

SCOURING INCIDENCE IN CALVES REARED IN FIXED OR MOVEABLE SHEDS AT TWO RATES OF MILK REPLACER FEEDING

J. C. RADCLIFFE* and B. R. WHITE*

Summary

Eighty Jersey or Friesian sired calves born at the Northfield Research Centre between July 1966 and June 1967, were assigned at birth to one of four calf rearing treatments: (1) standard feeding rate, fixed sheds; (2) high feeding rate, fixed sheds; (3) standard feeding rate, moveable sheds; (4) high feeding rate, moveable sheds. Calves were fed colostrum for four days after birth, and then were fed a milk replacer in each rate treatment twice daily according to live weight.

A combination of high rates of feeding and the protracted use of fixed housing was found to contribute to increased deaths from scouring. Scouring calves had significantly greater rectal temperatures, faecal moisture contents and faecal coli compared with normal calves, but no differences in serum potassium or gamma-globulin values were recorded. It was considered that the scouring was nutritional rather than bacterial in origin, and that dehydration was of little importance in the early stages of the disease.

1. INTRODUCTION

Scouring, a major disease of calves prior to weaning, is a disturbance of the alimentary tract resulting in a failure of normal water and ion absorption. The cause of scouring may be either bacterial or nutritional, and differentiating between them is difficult (Roy 1964).

Radostits and Bell (1970) observed that scouring is more often found in milk replacer-fed calves than in milk-fed calves. They also noted the widespread though poorly documented belief that overfeeding calves with liquid diets results in scouring. Roy *et al.* (1955) have shown that continued use of indoor intensive rearing facilities also contributes to increased scouring frequency, reduced growth rates and more deaths. However, calves are commonly reared in Australia in groups using extensive outdoor facilities.

This paper describes an experiment in which growth rates and scouring incidence were recorded when calves were group reared, in either fixed or moveable outdoor housing, and using two rates of milk replacer feeding.

II. MATERIALS AND METHODS

Eighty calves born at the Northfield Research Centre, South Australia between July 24, 1966 and July 3, 1967 were assigned to one of four treatments by

*Northfield Research Centre, South Australian Department of Agriculture, Adelaide, South Australia, 5001.

restricted randomisation according to whether they had Jersey or Friesian sires. Calves were left with their dams for 2 days after birth, and were bucket-fed maternal colostrum for a further 2 days. On the fifth day, they were placed in the appropriate treatment shed where they remained until weaned at 12 weeks of age.

The treatments were: (1) fed at a standard rate and housed in a fixed shed; (2) fed at a high rate and housed in a fixed shed; (3) fed at a standard rate and housed in a moveable shed; and (4) fed at a high rate and housed in a moveable shed. There were two replications of each treatment. All calves were fed a 10 per cent suspension of a commercial milk replacer* at 39°C twice-daily according to live weight. Volumes of milk replacer given at each feed at the standard feeding rate were 1.4 l below 27 kg, 1.7 l between 27 and 34 kg, 2.7 l between 34 and 41 kg and 2.3 l above 41 kg live weight. Feed volumes at the high feeding rate were 70 per cent greater than those in the standard feeding rate. The calves were offered cereal hay and water *ad lib*. The calves were housed in corrugated iron sheds 3.6 x 2.1 m with the open northern face attached to a yard 4.6 x 3.0 m. The fixed sheds and their adjoining yards remained in the same position for the whole of the trial. The moveable sheds and their adjoining yards were relocated on a fresh site at monthly intervals.

Calves were weighed at weekly intervals from birth. On the same day, 20 ml of blood were taken by jugular puncture for the determination of serum potassium by flame photometry (Varley 1954), total serum protein (Van Slyke *et al.* 1950) and gamma-globulin by scanned paper electrophoresis (Grassmann and Hennig 1957).

The rectal temperature of each calf was measured daily at 1400 hours and a faecal sample taken. Defaecation was induced by gently inserting the base of a sterile 15 mm diameter test-tube into the rectum.

The moisture content of faecal samples was determined by oven drying to constant weight. Faecal samples taken from calves up to eight weeks old were examined for coliforms by mixing 0.5 g wet faeces with 50 ml sterile water, plating out serial dilutions of 10^{-4} to 10^{-8} on McConkey agar, and incubating for 24 hours at 37°C.

If a calf was visually observed to be scouring, milk replacer feeding was terminated for 24 hours. A calf continuing to scour after 24 hours received 2.3 l of a 5 per cent glucose solution at each feed. On the day after scouring ceased, half of the normal milk replacer ration was fed, followed by the full ration the following day. **Post mortem** examinations were carried out on any calves which died.

Live weight data were examined by analysis of covariance and means corrected for differences existing between the calves at birth. Physiological data were examined by using *t* tests for unequal groups (Snedecor 1956), the bacteriological figures being logarithmically transformed prior to analysis.

*"Denkavit", manufactured by Hall, Sandford and Co., Mitcham, South Australia, for Denkavit (Australia) Pty. Ltd., Melbourne, Victoria.

III. RESULTS

Mean live weights at 12 weeks of age are given in Table 1. Mean corrected weekly live weights of surviving calves differed significantly ($P < 0.01$) due to feeding rate from the second week of the trial, but no differences were recorded due to housing treatments. The total number of days in which individual visual positive scouring observations were made, expressed as animal scouring days, together with the number of deaths in each treatment, are also given in Table 1. Scouring calves had a significantly greater ($P < 0.01$) body temperature, faecal coli and faecal moisture content compared with normal calves. The scouring means presented in Table 1 were related to the visual scouring observations rather than to the moisture determinations, because in nearly 20 per cent of observed scouring cases, sufficient faeces could not be obtained for moisture determinations, whereas faecal samples were obtained from all but 10 per cent of normal calves.

TABLE 1
Mean values of data recorded during the trial

	Fixed shed		Moveable shed		Standard deviation
Feeding rate	Std.	High	Std.	High	
Live weights at 12 wks (kg)	63.0 ^a	76.4 ^b	62.4 ^a	77.6 ^{b*}	
Deaths	6	7	4	3	
Animal scouring days	81	103	78	72	
Body temperature °C					
Normal	39.1	39.2	39.1	39.1	0.4
Scouring	39.2	39.3	39.4	39.4	0.5
Faecal moisture %					
Normal	78	77	77	76	6.4
Scouring	90	88	88	88	5.6
Coliforms (log ₁₀ /gm dry matter)					
Normal	8.30	8.52	8.24	8.25	1.0
Scouring	8.90	9.13	8.67	8.74	1.1

*Figures with the same letter in a row are not significantly different ($P < 0.01$).

Scouring was most severe in the first five weeks of life. The incidences for weeks 1-8 inclusive were 9, 99, 61, 65, 51, 28, 8 and 6 animal scouring days respectively. A further 9 days were recorded during the third month after birth. Over the first five weeks, the mean weekly live weight gain in those weeks where no scouring was recorded was 2.2 kg. If calves scoured for two days in a week, this gain was converted to a mean live weight **loss** of 0.1 kg.

Although the mean scouring incidences among Friesian sired and Jersey sired calves were similar at 4.2 d/calf, the death rate among Jerseys was 30 per cent compared with 21 per cent among Friesians.

No relationship was observed between gamma-globulin level and scouring incidence, though a decline in gamma-globulin concentration was observed with

advancing age. Mean gamma-globulin values recorded weekly from the day after birth to the end of week 8 were respectively 31.5, 29.8, 26.6, 22.2, 20.0, 18.0, 16.2, 15.4 and 15.1 per cent of the total serum protein.

No relationship was observed between serum potassium data and scouring. The mean serum potassium value for all calves was 5.61 ± 0.19 m-equiv./l.

The **post mortem** examinations showed that all deaths could be attributed to scouring.

IV. DISCUSSION

The results of this trial show that although calves can be fed successfully at high rates of milk- replacer feeding early in life, the use of a combination of high feeding rates with fixed housing can lead to increased scouring and death. Growth rates during the first five weeks can be seriously reduced if calves scour for more than one day.

Results of this trial support the hypothesis of Smith (1962), that bacterial infections are not usually the cause of scouring in calves. Despite the careful feeding of maternal colostrum, a high incidence of scouring was recorded, but significant gamma-globulin changes, which might be expected to follow infections, were not observed.

It was not possible to detect serum potassium concentration increases which have been observed with dehydration (Roy 1970), and dehydration became visually evident only after the calves had scoured protractedly and were near death. It is concluded that dehydration may not be a serious problem in the early stages of scouring, and that any initial treatments should be aimed at removing the cause of the alimentary tract irritation.

The incidence of scouring in this trial was higher than that recorded in subsequent trials using the same rearing facilities. Both White and Radcliffe (1970) and Wickes *et al.* (1972) recorded a reduction in mean scouring incidence to less than one scouring day per calf, probably due to the elimination of glucose therapy in the prolonged treatment of scouring. Shillam, Roy and Ingram (1962) suggested that glucose may increase scouring by encouraging bacterial proliferation in the intestine.

Although scouring may be initiated by a physical irritation, bacterial infection may become involved if scouring continues, and under these circumstances, the prolonged use of rearing facilities may lead to increased deaths. This was observed in the fixed sheds towards the end of the experimental period, and was also evident in the moveable sheds since an infection chain was maintained even when the calves were moved.

The wide individual ranges of the parameters measured would render most of them of little use in the diagnosis of scouring. The mean serum potassium values from normal calves were similar to those recorded by Dalton (1967). Roy (1970) has recorded that values rise to 7 m-equiv./l when calves are scouring, but values up to 8 m-equiv./l were found in normal calves in this trial, while values of less than 5 m-equiv./l were recorded from some calves immediately following three or four days of continuous scouring. Although the normal and scouring means for both rectal temperature and faecal coli were significantly different ($P < 0.01$), the standard deviations in Table 1 indicate that the dis-

tributions of values from normal and scouring calves overlap sufficiently to prevent any accurate predictions being made from these parameters. The recent suggestion by Hallman (1971) and Guss (1971) that the rectal thermometer is a useful tool in calf rearing was not supported.

It is concluded that management is an important factor in controlling calf scouring, and that avoidance of the prolonged use of fixed housing in conjunction with high feeding rates will contribute to minimising calf deaths from scouring.

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