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Behaviour and performance of veal calves under different stabling conditions

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Summary

Two groups of veal calves, both reared under intensive husbandry conditions, were housed in individual pens. The first group had elevated pens with slatted floors. The second group had pens with slightly sloping rubber floors, to facilitate slurry drainage. Also microclimate conditions differed in the two stables.

The purpose of the study was to see which of the two situations was more suitable for veal calf production, as shown by weight gain and behavioural parameters. The production performance of the calves housed in the elevated slatted wood pens was considerably better, and behaviour surveys confirmed the better condition of the calves in this group.

Key words : Housing, behaviour, veal calves, physical condition, microclimate.

Introduction

In the production of veal calves, as in any other type of animal husbandry, different animals have different requirements for optimal growth, depending on their relative ability to adapt to environmental conditions.

There are already many data available on the influence of the housing and management system on behavioural and physical development of calves (DUNCAN, 1974 ; STEPHENS, 1980 ; DANTZER *et al.*, 1983 ; STEPHENS, 1982). A neonatal ethogram has been described (HERMANN & STENUM, 1982 ; LE NEINDRE, 1982). The most obvious disadaptation problems are usually related to poor capacity to orient to a new environment, to learn to use new feeding systems or to partial or total isolation. Disturbed behaviour has been frequently observed, in the form of licking and biting the pen bars, walls or other surrounding structures (STEPHENS, 1972), feces sucking and ingestion of urine, playing with the tongue (UNSHELM *et al.*, 1982), grinding of teeth, sucking in vacuum and chewing in vacuum (RIESE *et al.*, 1977).

Space requirements and structural characteristics of the individual pens have

also been studied, since besides determining microclimate, they affect freedom of movement, probability of trauma, circadian activity and growth rate (ELSHOF & VAN PUTTEN, 1980 ; JONGEBREUER & SMITS, 1978 ; WARNICK *et al.*, 1977). All these parameters are indices of adaptiveness which can be evaluated, as can usual growth parameters such as weight gain. Behavioural parameters may provide early indication of a potential disadaptive condition, which can affect the animal's welfare and productivity.

We have analysed the validity of behavioural parameters for early assessment of the housing conditions, to add to the usual animal husbandry index of growth rate, by observing two groups of calves, both reared under intensive husbandry conditions, and fed exclusively milk products (veal calves), but in environments differing for some aspects.

Material and methods

The experiment was carried out in a ' calf weaning centre ' in Northern Italy, for a period of five successive months.

Animals and feeding

All the animals were Friesian male calves imported from France and introduced to the rearing farm at about 1 week of age and kept there until slaughtered at about 5 months. There were 28 calves in group A and 26 in group B. The calves were fed milk products twice daily ; the calves in group A at 7 a.m and 4 p.m, and those in group B at 7.30 a.m and 4.30 p.m.

Housing conditions

Group A was located in a barn (A stable) with a forced ventilation system with extraction fans. The individual pens were elevated from the ground and the pen floor was made of wooden slats (fig. 1). The surface of each pen was 62 × 155 cm. The pens, built in two rows, were separated by an aisle and a drain. Lateral iron walls separated the pens, to avoid contact between neighbouring calves. The front of the pen was closed with iron bars, which were opened only at feeding time. Each pen contained a milk bucket. Each calf was chained in the aisle pen.

Group B was located in another barn (B stable), also with a forced ventilation system, but with inlet fans. The individual pens, measuring 62 × 155 cm, had sloping rubber floors to facilitate evacuation of the slurry, with wooden grating at the back, and slurry was collected under the grate (fig. 2). The pens were built in four rows, with the feeding aisles in front and the cleaning aisles behind. The individual pens were again separated to avoid contact between neighbouring calves. Feeding buckets were present in each pen and each calf was chained inside the pen.

Food consumption was measured for both groups.

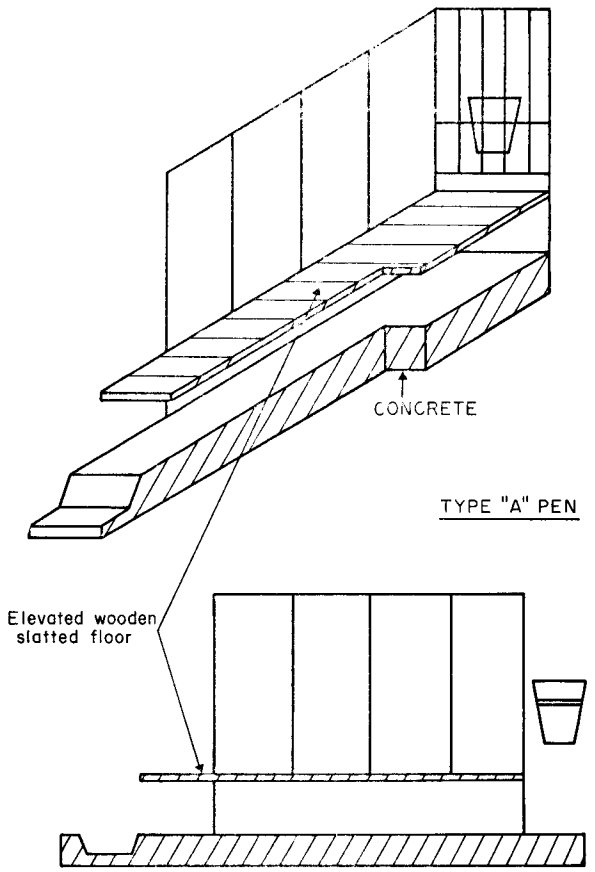

FIG. 1

Type « A » pen (scale 1 : 10).
Box « A ».

Measurements

During the five months, A and B calves were weighed 8 times, at two weeks to 1 month intervals. Environmental temperature and humidity were measured in both stables once a week every month. Behaviour of a sample of 12 calves of A group was recorded with a computer programmed camera installed in the A stable for 14 days, starting 1 week after the calves were stabled (at 14 days of age). Every day, 10-minute recordings were taken at 1-hour intervals, the first at 7 AM and the last at 4 PM. For the calves of Group B, the first recording was taken at 7.30 AM and the last at 4.30 PM. The recordings were examined with a videorecorder and data were collected and tabulated. An ethogram was established for the following activities :

1. standing ;
2. lying down ;

3. self-grooming (including licking, shrugging and scratching) ;
4. pen licking (licking of pen side walls and pen bars) ;
5. movement within the pen (including chain pulling, jumping and kicking) ;
6. tail licking ;
7. licking of the pen chain.

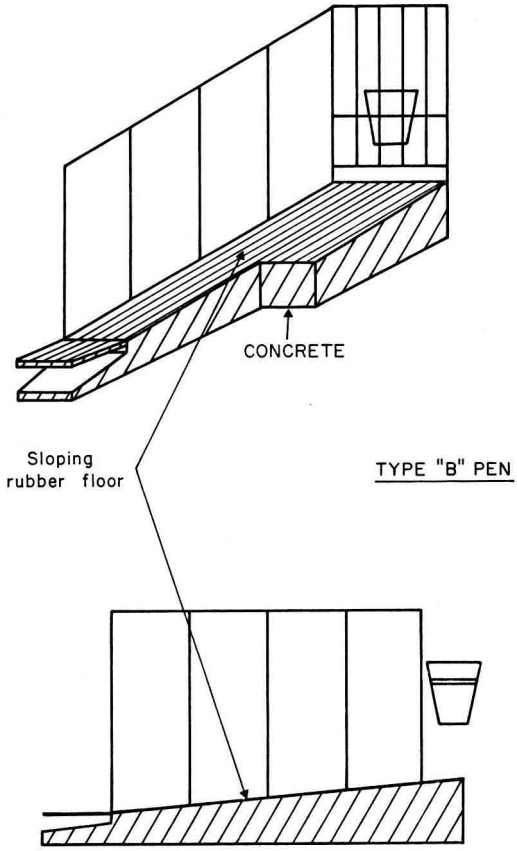

FIG. 2

Type « B » pen (scale 1 : 10).
Box « B ».

Time (minutes) spent standing and lying down was analysed for a sample of 12 A and 12 B calves. The frequencies of all the other activities were evaluated for a sample of 5 A and 4 B calves. The data collected during the experiment were subjected to the analysis of variance.

Results and discussion

Growth and milk consumption

The difference between the weights of A and B calves became increasingly greater after the first two weeks. At time of slaughter, 147 days after the beginning of the experiment, A calves weighed 32.2 kg more than B calves (fig. 3).

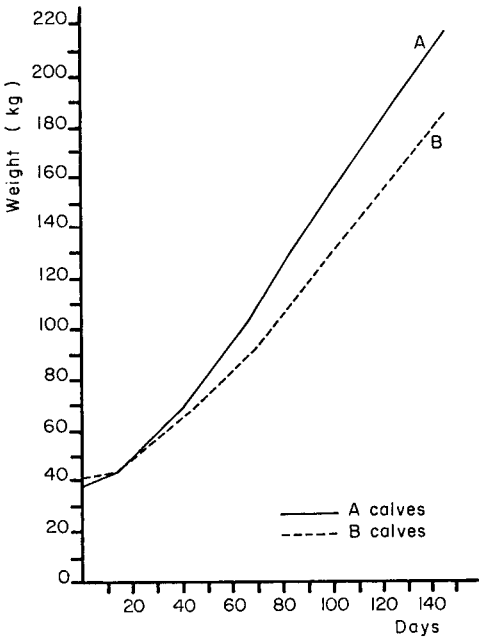

FIG. 3

Growth curves for the two groups of calves.
Courbes de croissance des deux groupes de veaux de boucherie.

The difference of growth in the two groups of calves, illustrated by the trend of the two growth curves, was statistically significant ($F_{(1,12)} = 11.10$; $P < 0.01$ at the analysis of variance between the two growth curves). There were no statistically differences in milk consumption between the two groups of calves during the study.

Microclimate records

During the 5 weeks of recording the mean humidity values were always higher in the B stable, reaching 100 p. 100 in the first 3-4 weeks, whereas in the A stable

the values decreased in 4th and 5th week, and varied during the day. Mean temperatures were lower in the first 3 weeks in B stable, ranging from 11° to 15°C (fig. 4).

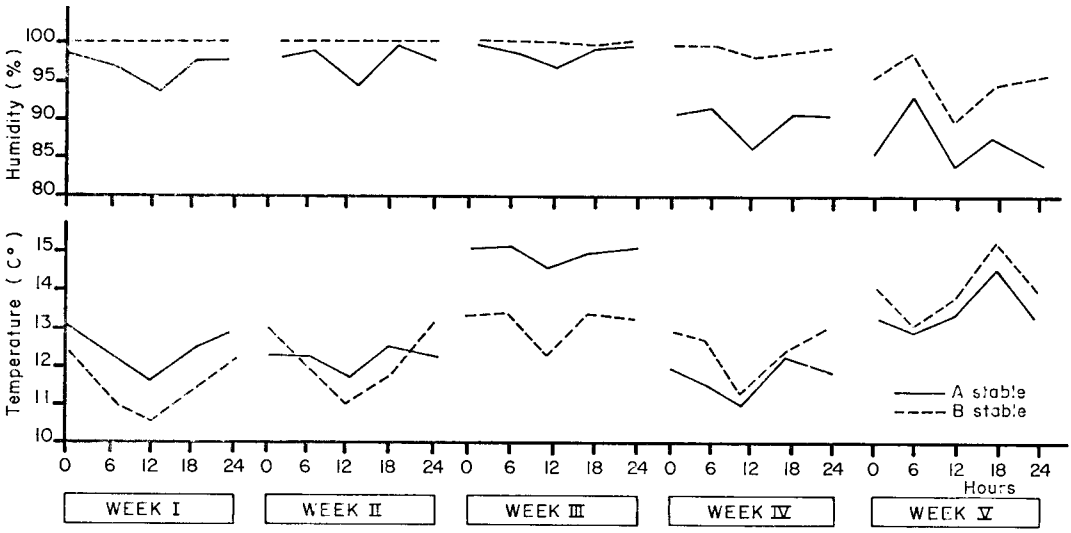

FIG. 4

Average weekly temperature and humidity in the two stables at different times of the day.
Température et humidité moyennes pendant le jour dans les deux systèmes d'élevage.

Behavioural data

The analysis of mean times of standing and lying down during each observation on the 14 experimental days (fig. 5) revealed that B calves stood for a significantly longer time than A calves ($F_{(1.286)} = 106.53$; $P < 0.001$). This might have affected the weight gain. The longer standing time and lesser growth rate of B calves could be related to the less favourable microclimate conditions (lower temperature and higher humidity level), which were caused by accumulated slurry on the rubber floor.

There were no significant differences in self-grooming, pen-licking or motor activity (fig. 6). Only B calves displayed chain licking (Table 2), B calves also more frequently licked their tails, but no statistical analysis were made because one calf was particularly active in this regard (Table 1).

During the first 6 days, B calves did more self-grooming than A calves ; from the 4th to the 7th day, they did more pen-licking than self-grooming ; and from the 8th to the 14th day, more chain licking than pen-licking. The changes in behaviour of the B calves might be ' displacement activities ', indicating disadaptation of B calves to the environment.

This behaviour cannot be related to mineral dietary deficiency, since the two groups were fed an identical diet.

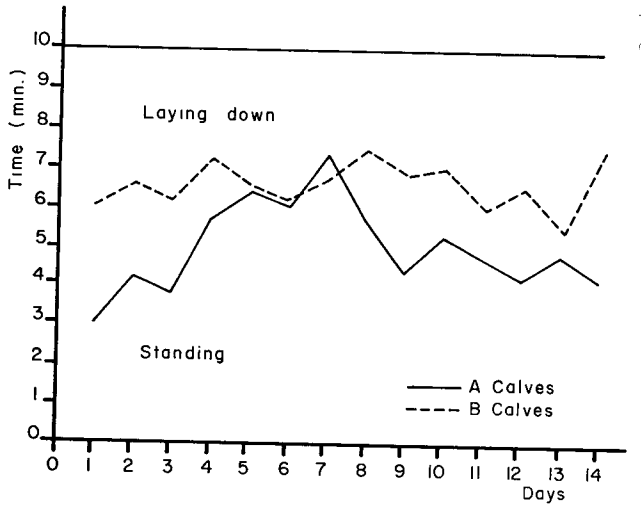

FIG. 5

Mean times of standing and lying down during each 10 minutes observation, during the 14 days.
Temps moyen de station debout et de coucher dans les deux groupes de veaux pendant les observations.

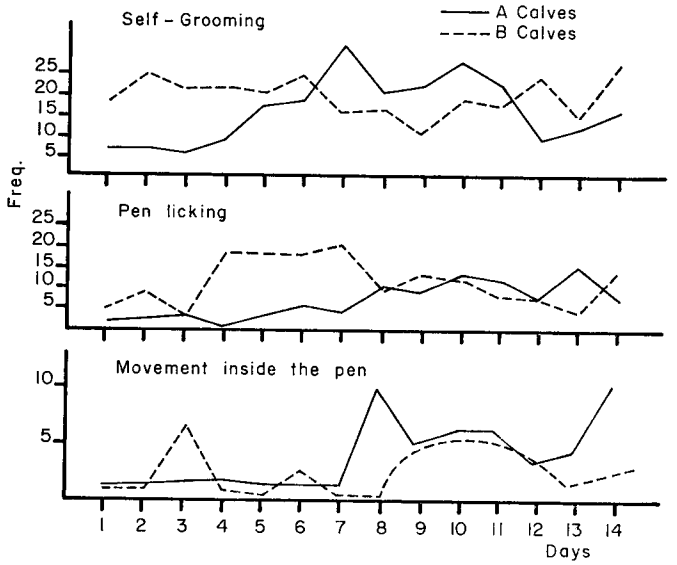

FIG. 6

Mean frequencies of self-grooming, pen licking and movement inside the pen on each day of observation.
Fréquence moyenne de toilette, de léchage du box et de mouvement pendant les observations.

Table 1

TAIL LICKING

A Calves

Days \ Calf	1	2	3	4	5
1	0	1	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	2	0
6	0	3	0	0	0
7	0	51	0	0	0
8	1	30	0	0	0
9	0	17	0	0	0
10	1	21	0	0	0
11	3	20	0	0	0
12	5	15	0	0	0
13	0	17	0	0	0
14	2	0	0	1	0
tot	12	175	0	3	0

B Calves

Days \ Calf	1	2	3	4
1	0	0	0	58
2	0	0	2	62
3	0	0	2	45
4	0	0	0	66
5	7	0	0	80
6	0	0	0	71
7	0	0	0	60
8	19	0	0	73
9	8	0	0	36
10	33	0	2	64
11	16	0	0	63
12	6	1	0	74
13	13	0	0	67
14	26	0	0	95
tot	128	1	6	914

Table 2

CHAIN LICKING

B Calves

Days \ Calf	1	2	3	4
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	5	25	0	0
6	0	0	0	0
7	0	9	0	0
8	0	17	20	0
9	0	0	19	0
10	1	14	70	0
11	0	2	60	0
12	2	31	64	0
13	0	3	54	0
14	5	23	57	0
tot	13	124	344	0

TABLE 1 : *Frequencies of tail licking for « A » and « B » calves. Fréquences de léchage de la queue (veaux A et B).*

TABLE 2 : *Frequencies of chain licking for « B » calves. Fréquences de léchage de la chaîne (veaux B).*

Conclusions

The growth rates seem to indicate that in the B stable the qualitative and quantitative characteristics of the environment (in particular the high humidity level did not provide a ' welfare zone ' suitable for veal calf production. By ' welfare zone ', we mean a compromise between the calves requirement and the environment available. This shows the importance of interaction between the animals' physiological needs and factors such as temperature, humidity and ventilation, already reported by other investigators (BLOM, 1982 ; HOLZHAUER, 1982).

Observation of behaviour is a valid instrument for evaluating good physical condition of the animals. The two groups had very different weight gains and also had different behavioural patterns, especially in time spent standing. Behavioural indices are also helpful for early detection of disadvantageous conditions (at 14-28 days of age), since differences in growth rate appear only later.

Our results show that more than one behavioural index needs to be evaluated since behavioural patterns change in importance with time.

Finally, the results show the effects of different housing conditions on the calves' growth and behaviour. The rubber floor of the B group pens does not seem as suitable as the wooden slatted floor of A group pens.

Slurry stagnated on the rubber floor since the slope was not deep enough to remove it. In addition, stagnating urine caused a higher concentration of ammonia gas, which the inlet fans could not eliminate completely.

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Résumé

Comportement et performances de veaux de boucherie suivant les conditions de logement

Deux groupes de veaux de boucherie ont été observés dans des installations différentes. La première installation (type A) était caractérisée par des boxes surélevés, avec un plancher en lattes de bois, et par une extraction forcée de l'air. Dans la seconde (type B) les veaux étaient sur un sol légèrement en pente recouvert de caoutchouc ; de l'air frais était introduit par un ventilateur. Les veaux du logement A ont eu des croissances nettement supérieures à celles des veaux du logement B. Les observations comportementales ont confirmé le « bien être » supérieur assuré par l'installation A par rapport à celui de l'installation B.

Mots clés : Stabulation, comportement, veaux de boucherie, « bien être », microclimat.

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