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Feed intake and oral behaviour of dairy calves housed individually or in groups in warm or cold buildings

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Abstract

The influence of environmental temperature, housing, social company and age on the feed intake and oral behaviours was studied by housing male dairy calves for seven weeks individually (INDIV) or 12 weeks in groups of four; indoors (INGROUP) or outdoors either with (OUTWARM) or without a heated shelter (OUTCOLD). During the milk-feeding period (1–7 experimental weeks), the mean daily milk, hay and total dry matter intakes of INDIV calves were lower than of INGROUP calves ($P<0.05$). No differences in the feed intake between OUTWARM, OUTCOLD or INGROUP were found. Nor was found any differences in the feed efficiency (growth kg^{-1} DM) between the treatments. After weaning off milk, during experimental weeks 8 to 11, the total dry matter intake of INGROUP tended to be greater than that of OUTWARM ($P=0.05$). There were no other differences in the mean daily feed intakes, nor in the feed efficiency. During the milk-feeding period, INGROUP calves ate more often concentrates ($P=0.05$) and ruminated more ($P=0.01$) than INDIV calves. During the 12-week experiment, INGROUP calves licked themselves more often than OUTCOLD calves ($P=0.04$) and tended to lick more often than OUTWARM calves ($P=0.08$). INGROUP calves licked more often penmates or structures and bit more often structures than OUTWARM or OUTCOLD calves ($P<0.05$ for all). Overall, with a decreasing temperature, the calves in outside groups spent less time performing oral behaviours. We conclude that group rearing may facilitate calves to start eating and ruminating earlier than individual housing. The effect of low temperatures on the time spent eating solid foods is discussed in relation to housing design.

Keywords: Calf; Environmental temperature; Feed intake; Group housing; Individual housing; Growth; Oral behaviour

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1. Introduction

In the northern latitudes, there has been interest in housing dairy cows in simple, unheated buildings. However, there is some concern for housing very young calves in cool environments. Calves can tolerate relatively low temperatures, the lower critical temperature (LCT) of dairy calves being about 8–10 °C from 3 to 56 days of age (Webster et al., 1978). LCT is the temperature below which an animal must increase its heat production. LCT can vary a lot depending upon housing, breed, nutrition, time after feeding, behaviour and thermal adaptation (Young, 1981). Exposure to cold conditions results in adaptive changes and can be seen in appetite (Young, 1983). Long-term cold stress may increase calves' energy requirements for maintenance and increase feed intake (Young, 1981). According to Scibilia et al. (1987), calves housed at −4 °C required 32% more energy for maintenance than calves housed at +10 °C. However, in some studies, the calves' feed intake in cold housing has been either the same (Scott et al., 1993) or higher (McKnight, 1978; Kunz and Montandon, 1983) than in warm housing. Controversial results exist of the temperature effects on growth. The daily gain of the calves in cold housing has been the same (e.g. Jorgenson et al., 1970; Hansen, 1984), lower (Scibilia et al., 1987; Scott et al., 1993) or even better (Kauppinen, 2000) than in heated buildings.

According to the European Union's Animal Welfare law, calves must be raised in groups after 8 weeks of age. In Finland, the number of calves less than 8 weeks of age reared in groups is increasing, especially in beef production. Group housing may stimulate feed consumption (Warnick et al., 1977). In the experiment by Richard et al. (1988), milk replacer and water intakes of group-reared calves tended to be higher than that of individually fed calves but concentrate intake was not different. In some experiments, there have been no differences in the average daily gain between group or individually reared calves (Warnick et al., 1977; Nocek and Braund, 1986), but in some experiments the growth has been higher in individual pens than in groups (Maatje et al., 1993). One disadvantage of group rearing is that calves in groups may start to suck each other, a behavioural disturbance called cross-sucking (e.g. Jensen, 2003).

Group rearing of dairy calves and feed intake connected with oral behaviour has not been widely studied in a changing climate below 0 °C. The aim of this experiment was to compare feeding behaviour and the performance of young dairy calves in warm and cold group-housing systems in a cold climate. In addition, we compared calves housed individually and in groups.

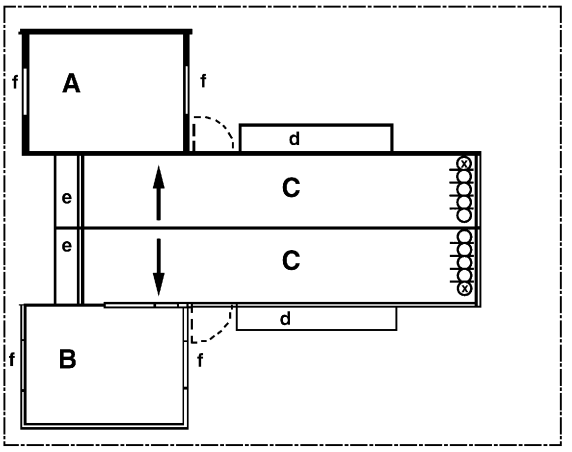

Fig. 1. Diagram of the group pen structure of four calves. (A) OUTWARM: 3 × 4 m straw-bedded, heated shelter, daily temperature (mean ± S.D) +11 ± 6 °C; (B) OUTCOLD: 3 × 4 m straw-bedded unheated shelter, windproof, daily temperature +3 ± 2 °C higher than the yard outside; (C) 2 × 10 m bark-bedded, roof-covered outside yard; d: hay trough; e: concentrate trough; f: window; ○: teat bucket; ⊗: heated water bowl (unheated for INGROUP); →: plastic strip door; _._: roof-covered area. The INGROUP housing system was identical in structure to the other two systems.