit stock movement between different grazing groups where weight changes indicate that this is necessary.
5. Recognition as major objectives that maiden heifers must be well grown for age at the time of breeding and that cows are in good condition at calving. Apart from any influence on lactation, this will ensure earlier cycling in the postpartum period with a resulting improvement in both submission rate and conception rate (the latter because there will be sufficient time for at least one or more "open" heats before breeding is necessary). The end result will be concentrated calving for the herd.

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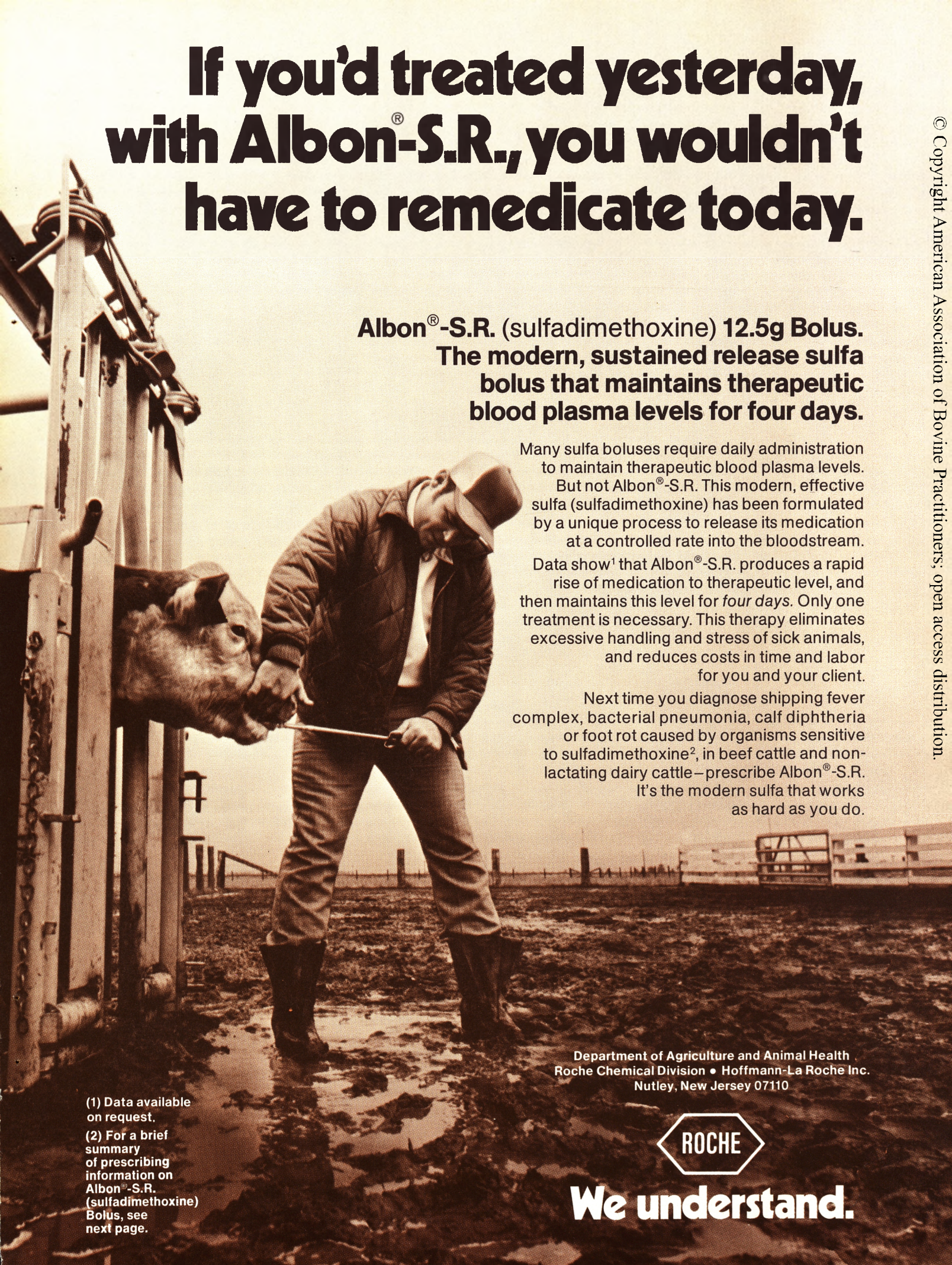

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