SOCIETY for VETERINARY ETHOLOGY

Summer Conference

University of Bristol
6th - 8th July 1989

SUMMARIES OF PAPERS

NOTES:

1. Summaries are given here in the order in which papers are to be presented, with posters at the end.

2. Summaries have not been submitted for all spoken papers, and only a few have been submitted for posters. Authors are therefore listed on the right, in the order in which summaries appear, to assist readers to locate summaries as required.

3. It is regretted that there are difficulties in legibility of some summaries. This usually follows from authors failing to allow for the clearly stated intention to reduce two A.4 sheets to one, or to follow other explicit submission instructions. Some even submitted three pages !

SPOKEN PAPERS (in order of presentation):
Lawrence, A.B. and Illius, A.W.
Cooper, J.
Gerken, M.
Petherick, C., Rutter & Duncan
Appelby, M.C.
Grandin, T.
Alexander, T.L.
Kent, J.
Cockram, M.S.
Knowles, T.G.
Kenny, F.J.
Trunkfield, H.R.
Ewbank, R. and Kent, J.
Hughes, B.O. and Appleby, M.C.
Terlouw, E.M.C., Lawrence, Nielsen & Illius
Dybkjaer, L.
Rushen, J., Schouten & de Passille
Ventorp, M. and Michanek, P.
Horrell, I. and Wild, H.
Kiley-Worthington, M.
French, J.M.
Lidfors, L.
de Passille, A.M.B., Robert, Durbreuil, Pelletier & Brazeau
Csermerly, D. and Nicosia, E.
Kyriakis, I. and Emmans, G.C.
POSTERS :
Manninen, E and Castren, H.
Mohan Raj, A.B., Audsley & Gregory
Mohan Raj, A.B. and Moss, B.W.
Reed, H.
Rundgren, M., Forsslund & Froberg
Vanicek, J., Vestergaard, Jurackova, Dostal & Mihula

OPERANT CONDITIONING AS A TOOL TO UNDERSTANDING PIGS' FOOD NEEDS

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SVE, Bristol Summary

SUMMARY

The study of the existence and nature of motivational states underlying behaviour is often seen as critical to understanding the implications of restrictive husbandry conditions for the welfare of the animal. One technique increasingly used to measure motivation is operant conditioning where an animal is trained to perform an operant response to obtain a reward. However there is a clear need to improve our understanding of operant conditioning as a technique. The schedule on which the animal is reinforced by rewards is recognised to have large effects on operant response rates yet few studies have directly compared operant performance in relation to reward schedule. Two reward schedules were compared for their sensitivity in measuring motivational changes due to food restriction in the pig (Sus scrofa). Six boars were each restricted (proportionally) to 0.8, 0.6 and 0.4 of their predicted ad libitum food intake (PFI) in a Latin-square design. Subsequently, they were offered their PFI (treatment 1.0). Feeding motivation was measured using a fixed ratio of 10 panel presses for each 6 g reward of food (FR schedule), and operant response rates were measured over 20 minute sessions at 3 times post-feeding on each food level. Another 6 boars were subjected to identical conditions, differing only in their being rewarded on a progressive ratio (PR) where the response contingency was incremented by one on each successive reward. Reward rate per session was strongly affected by food restriction on both FR and PR schedules. On FR, reward rate per session increased with food restriction but only up to a maximum at food level 0.6. On PR in contrast it was possible to distinguish between reward rates on food levels 0.6 and 0.4 up to 5 hours post-feeding (Fig. 1). Progressive ratio appears to be a more sensitive means than FR of measuring changes in feeding motivation, however the cost is an increase in the variability of the response data. The results suggest that the subjects on treatment 0.6 were maximally food-motivated for at least 19 hours of the day. This also applies to sows and boars maintained on similar levels of food restriction under commercial conditions, showing the extreme divergence between food-restricted pigs' motivational need for food and their economically determined food allowances.

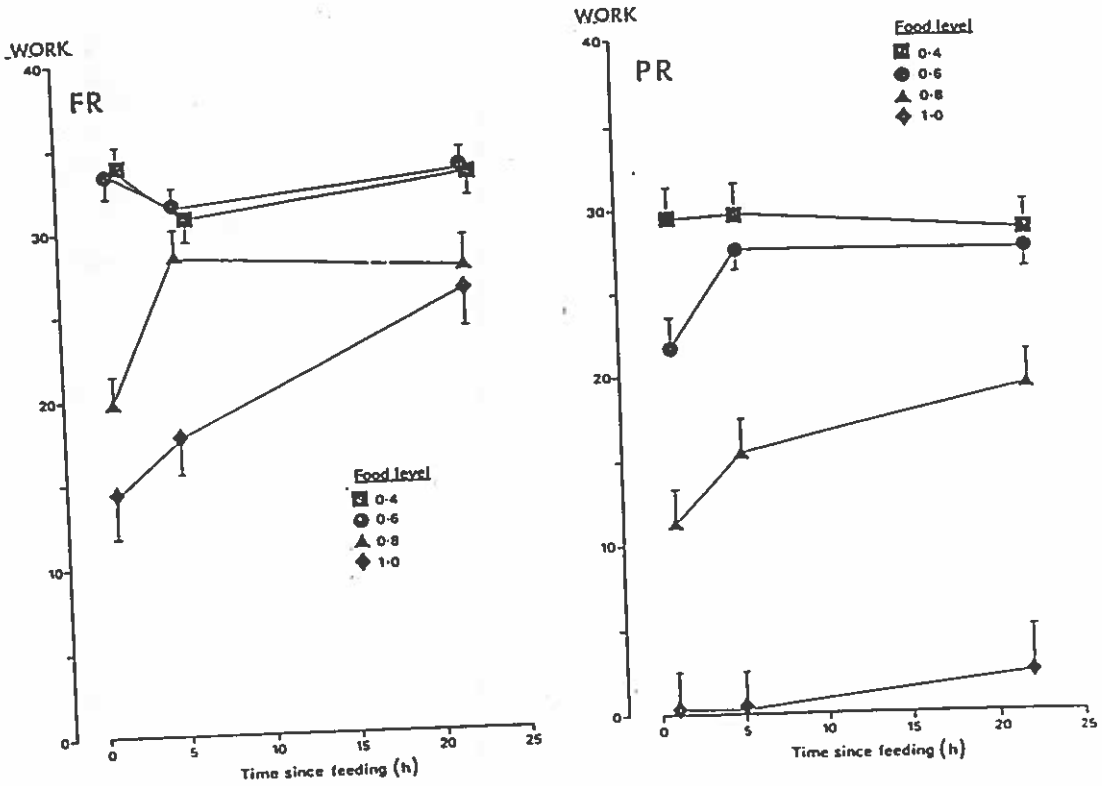

Fig. 1. The effect of time since feeding on rewards earned per session for different food levels: a) FR schedule: b) PR schedule

A BEHAVIOURAL ANALYSIS OF STEREOTYPIES IN THE BANK VOLE (Clethrionomys glareolus)

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ABSTRACT

Bank voles (Clethrionomys glareolus) readily develop stereotypic behaviours when reared singly in cages. It has been suggested that these stereotypies function to reduce arousal caused by conflict situations, a response mediated by opioid peptides in the brain. But does this mean that the voles are coping with the original situation? Preference tests may be used to examine how the vole's perception of its environment is affected by the performance of stereotypies.

Two experiments were carried out to investigate this effect. The purpose of Experiment 1 was simply to design a choice-test, to which the voles were sensitive. Four voles showed a preference for a box containing hay, as well as sawdust litter, over a box with just litter, in a T-maze. In Experiment 2, eight voles were tested in the same T-maze, as they aged. Six of the 8 voles developed stereotypic behaviour. As these voles aged the amount of stereotypies increased (Fig.1), whilst their preference for the hay box diminished (Fig.2). This implies that as stereotypies arise, they reduce the vole's ability to distinguish between different environments, the aversion to the least preferred having decreased. This experiment continues with a further 9 voles, concentrating on the variation between individuals.

FIG 1 Mean time spent in hay box for 8 voles

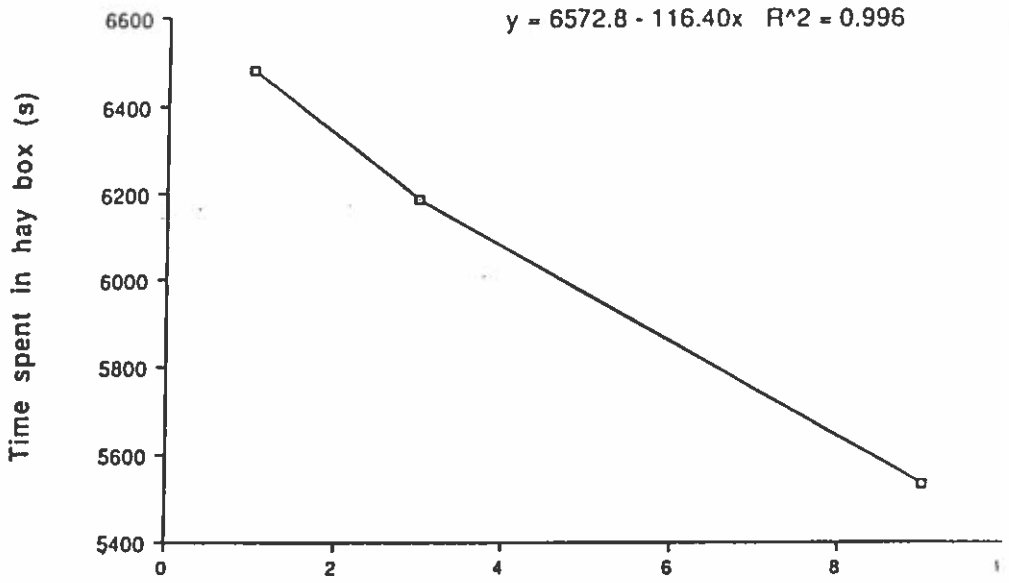
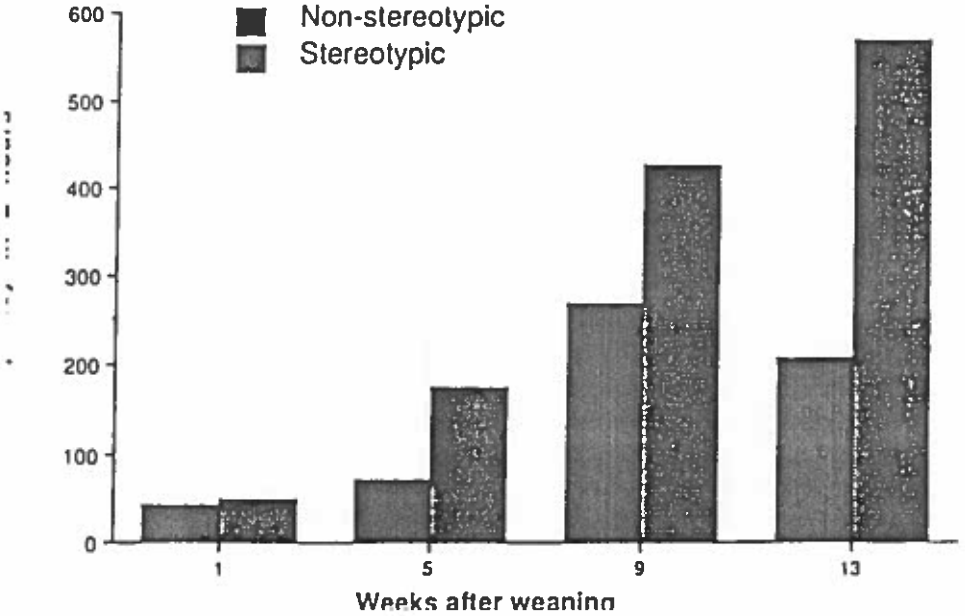


FIG 2 Change in sterotypic and non-stereotypic action patterns with age



OVIPOSITION INTERFERES WITH THE DIURNAL RHYTHM OF DUSTBATHING IN JAPANESE QUAIL

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The diurnal rhythm of dustbathing behaviour was studied in female and male Japanese quail (Coturnix coturnix japonica) originating from lines genetically selected for high or low dustbathing activity for 16 generations and the randombred control (Gerken and Petersen, 1987). A total of 120 birds (20 per line and sex) was observed by time lapse video recorder between 07.00 and 19.00 h (the photoperiod was from 05.00 to 21.00 h). Duration of dustbathing was individually recorded per hour and expressed as percentage of total dustbathing time per bird. There was no significant difference in total time spent dustbathing between males and females (17.9 vs 20.9 min). Male dustbathing behaviour, however, showed a marked peak in the second half of the lighting period, whereas in females the diurnal rhythm was less pronounced (Fig. 1). Grouping females into hens with (layers, N=47) and without (non-layers, N=13) oviposition on the observation day resulted in similar rhythms for non-layers and males (Fig. 2). Since Japanese quail mainly lay during the second half of the lighting period influence of oviposition appeared to be the main reason for the differences in rhythms in non-layers and layers (Vestergaard, 1982). Computations based on the exact oviposition times of 20 females showed that dustbathing decreased sharply between 1 to 2 h pior to oviposition and was re-initiated afterwards. The percentage values for dustbathing 4, 3, 2 and 1 h before and 1, 2, 3 and 4 h after oviposition averaged 10.5, 11.2, 7.7, 2.5 and 5.8, 16.8, 6.2, 3.9 min respectively. Correction of dustbathing performance of layers for the influence of oviposition resulted in a dustbathing rhythm similar to those of non-layers and males. It is concluded that dustbathing is a behaviour of lower priority only activated when behavioural patterns of higher priority such as oviposition are satisfied.

Gerken, M. and Petersen, J., 1987. Bidirectional selection for dustbathing activity in Japanese quail (Coturnix coturnix japonica). Br. Poult. Sci., 28: 23-37

Vestergaard, K., 1982. Dust-bathing in the domestic fowl - diurnal rhythm and dust deprivation. Appl. Anim. Ethol., 8: 487-495

Fig.1: Diurnal rhythm of dustbathing in males (N=60) and females (N=60)

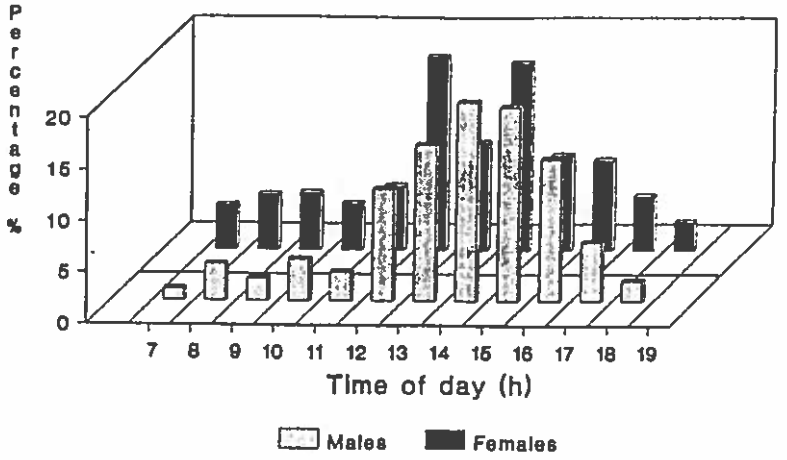
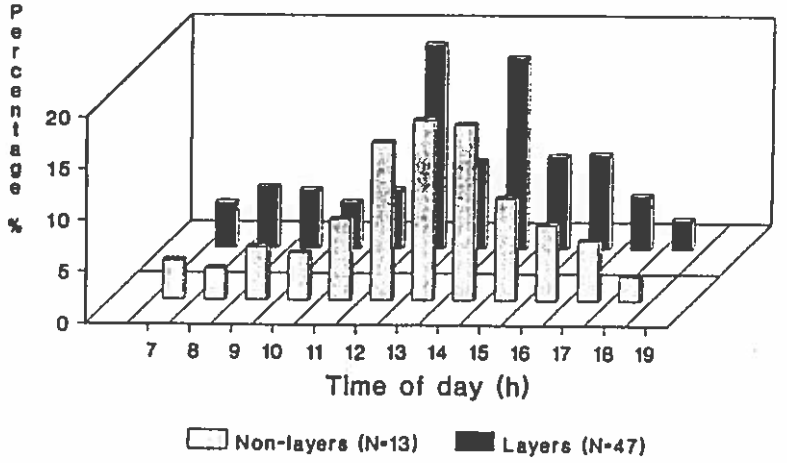


Fig.2: Diurnal rhythm of dustbathing in females grouped by occurence of lay



A PUSH-DOOR FOR MEASURING MOTIVATION

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We believe that animal welfare is dependent solely on the cognitive needs of the animals concerned (Duncan and Petherick, in press). Therefore, in order to assess welfare we need to know how an animal "feels" about the conditions under which it is kept and the procedures to which it is subjected.

Duncan and Kite (1987) measured the motivation of hens to gain access to a nest box by placing obstacles in their way. In addition, they used a swing door to which weights could be added to see how hard a bird would work to reach the nest box. However, the force that had to be exerted by the bird to open the door increased as the door was being pushed. Also, the maximum force that a bird was prepared to exert could only be determined by slowly increasing the weight of the door over a number of trials. Therefore, a computer-controlled "push-door" was developed (Figure 1). An unweighted door was held closed by an electro-magnet and the force exerted against the door measured with a load-cell. When the bird had performed a given amount of 'work' (measured in terms of force x time, Ns), the electro-magnet was switched off allowing the door to open. This door was evaluated with five Isa Brown and six Ross White hens, which had been trained to use the push-door to get access to a small food reward. During a nine week period each bird was randomly deprived of food for either 43h or 12h, on 12 occasions and tested with the push-door, having to reach the threshold of 13Ns. The time taken by the birds to reach this threshold was recorded and plots made of the force exerted and the cumulative force exerted against time (Figure 2).

The times taken to get through the door were analysed by Analysis of Variance at the within-bird level. Birds deprived of food for 43h pushed through the door significantly faster ($F_{1,115}=8.44$; $p<0.01$) than those deprived for 12h. However, examination of the force plots showed that on occasions the force exerted by the birds had exceeded the maximum that the load-cell was capable of recording. Also, excessive "bounce" of the door made calibration of the system difficult. These problems do not invalidate the findings, as they were likely to reduce the differences found between the two deprivation times. Changes will be made to the hardware to overcome the difficulties and the system will be used to assess the motivation of birds to gain access to, or avoid a wide range of stimuli.

REFERENCES

Duncan, I.J.H. and Kite, V.G., 1987. Some investigations into motivation in the domestic fowl (Abst.). *Appl. Anim. Behav. Sci.*, 18 : 387-388.

Duncan, I.J.H. and Petherick, J.C. Cognition: the implications for animal welfare (Abst.). *Appl. Anim. Behav. Sci.* (in press).

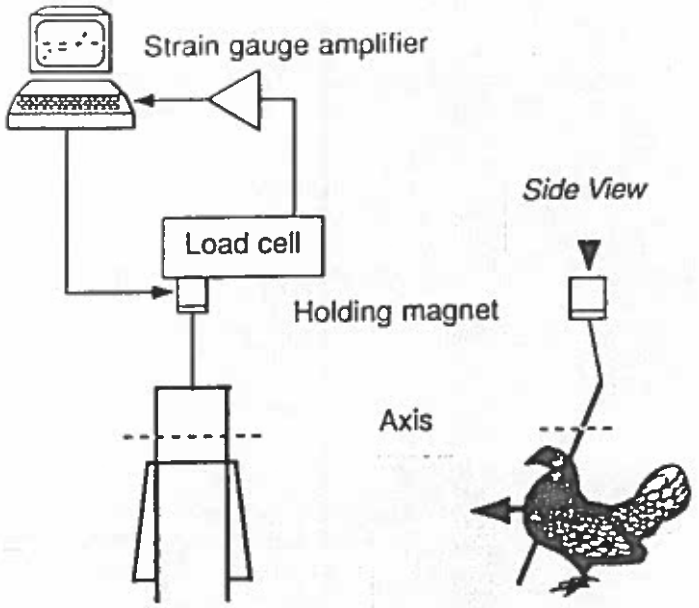

Figure 1. Diagram of the push-door.

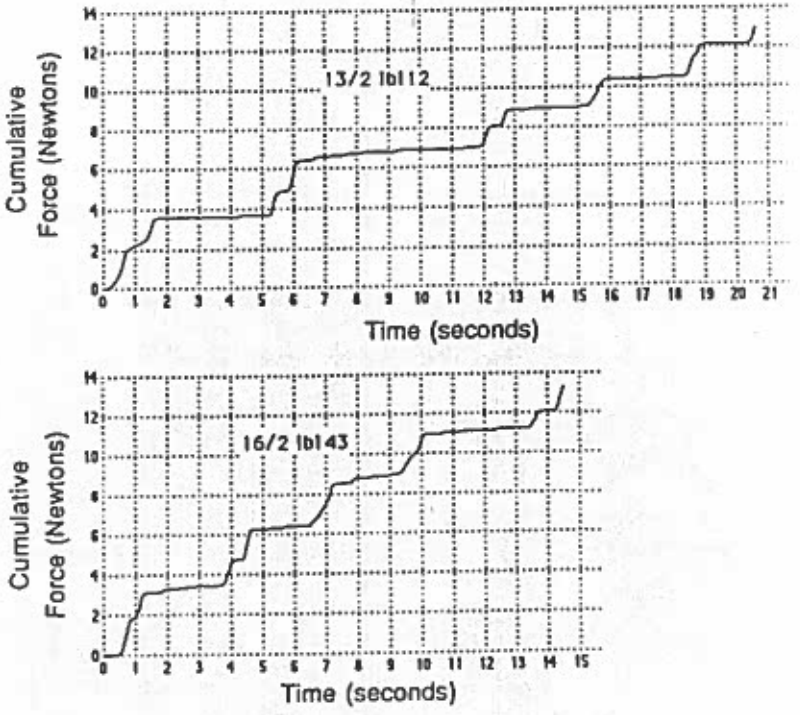

Figure 2. Cumulative plots of force (as measured at a fixed point on the door) with respect to time.

INDIVIDUAL VARIATION in PRE-LAYING BEHAVIOUR of HENS : IMPLICATIONS for MOTIVATION

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ABSTRACT

Intensive housing systems are criticised for preventing certain behaviour, or for constraining appropriate matching of stimuli and behaviour. Yet even in more extensive conditions some individuals may fail to show these behaviour patterns, or may react to stimuli in unexpected ways. The implications of such individual variation for motivation are not clear, but are clearly important. Pre-laying behaviour of hens shows considerable variation. In cages, some hens show frustrated pacing, while others perform vacuum nest building. It is not known whether the latter indicates strong motivation, and hence also frustration, or a low threshold for stimuli triggering nesting. Similarly, in systems with nest sites provided, it has hitherto been unclear whether motivation differs between hens which use them and those which lay elsewhere.

Pre-laying behaviour of hens in cages provided with nest-sites was compared with that in control cages. Nest sites were of 4 types, varying in complexity from a simple wooden surround within the cage to a nest box behind the cage. The proportion of hens laying in these sites varied, increasing with complexity. Furthermore, pre-laying behaviour of hens which did not lay in the nest sites also varied; some showed abnormal behaviour indicative of frustration. This suggests that nesting motivation was high irrespective of the final choice of laying position. Nevertheless, design of appropriate nesting facilities to be provided for hens is especially difficult, both because of the individual variation described and because stimuli for nest-site selection lie on a continuum from sub-optimal to super-normal.

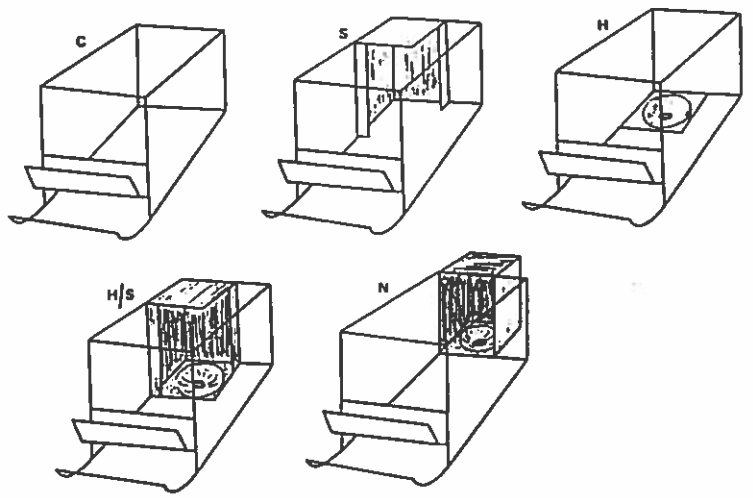

Fig. 1. The experimental cages : control cages (C) had no nest site provided; other treatments had a wooden surround (S), a fibreglass rollaway hollow (H), a hollow and a surround (H/S) or a hollow in a nest box (N).

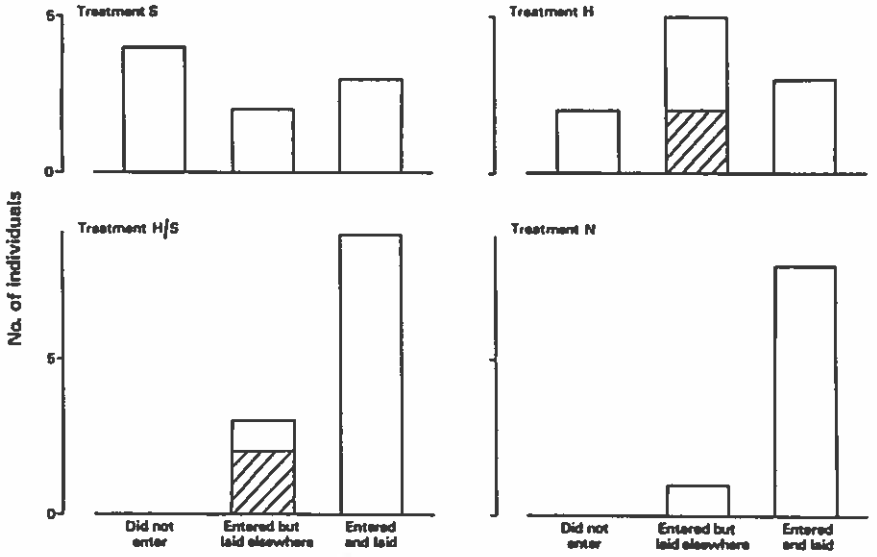

Fig. 2. Response of individual hens to nest sites in the different experimental treatments. Shaded sections of columns indicate hens with abnormal pre-laying behaviour; these hens entered the nest site many times (medians 34 to 62) before laying elsewhere.

DESIGNATION IN PRE-SLAUGHTER HANDLING

TEMPLE GRANDIN

Principles of animal behavior should be used to design improved pre-slaughter handling systems. Three or four single file races in parallel leading to multiple stunners would greatly improve the welfare and meat quality of slaughter pigs (Figure 1). This system would avoid stress associated with forcing pigs into a single line at high production speeds. The pigs would move through the system three or four abreast. The outer walls of the race and crowd pen would be solid to prevent the pigs from seeing outside distractions. The inner partitions in between the animals would be constructed from bars. The pigs would be able to see each other through the inner partitions. This would promote following.

However, some pig handling problems can not be solved with design changes. Certain genetic lines of pigs are highly excitable. When these pigs are reared in an environment with low stimulation levels they become extremely excited and aggitated during handling. When driven, they balk, turn back and shelter seek within the herd. Some of these pigs are so difficult to drive that it is almost impossible to handle them gently at high production speeds. Environmental enrichment and selective breeding will be required to solve this problem. Toys and extra contact with people inside the fattening pens will reduce excitability.

For cattle, there is a need to fully implement design concepts which are already known such as solid fences and curved races. For sheep, there is a need to continue research started by Ron Kilgour on leader sheep and the sheep carousel. Leader sheep and leader goats are very efficient. The sheep carousel is a rotating platform containing sheep. The carousel is located near the entrance to the race.

A new double rail restraining system is operating successfully in two U.S. calf slaughter plants. The animal straddles a moving conveyor (Figure 2). Some of the advantages of this system compared to a V conveyor restrainer are: ease of animal entry, animals ride more quietly, and stunner placement is more accurate because the stunner operator can stand closer to the animal. Animals can enter more easily because they can walk in with their legs in a normal position.

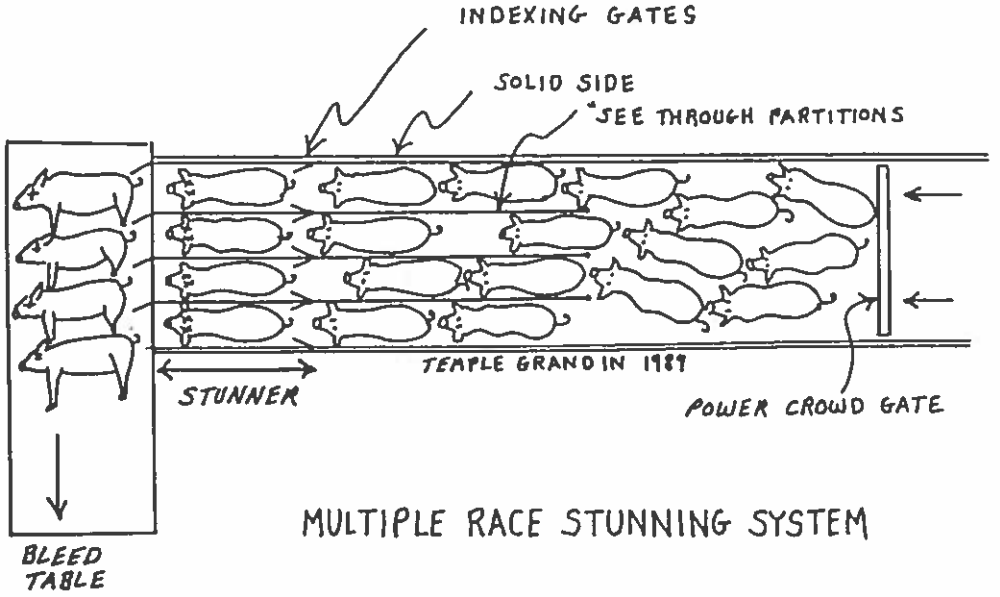

Figure 1. Pig handling system

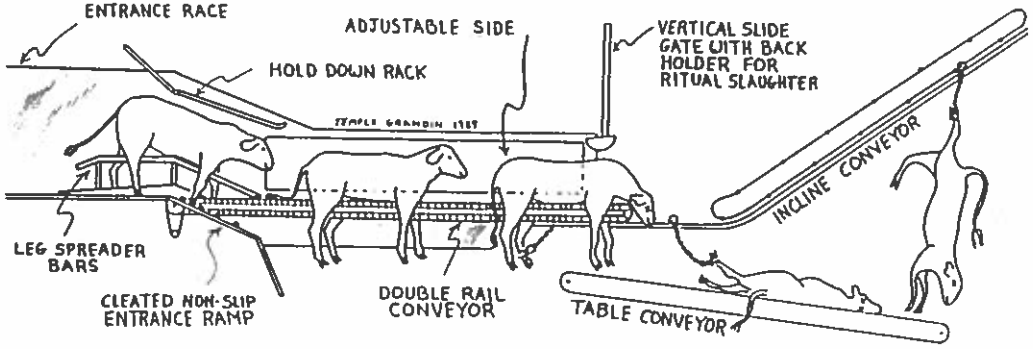

Figure 2. Double rail restrainer conveyor

ABSTRACT

THE HANDLING, TRANSPORT AND PRE-SLAUGHTER MANAGEMENT OF FARMED DEER

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MAFF, St Mary's Manor, Beverley (Great Britain)

ABSTRACT

The sources of breeding stock for the United Kingdom red deer farming industry are the free living population, parks and zoos and more recently fully stocked farms. In general there is a down the hill flow of breeding stock and also store calves to finish for slaughter. Where feasible, field slaughter of 10 or more deer from a large group can be carried out humanely by a proficient marksman and stockman at a regular feeding site. Only farmed deer accustomed to being handled should be taken to an abattoir. Certain classes should not be taken. Precautions are necessary during shedding out on the farm and in transit to ensure a minimum of stress. Prior arrangements should be made for the arrival of the deer to enable them to be slaughtered without delay. Calm, confident, competent handling is required at all times. Once stunned, deer should be bled immediately.

a KENT (Univ. Edinburgh):

The behavioural response of 3 month old calves to 18 hours transportation

The five main component parts of transportation of livestock are, the original environment, loading, travel, unloading and the new environment. Each component is composed of a multitude of potential stressors eg. changes in temperature, food supply, companions, and environment, vibration, noise, stocking density, presence and use of dogs and sticks. Some of these stressors are features of commercial transportation that are difficult to avoid. This paper investigates to what degree a change in environment post travel has an effect on the behaviour of 3 month old calves.

Two groups of Friesian, Hereford x Friesian calves (about 100kg) were observed before, during and after 18 hours road transportation (685 km) at 0.5m^2/ calf (206kg/m^2). Observations of lying, sleeping, ruminating, eating and drinking were made every 6 minutes by a team of 3 observers working for two hour periods. After the journey one group (n=5) of calves was placed in a fresh environment (but with the same food and handlers) while the other group (n=4) was returned to its own pen.

The calves spent the first hour of the journey standing with hunched backs and defaecating profusely, the faeces being more liquid than normal. The first calf laydown 3 hours after loading - later than for calves transported at 0.72m^2/calf. 10.4% of the in transit time was spent lying (65% normal day and 42% for calves transported for 18 hours at 0.72m^2/calf). The bulk of the lying occurred while travelling on Motorways, stationary or towards the end of the journey (Figure 1). The calves preferentially lay round the perimeter of the trailer where the straw bedding had built up. The calves ruminated for 19% of the journey time (33% normal day) but 91% of this rumination occurred while the calves were standing (less than 1% normal day).

On their return to a pen both groups of calves, first walked about snatching at the straw bedding before having a drink and eating some of their concentrate feed. All calves were lying within half an hour of being unloaded. Both groups of calves had eaten all their concentrates by morning and quickly devoured the 9am feed before lying down again. Very little hay was eaten in the first 6 hours after unloading and the new pen group were only just beginning to pull their hay 10 hours after travel, despite having had little to eat in transit.

The overall behaviour results for both a normal day and the recovery days are summarised in Table 1. Lying time was increased by a 4 hours with an increase in sleeping time and a decrease in rumination during the recovery 24 hours. There was also a reduction in the time spent eating. Figure 2 demonstrates that during the recovery period the calves lay down quickly immediately after being fed compared with a normal day. Sleeping was evenly distributed throughout the day. The main difference in behaviour after the journey between calves returned to a familiar environment compared with a strange environment was an increase in rumination time and reduction in idling and sleeping time. The amount of time spent eating was unaffected by the change in environment.

The in transit weight loss was 2.1 kg greater than for 3 month old calves transported for 18 hours at a stocking density of 0.72m^2/calf (Table 2).

The lack of rumination and lying, the excessive defaecation and urination, the looseness of the void faeces and the hunched backs were all behavioural changes seen during the early stages of transportation that suggested that the calves were frightened/excited and therefore stressed during this period. The rise in plasma cortisol in calves of a similar age (Kent and Ewbank, 1986) would support this suggestion. The decreased in transit lying and ruminating times and increased weight loss compared with calves transported at 0.72 m^2/calf would suggest that travel at 0.5m^2/calf was more stressful than at 0.72m^2/calf.
The decreased appetite, increased lying and sleeping post travel, also seen when 6 month old calves were transported (Kent and Ewbank, 1983) suggest that the calves were fatigued by the 18 hour journey. The decreased appetite is opposite to the findings of Kilgour and Mullord, 1973 and Bisschop (1961) and Kent (1977) in grazing calves/cattle. The change in the environment post transport only resulted in a non-significant increase in sleeping time at the expense of ruminating, resulting in an increased idling time.

Table 1
BEHAVIOUR OF 3 MONTH OLD CALVES AFTER TRANSPORTATION

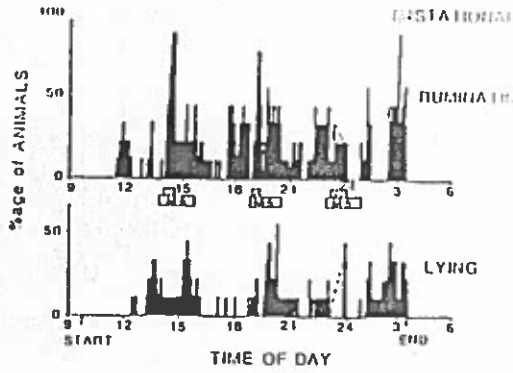
ACTIVITY	GROUP					
	New Pen			Old Pen		
	Normal		Recovery	Normal		Recovery
Lying	14.7	**	18.8±0.5	14.5	**	18.0±0.6
Sleeping	3.5	**	+6.0±0.2	3.8	NS	+4.9±0.4
Ruminating	9.4	**	6.7±0.7	8.9	NS	8.3±0.3
Eating	6.5	**	4.6±0.4	6.0	*	4.8±0.4
Idling	8.1	***	12.9±0.9	8.8	**	10.9±0.3
Standing idling	2.8		1.3	2.9		0.5

Table 2
IN TRANSIT WEIGHT LOSSES DURING AN 18 HOUR JOURNEY

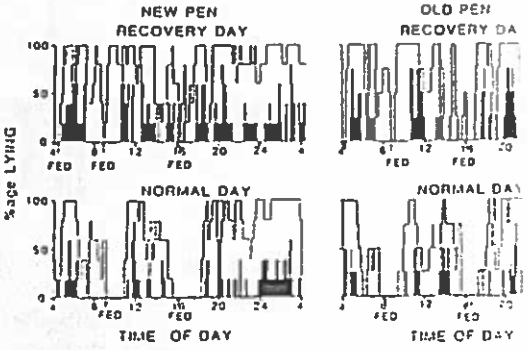
Stocking Density (m^2/calf).	Weight loss (Kg)	%BW
Control	5.9 ± 0.54	6.0 ± 0.2
0.72	6.5 ± 1.14	6.1 ± 0.9
0.50	8.7 ± 1.15	8.4 ± 1.0

BW - Body weight

IN TRANSIT LYING & RUMINATING BEHAVIOUR
3 month old calves 0.5m /calf



LYING & SLEEPING BEHAVIOUR PATTERN POST TRANS
3 month old calves



'RESTING' BEHAVIOUR OF CATTLE IN A SLAUGHTERHOUSE LAIRAGE

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Ninety-three groups of cattle were observed overnight in a slaughterhouse lairage pen (surface area 31m^2). A video camera and time-lapse recorder was used to make scans of activity at 10-minute intervals. The median group size was 6 (range 2-19). The mean duration of a group of cattle in the lairage pen was 18 h (s.e. 0.3). The lying behaviour of the cattle increased over the first 12 h in the lairage. The proportion of cattle lying did not normally reach a constant level, but consisted of a series of peaks. The median number of lying periods was 4 (range 0-12). Most lying behaviour occurred between 6 p.m. and 6 a.m. (mean arrival time 2.24 p.m; mean removal time 8.25 a.m.). This period was associated with minimal human activity in the lairage.

The groups were categorized by sex (steers, heifers and steers + heifers) and by source (local farms; local markets, adjacent to the slaughterhouse; and other markets, median 43, range 35-100 miles from the slaughterhouse). A one-way analysis of variance was used to compare the effect of sex on the lying behaviour of cattle from local farms and a two-way analysis of variance was used to compare the effects of distance travelled to the slaughterhouse and sex on the lying behaviour of cattle from markets. The lying behaviour of cattle from local farms was then compared with that from markets using t-tests.

The time between arrival and the first animal lying down was greater in farm cattle (5 h) than in market cattle (2 h) ($P<0.01$). The time taken for more than half of the group to lie down was also greater in farm cattle (8 h) than in market cattle (steers 2½ h, heifers 2 h, and steers + heifers 4 h) ($P<0.01$). The proportion of time in the lairage when no cattle were lying down was greater in farm cattle (0.65) than in market cattle ($P<0.05$). There was a significant interaction between the distance travelled by market cattle to the slaughterhouse and the sex of the group (local markets: steers 0.24, heifers 0.41, steers + heifers 0.40; other markets: steers 0.42, heifers 0.27, steers + heifers 0.48). The proportion of time in the lairage when more than half of the cattle were lying down was less in farm cattle (0.20) than in local market: steers (0.64), heifers (0.37), steers + heifers and other market: heifers (0.59) ($P<0.05$). The proportion of time in the lairage when proportionately >0.9 of the cattle were lying down was less in farm steers (0.01) than in market cattle (0.13) ($P<0.05$).

The exposure to a novel environment and activity in the lairage probably resulted in less resting behaviour than that found in cattle kept in a familiar farm environment (e.g. steers + heifers observed on a farm for 3 days were found to spend only one-fifth of their time with no animal lying down and to spend about half of the time with more than half of the group lying down). In the lairage, for more than half of the time no cattle direct from farms were lying down and for only one-fifth of the time were more than half of the group lying down. More lying behaviour was found in market cattle than in cattle direct from farms. However, only steers from local markets and heifers from other markets spent at least half of the time with more than half of the group lying down. Groups of cattle from markets require 2-4 h and groups of cattle direct from farms require 8 h in the lairage before resting behaviour commences in over half of the group.

Acknowledgement

The video equipment was provided by the Humane Slaughter Association.

Effects of source and sex on the behaviour of groups of cattle in a slaughterhouse lairage

			Mean	s.e.	n			Mean	s.e.	n	Statistical significance
$\log_e$[time between arrival and the first animal lying down (h)]*	Farm		1.73	0.207	20						
						Market		0.68	0.072	73	***
$\log_e$[time between arrival and proportionately >0.5 of the group lying down (h)]*	Farm		2.07	0.173	20						
						Market	steers	0.97	0.187	15	***
						Market	heifers	0.85	0.113	26	***
						Market	steers+heifers	1.42	0.119	32	**
arcsin $\sqrt{}$ [proportion of time in the lairage when no cattle were lying down]	Farm		53.7	4.10	20						
						Local	market steers	29.1	1.95	8	***
						Local	market heifers	40.0	3.03	18	*
						Local	market steers+heifers	39.1	2.52	16	**
						Other	market steers	40.3	4.75	7	*
						Other	market heifers	31.0	1.71	8	***
						Other	market steers+heifers	43.9	2.04	16	*
arcsin $\sqrt{}$ [proportion of time in the lairage when proportionately >0.5 of the group were lying down]	Farm		26.8	3.86	20						
						Local	market steers	52.9	2.45	8	***
						Local	market heifers	37.3	3.02	18	*
						Local	market steers+heifers	40.8	3.06	16	**
						Other	market steers	35.7	5.67	7	
						Other	market heifers	50.4	2.84	8	***
						Other	market steers+heifers	36.5	3.20	16	
arcsin $\sqrt{}$ [proportion of time in the lairage when proportionately >0.9 of the group were lying down]	Farm	steers	4.4	3.54	7						
	Farm	heifers	14.7	3.61	7						
	Farm	steers+heifers	21.1	4.59	6	Market		21.5	1.63	73	*

*When no cattle in a group lay down the total time in the lairage was used to calculate this value.

THE EFFECT OF HOUSING SYSTEM ON THE ACTIVITY LEVEL AND BONE STRENGTH OF LAYING HENS

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Spent hens have been shown to suffer a high incidence of broken bones during handling and transport (Gregory and Wilkins in press). The problem is especially severe in hens from battery cages. In order for bone to maintain its mechanical integrity it must be subject to some level of dynamic loading. Only short periods of loading above a given threshold of magnitude and frequency are necessary to prevent degeneration (Lanyon *et al*, 1986). In order to investigate the effects of housing systems on bone strength and relevant exercise, ISA Brown laying hens in three types of housing systems were studied:-

1. Commercial battery cages at 5 birds per cage with a space of 430cm² per bird, a maximum height of 43cm and a minimum height of 33cm.

2. The ADAS experimental Elson Module system in which 80 birds were housed in four tiers (each 98cm x 320cm x (50cm max-40cm min)) interconnected by a stairwell. The tiers consisted of a lower littered level and three wire floored upper decks with nest boxes, feeders and drinkers and perches beside the stairwell.

3. A perchery system containing 1318 birds stocked at 16.9 birds/m² and with a littered area of 44.05m².

The birds were housed at 18-19 weeks old. Activity levels were recorded after 50 weeks of age. The average number of wing movements and steps taken by birds per hour during the light period were calculated from video recordings of the birds within each system. Wing movements were broken down into four categories of event - a)flights b)flaps c)stretches and d)ruffles. The birds were slaughtered at approximately 61 weeks old and a tibia and humerus dissected out. Bone strength was measured on a tensiometer as the peak breaking strength of the bone, broken using a three point bend.

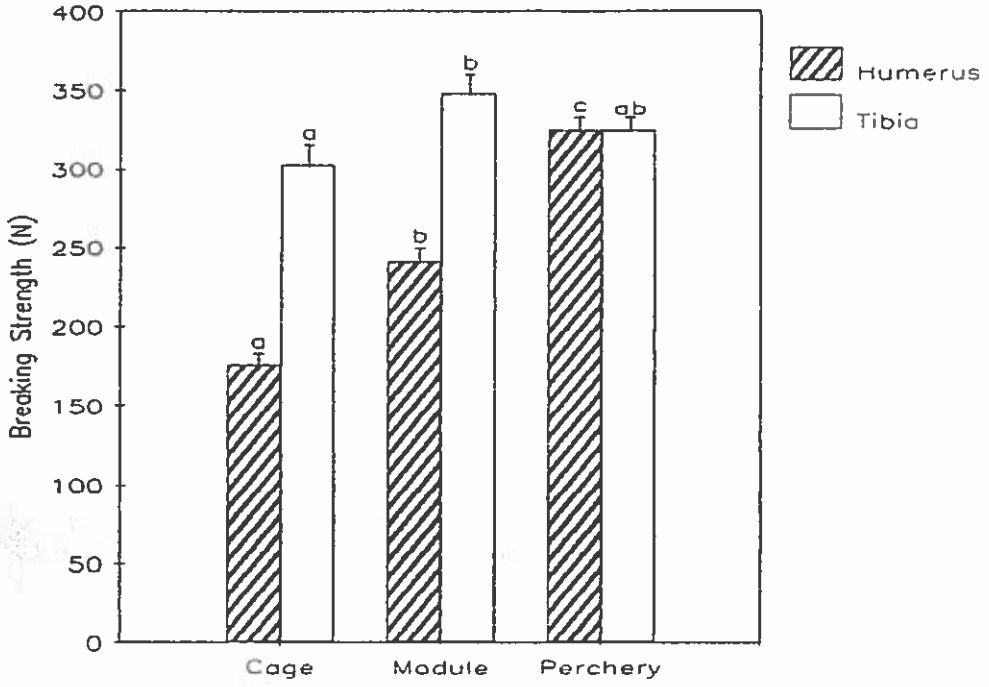
The amount of exercise which involved load-bearing by bone was much less in the cages (Table 1) and bone strength was less (Fig. 1). Bird weight in the cages (1.8kg) was lower than in the other systems (module 2.2kg, perchery 2.1kg).

The perchery birds, with the least constraint on movement, can be considered as the control case. The results suggest that the movements made by the caged hens were insufficient to prevent bone degeneration. The tibia strength of module birds was probably enhanced by use of perches (Hughes and Appleby, 1989) and by the much higher levels of walking but they had insufficient opportunity to properly exercise their wings.

Table 1. Median bird movements within systems

	Types of movement/bird/hour		
	Cage	Module	Perchery
Flight	0.0 a	0.0 a	0.4 b
Flap	0.0 a	0.2 b	1.9 c
Stretch	4.0 a	0.1 b	0.0 c
Ruffle	1.3 ab	0.9 a	0.3 b
Steps	72.0 a	1058.3 b	208.2 c

Figure 1. Mean bone breaking strength



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THE BEHAVIOUR OF BEEF CATTLE DURING SHORT-HAUL ROAD TRANSPORT

F. J. Kenny

Kilmurray, Enfield, Co. Meath, Eire.

ABSTRACT

Experiments are reported which aim to gather information regarding the behavioural and physiological responses of beef cattle to road transport. In particular, different components of transport, e.g. loading/unloading, confinement, motion and stocking density were examined in detail. This was to determine the aspects of transportation that are most stressful. Observations of behaviour were made throughout all transportations while physiological variables were measured before and after transport. Journeys were for either 1 hr. or 4 hrs. Behaviour was recorded by direct observation during 1 hr. runs and using cameras during 4 hr. runs. Results include information on orientation adopted during transport, rates of social interactions, changes of position and responses in terms of loss of balance to driving events, e.g. braking, cornering.

THE EFFECTS OF HOUSING EXPERIENCE ON CALF RESPONSES TO HANDLING AND TRANSPORT.

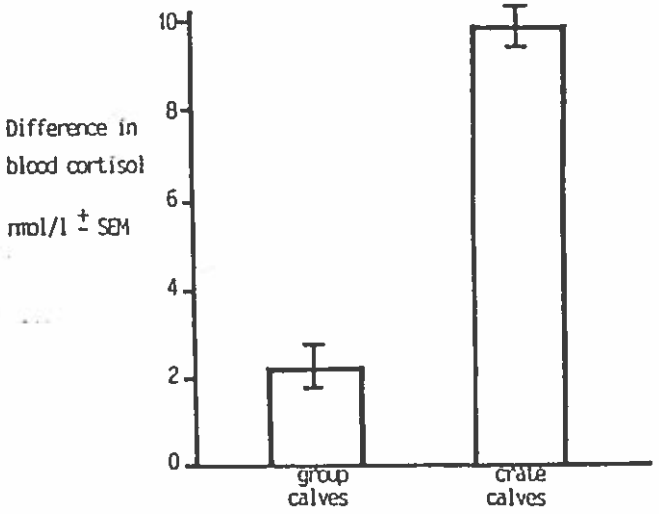
TRUNKFIELD, H.R.

Calves reared in isolation in crates are less active, are less socially experienced and carry out more abnormal behaviour than group-reared calves because of the restrictions imposed by their environment. Such findings suggest that calves reared in crates are chronically stressed as compared with calves reared in groups. Because of these differences, it is possible that housing experience may have effects on the subsequent responses to the acute stress of transport.

Two studies have been carried out in Holland to compare responses to transport of male Dutch Friesian veal calves reared to six months of age either in crates and bucket-fed (n=20), or in groups fed by computer-operated teat feeders (n=56 or 57). Behavioural observations were made for two weeks before transport to slaughter and during loading on the day of transport. Simultaneous blood and saliva samples were taken before loading and transport and at slaughter following a one hour journey and half an hour spent in lairage.

Calves reared in crates were found to lie down for a greater percentage of time than did calves reared in group pens. Visual observations during loading showed that crate-reared calves had considerable difficulty in boarding a walk-on ramp. An increase in saliva and blood cortisol levels following handling and transport was found to be greater in crate calves compared with group calves ($P<0.0001$), see Fig. 1. Lactate dehydrogenase isomer 5, an enzyme leaked from skeletal muscle and thought to be released during emergency responses, also showed a significant increase in the crate calves but not in group calves, see Fig. 2. Such evidence suggests that crate-reared calves are more stressed in response to handling and transport than are group-reared calves.

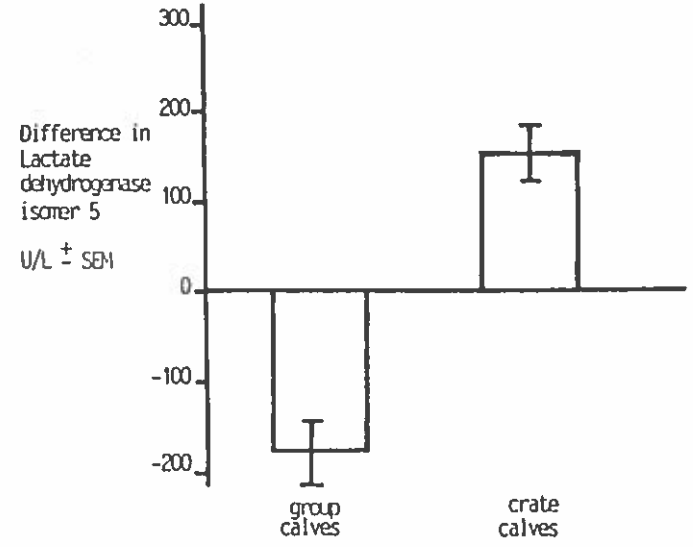
Difference in blood cortisol levels following handling and transport; group calves compared with crate calves.



mean of group calves significantly different from mean of crate calves, $P<0.0001$

FIGURE 2

Difference in blood LDH isomer 5 levels following handling and transport; group calves compared with crate calves.



mean of group calves significantly different from mean of crate calves, $P<0.0001$

THE BEHAVIOUR OF ROAD-TRANSPORTED SHEEP

Ewbank R and Kent J E

A total of thirty-eight pastured store lambs (31.8 to 48.6 Kg) were used in a systematic experimental investigation into the effects of road transport on livestock behaviour and weight changes. The animals were split into four groups: 2 groups of nine lambs were transported for 12½ hours over a distance of 523 Km with a space allowance of 0.25 sq metres per lamb, and on their return 9 were penned under cover and 9 were pastured; ten others were penned at 0.33 sq metres per lamb for the transport period and then turned out into their 'old' field and the remaining 10 were kept pastured throughout the 12½ hours and the recovery day. The behaviour of all the lambs were followed, using a six minute activity sampling technique during the experimental period (12½ hours) and for a further 24 hours.

The results suggest that the transport affected the behaviour by reducing both the ruminating and eating times to zero and the lying time to 6.3% of the 12½ hours. The penned controls also showed a reduction in ruminating and eating times to 6% and 2.2% respectively compared with 19.7% and 64.9% for the pastured controls. The main reaction of the lambs after transport or penning was to satisfy their hunger. Those pastured grazed for nearly 4 hours; those housed ate hay for 1.25 hours with interruption only for drinking. The proportion of the recovery day spent on each activity of lying, ruminating and eating was similar for all pastured lambs. However, the distribution throughout the day varied. The housed lambs ate for less time and lay down for longer than the other groups. The weight lost during transport (2.8 Kg) was no greater than that lost by the penned controls i.e. crowding and/or lack of food rather than the transportation itself are probably the main contributors to the loss of condition. Transportation seemed to have no lasting effect on the overall weight gains of the lambs. It is suggested that behavioural observations, by themselves, are probably of limited use as direct, practical evaluators of the effects of transport stressors on sheep.

PERCH USE, PLUMAGE AND FOOT CONDITION AND BONE STRENGTH IN CAGED HENS

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Caging laying hens has adverse behavioural and physical effects. It restricts their movements, causing reductions in bone strength, standing for long periods on wire floors can affect foot condition and feather loss is commonly seen. The object of this experiment was to determine whether providing perches had any effect on these variables.

There were 5 main treatments : front perch, rear perch, front + rear perch, long perch and control cages without perches. Within the first 4 treatments half the perches were rectangular and half were circular in cross section. The hens were ISA Browns; the experiment lasted from 20-72 weeks of age.

We looked at perch usage during daytime and night-time, at foot condition including skin damage and claw length, at plumage condition and at bone strength. The last was achieved by killing a sample of birds, dissecting out the tibia and measuring the breakage force under standard conditions.

RESULTS. Overall, the proportion of time spent perching during daytime was about 43%, but there was considerable between-treatment variation, from 20% for the rear perch to 81% for the 2 perches. In all 4 perch treatments the rectangular perches were used more often than the circular ones - observations suggested the hens had difficulty maintaining their position on the latter. A scatter diagram of perch use is given in Fig. 1. At night-time the perches were generally fully occupied by roosting birds.

Foot condition was fairly good in all treatments. It was poorest with circular perches, perhaps because the birds slipped on them, and best with rectangular perches. Control cages occupied an intermediate position.

Feather damage was decreased in two of the perch treatments (2 perches and long perch) compared with controls, suggesting that adequate perching space either minimises abrasion or reduces feather pecking.

Tibia strength was measured only for the front perch and the rear perch treatments - it was stronger in both (by 19% and 13% respectively) than in control cages (see Fig. 2). We suggest that this is attributable to increased forces exerted on the bones of perching birds, both stepping up and down and increased muscle tension when grasping the perch.

The only disadvantage was an increase in broken eggs from cages with perches - probably because some hens laid while sitting on the perch.

CONCLUSIONS. The results of this study make a strong case for the inclusion of perches in all battery cages. There are few adverse effects to set against several advantages : a location which was preferred over the cage floor for standing and sitting, increased average bone strength and, in the case of certain treatments, improved foot condition and reduced plumage damage.

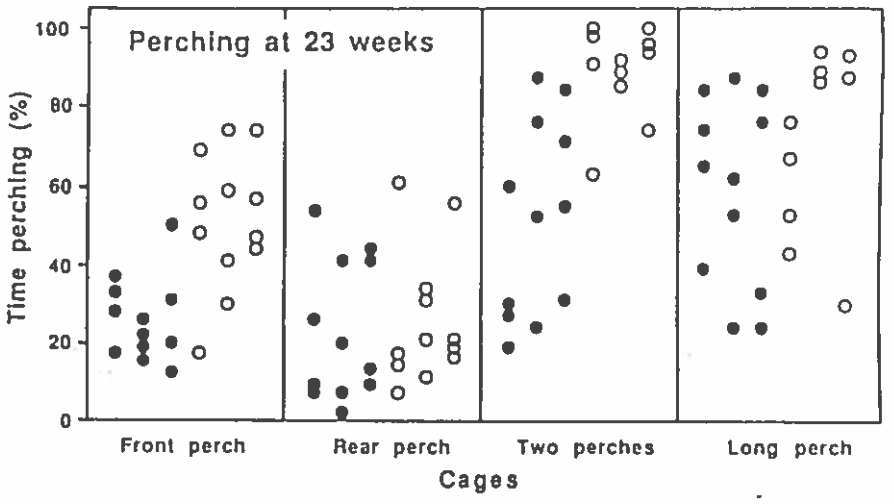

Fig. 1 Scatter diagram of perch use at 23 weeks of age i n relation to perch cross-sectional sha and location in cage.

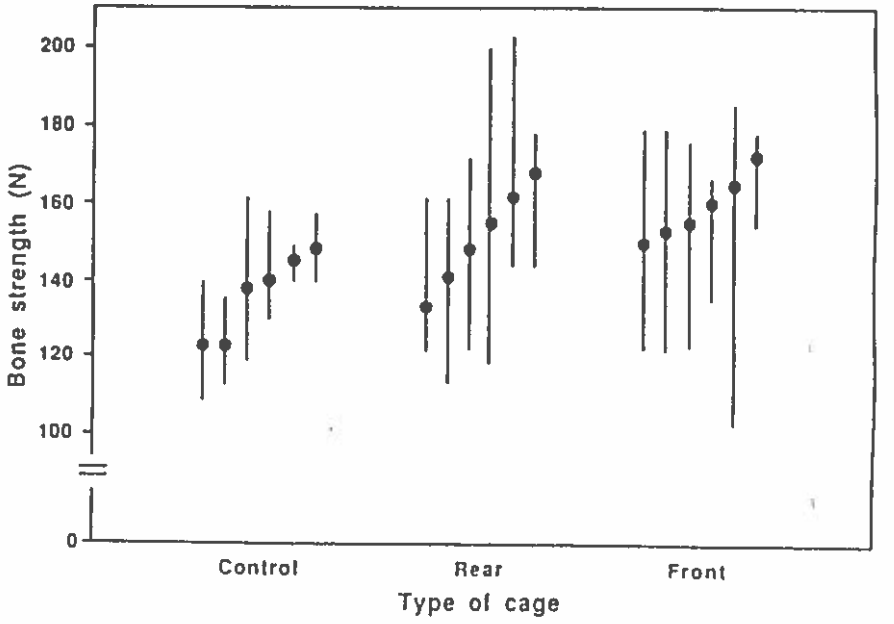

Fig. 2 Medians and ranges for tibia breaking strength (N) in 72-week old hens. Arranged by treatment : controls and cages with rear or with front perches

THE EFFECT OF FOOD LEVEL AND HOUSING ON THE DEVELOPMENT OF STEREOTYPIC BEHAVIOUR IN TETHERED SOWS

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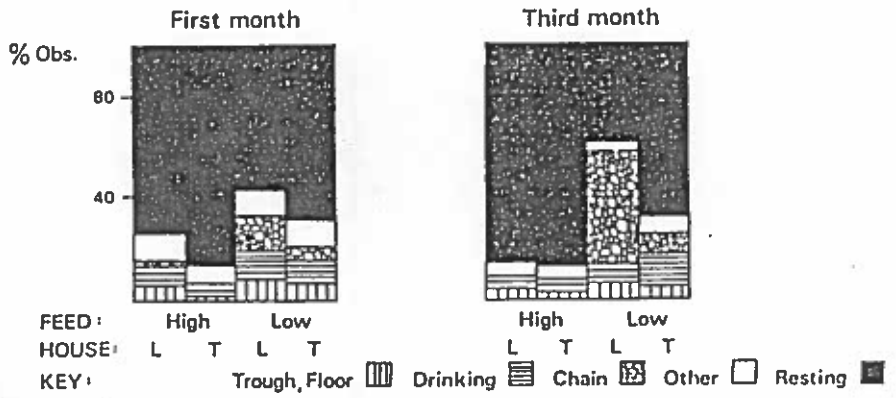
SUMMARY

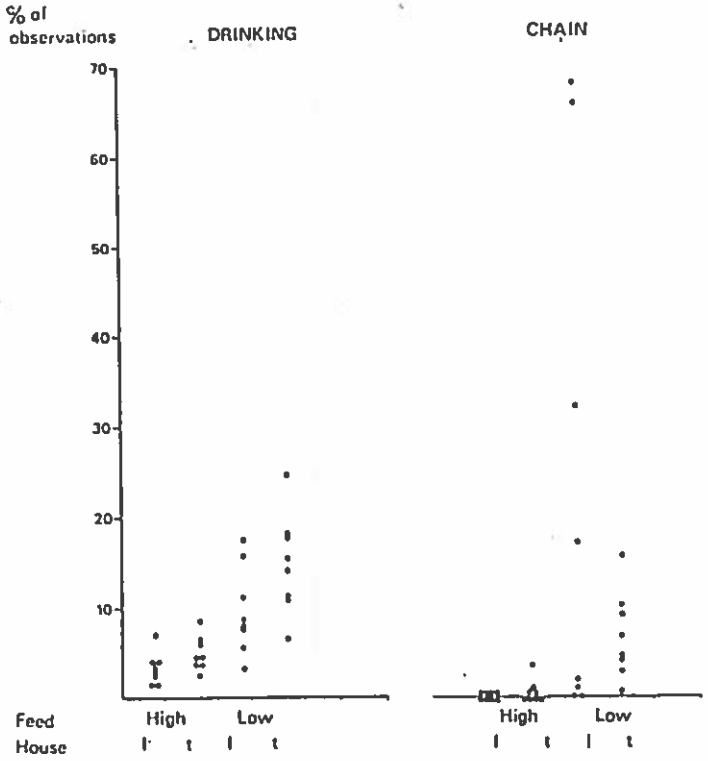
It is often assumed that physical restraint and lack of stimulation are the major stressors for intensively housed sows. However, recently food levels have been implicated in the development of stereotypic behaviours. Factors affecting the development of stereotypies were investigated in pregnant gilts in two housing systems (loose housed vs tethered) and on two food levels (low (2.2 kg/day) vs high (4.0 kg/day)). Apart from loose housed gilts having social contact and freedom of movement the housing systems were similar including the provision of chains to the loose housed gilts. The gilts in each system were equally allocated to the low and high food levels. Behaviour was recorded by a scan sampling technique for two days every two weeks. As in other studies, low fed gilts showed high individual variability in drinking and chain-directed behaviour. At all times of the day low fed gilts were more active than high fed gilts, spending more time nosing the trough and floor, drinking, and manipulating the chain. Over pregnancy the low fed gilts spent an increasing proportion of time on these activities and showed a significant increase in feeding rate. No such increases were observed in high fed gilts. Low fed loose housed gilts had significantly higher post-feeding levels of chain-chewing than low fed tethered gilts, possibly due to social stress. These results show that the frustration in feeding behaviour caused by low food allowances increase with time and are not diminished simply by providing freedom of movement.

. Low: polydipsia?
. ↓ SS. patterns ~ ↑ stereotypies frustrated

MORNING ACTIVITY OVER PREGNANCY



INDIVIDUAL VARIATION IN BEHAVIOUR



L = Loose, T = Tethered

BEHAVIOURAL STRESS-INDICATORS IN EARLY WEANED PIGLETS.

L. DYBKJÆR

When animals are exposed to stressors the first visible reaction will be a change in behaviour. The aim of this study was to find behavioural stress-indicators to be used for assessing the suitability of housing systems for piglets weaned at 3-4 weeks old. In addition it aimed at finding out whether recording of behavioural stress-indicators should be carried out in the 2nd or the 4th week after and weaning. Finally it investigated whether the experimental routine used in this study affected the growth and the occurrence of scratches on the piglets ears and tails.

The investigation has exclusively dealt with behavioural stress-indicators. No physiological stress parameters have been measured. The assertion that the behavioural stress-indicators found in this investigation are indicators of stress are based on the fact that their occurrence was under influence of three factors that previously have been shown to affect a physiological stress-response (Blecha et al., 1985; Warnier and Zayan, 1985; Meunier-Salaun et al., 1987).

256 earmarked piglets were distributed in 32 flat-deck pens at weaning. During the following 4 weeks the piglets in half of the pens were exposed to a relative low level of stressors by avoiding mixing with non-littermates, keeping them at a low density and giving them access to straw all the time. In the other 16 pens a relative high level of stressors was obtained by mixing the piglets with non-littermates at weaning, keeping them at a high density and by the lack of any substrate in the pen.

In the 1st and the 4th week after weaning all individuals were weighed and the number of scratches were recorded. Behavioural recordings were carried out by direct observation, 3 min per piglet per day for 4 days in succession, in 2nd and 4th week after weaning. Results are based on mean values for each pen.

On basis of the results the behaviour patterns "belly-nosing", "manipulating other piglets" (whether directed at ears, tail, other parts or the total occurrence), "play", "chewing chain" and "sitting passive" are assessed as useful behavioural stress-indicators in early weaned piglets.

Four behaviour patterns were found unfit as stress-indicators, namely "sniffing floor and walls", "headshaking", "drinking water" and "headknocks and bites".

Piglets exposed to the "low" level of stressors had a higher growth rate and a lower number of scratches on the ears than piglets exposed to the "high" level of stressors. There was no difference in number of scratches on the tails.

As a supplement to behaviour patterns, and with reservations, reduced growth and increased number of scratches on the ears can be used as indicators of stress.

The behavioural patterns can be used as stress-indicators in 2nd og 4th week after weaning, except play-behaviour which, on basis of this investigation, did not seem to be useful in the 2nd week after weaning. Preferably stress-indicators should be recorded in the 4th week after weaning, since this seems to give a more certain estimation of the stress-level.

TABLE 1. MEAN OCCURRENCE OF POTENTIAL BEHAVIOURAL STRESS-INDICATORS IN 2ND AND 4TH WEEK AFTER WEANING AT TWO DIFFERENT LEVELS OF STRESSORS.

BEHAVIOUR	2ND WEEK AFTER WEANING			4TH WEEK AFTER WEANING		
	"LOW" LEVEL OF STRESSORS $\bar{X}$ (SD)	"HIGH" LEVEL OF STRESSORS $\bar{X}$ (SD)	P	"LOW" LEVEL OF STRESSORS $\bar{X}$ (SD)	"HIGH" LEVEL OF STRESSORS $\bar{X}$ (SD)	P
BELLY-NOSING (SEC/3 MIN)	1.51 (2.25)	5.91 (5.85)	***	0.47 (0.89)	2.76 (3.09)	***
MANIPULATING (TOTAL) (SEC/3 MIN)	1.28 (1.62)	6.35 (6.80)	***	1.46 (1.67)	6.35 (4.51)	***
HEADSHAKING (NO/3 MIN)	0.29 (0.14)	0.26 (0.09)	NS	0.21 (0.12)	0.18 (0.10)	NS
PLAYING (SEC/3 MIN)	0.17 (0.24)	0.13 (0.31)	NS	0.21 (0.30)	0.05 (0.13)	**
DRINKING WATER (SEC/3 MIN)	1.47 (0.91)	2.60 (1.91)	NS	2.73 (1.54)	3.38 (3.79)	NS
HEADKNOCKS AND BITES (NO/3 MIN)	0.42 (0.32)	0.55 (0.24)	NS	0.48 (0.33)	0.46 (0.21)	NS
CHEWING CHAIN (SEC/3 MIN)	0.52 (1.04)	2.73 (3.05)	**	1.84 (4.48)	8.69 (9.52)	***
SITTING PASSIVE (SEC/3 MIN)	1.19 (1.41)	4.65 (3.70)	**	1.53 (1.66)	5.31 (3.48)	***
SNIFFING FLOOR AND WALLS (SEC/3 MIN)	42.9 (19.8)	23.0 (9.64)	**	45.9 (16.3)	24.6 (10.9)	***

NS = NOT SIGNIFICANT, * P<0.05, ** P<0.01, *** P<0.001

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STEREOTYPIC BEHAVIOUR, ENDOGENOUS OPIATES AND POSTFEEDING HYPOALGESIA IN PIGS.

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The hypothesis that the performance of stereotypies is associated with increased opioid activity is very popular but there is no supporting evidence. We developed a modified "tail-flick" test to measure the sensitivity of pigs to pain. Stereotypic behaviour is most pronounced immediately after feeding and we found tethered sows to be less sensitive to pain at this time; this effect was abolished by naloxone injections (Fig. 1). However, sows with well-developed stereotypies were more sensitive to pain both before and after feeding. This is contrary to the predictions of the hypothesis. Heart-rate increased from 60-70 b.p.min. before feeding to 110-130 b.p.min. during feeding (Fig. 2). Naloxone increased heartrate before, during and after feeding. There were no differences in heartrate between sows with and without stereotypies. We conclude that opioid systems regulating heart rate are separate from those producing analgesia and that the performance of stereotypies is not associated with increased activity in either opioid system.

FIG 1.

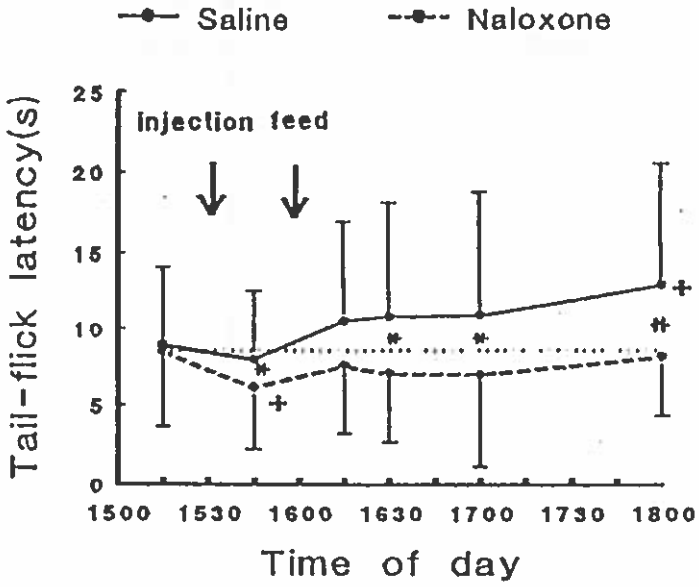
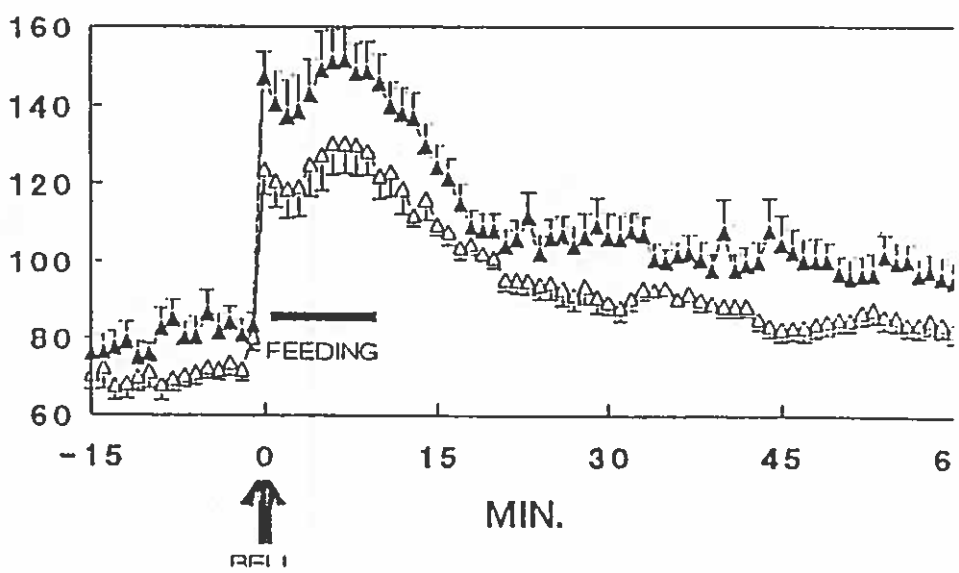


FIG 2.

HEART RATE CHANGES IN TETHERED SOWS AROUND FEEDING



BEHAVIOUR OF NEWBORN DAIRY CALVES IN DIFFERENT HOUSING SYSTEMS

MICHAEL VENTORP & PER MICHANEK

Abstract

Five groups of 21 cow-calf pairs each were used to study five different housing systems:

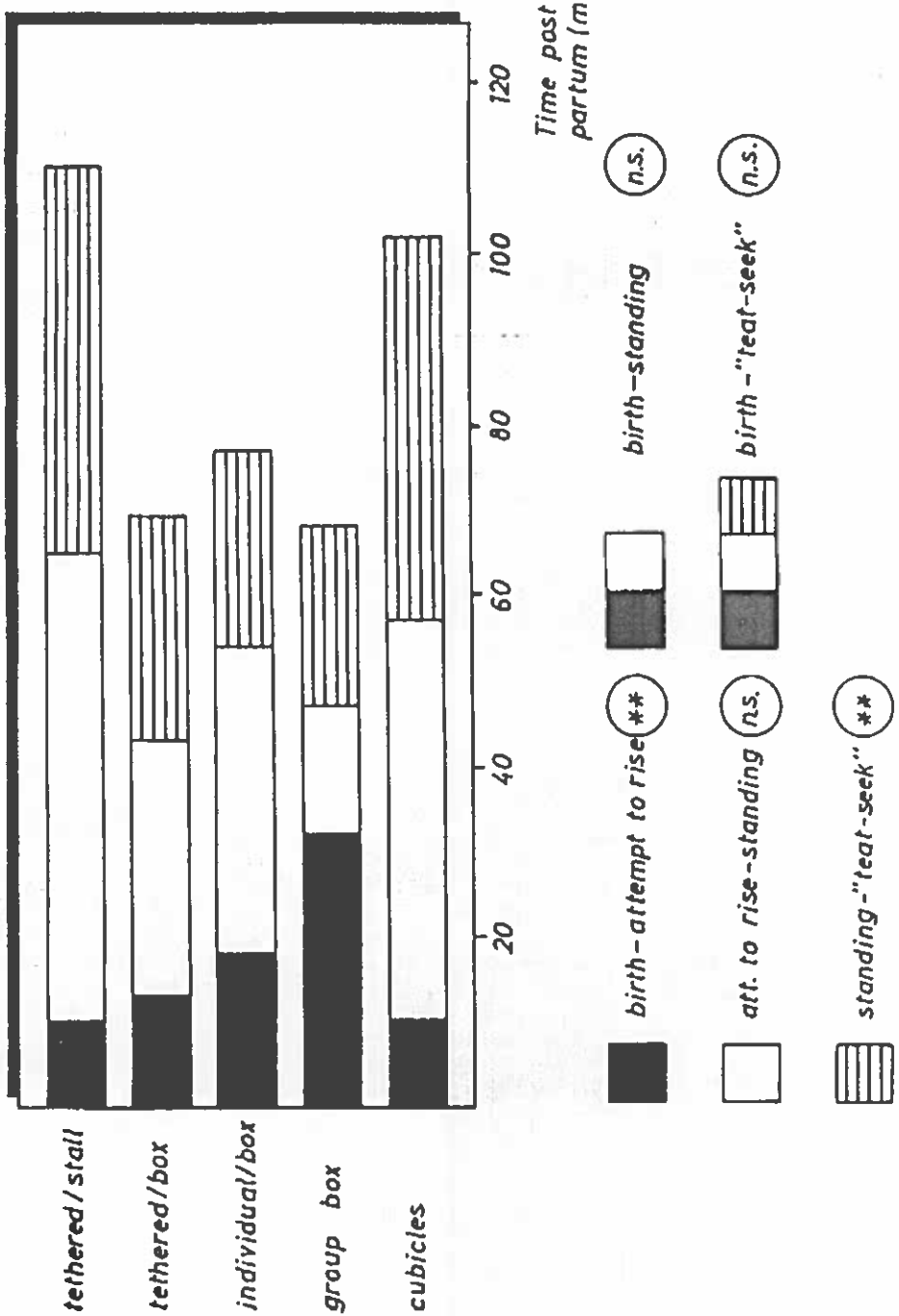
1. Tethered cow calving on stall.
2. Tethered cow calving in a box.
3. Loose cow calving in a box.
4. Loose cow calving in a groupbox.
5. Loose cow calving in a cubicle barn with slatted floor.

In spite of considerable differences between the housing systems there where no significant differences regarding the time between birth and first standing. The calves in groups 1, 2 and 5 tried to get up early, first attempt about 10 min. after birth, while group 4 calves made their first attempt to rise after more than 30 min. Group 3 was intermediat. It was assumed that a calf that is lying on a good bed, with its mother taking care of it, is not in a hurry to change its situation. This would be the case for calves in groups 3 and 4. The other calves are more or less uncomfortable, lying on hard surfaces, groups 1 and 2 calves with the dam unable to reach the calf, group 5 calves with a lot of disturbances from cows moving in the narrow alleys. The reason for the early triers not getting up sooner than the late triers is probably partly slippery floors, partly the fact that they are not ready to stand as soon after birth.

The time laps between first standing and first "teat-seek" was about 10 min. for calves in groups 2, 3 and 4 but about 30 min. for calves in groups 1 and 5. Group 1 calves had to go in the right direction and cross the manure channel to reach a cow and group 5 calves had difficulties walking on the slatted floor.

The time between birth and first "teat-seek" did not differ significantly between calves in different housing systems.

The calves showed a remarkable ability to adapt to the different environments and reached important steps in their early lives like standing and looking for food at approximately the same time, in spite of the different conditions.



The figure shows the median times for first attempt to rise, first standing and first "teat-seek". The statistical significance of differences between groups (Kruskal-Wallis test) is indicated in the circels in the lower part of the figure (** = p<0.01).

MATING TACTICS IN RAMS

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Summary

A ram in a flock of sheep during the mating season is faced, at any moment, with a choice of a number of options: having mated an oestrous ewe, it may mate or remate it, court and mate another ewe known to be in oestrus, tease and encourage the emergence of oestrus in one in pro-oestrus, test di-oestrous ewes (or those of unknown status) for receptivity, or it may conserve necessary resources by grazing, ruminating or resting. If there is another ram present, it may or may not choose to compete with it. Though the potential costs and benefits of each these actions may be identified in principle, little is known about their relative importance or magnitude in real situations. However, it is clear that these will be influenced by particular conditions such as the number of ewes in oestrus, the stage of oestrus, the number of competing rams and their relative dominance.

As an initial step in analysing the tactics adopted, a small flock of 19 sheep was observed with either 1 or 2 rams present for 6 hours/day. The greatest level of activity, both in courting and mating oestrous ewes (OEs) and in testing unknown or dioestrous ewes (DIEs) occurred in the first hour after introduction, with a lesser peak in the middle of the day after a mid-morning decline. OEs were quickly identified and activity concentrated on them: the ram would attach himself to her, repeatedly courting and mating her, often with a number of matings in a single courtship bout. From time to time, he would detach himself briefly and test DIEs that happened to pass nearby. But there seemed little evidence of systematic testing and, even with a this small flock, there were a number of cases of an individual ewe receiving no attention from a ram throughout the day. Teasing appears to have little pay-off, as rams gave little more attention to ewes in pro-oestrus than they did to DIEs. When 2 or more ewes were in oestrus, the ram tended to alternate between them, sometimes quite strictly, and the frequency of bouts with DIEs decreased, as did the time spent grazing and resting. With 2 rams present, there was a great deal of agonistic interaction between them, mostly in direct competition for OEs; this became a common cause of termination of coutship bouts. As a result, though there was little change in the frequency of courtship initiatives or of matings by each ram, more bouts were short (less than 10 secs) and the total courship time per OE was reduced, as were the time spent grazing and resting. The two rams appeared to adopt somewhat different tactics, with one interacting frequently with DIEs, while the other concentrated on OEs and appeared to rely, for identification of them, on 'ram seeking' by OEs.

TABLE 1. FREQUENCIES and HOURLY TOTAL DURATIONS of COURTSHIP INTERACTIONS, MATING and OTHER ACTIVITIES of one ram (Texel), with ewes in oestrus (OEs), dioestrus (DIEs) and pro-oestrus (PREs).

	One ram (1x1)			Second ram present (Data of 1x1)	
	OEs	DIEs	PREs	OEs	DIEs
Bouts per hour (N)	11.8	10.7		12.1	9.8
- - - per ewe	7.6	0.6	1.5	5.6	0.6
Short bouts/hour (N)	3.1	7.7		4.8	8.2
- - - per ewe	2.0	0.5	0.8	2.2	0.5
Total Interaction Time/hr (longer bouts) (secs)	1040	112		761	70
- - - per ewe	667	7	24	360	4
Matings per hour (N)	11.3	-	-	13.6	-
- - - per OE	7.2	-	-	6.3	-
Grazing time/hour (mins)	13.5			10.9	
Resting time/hour (mins)	9.7			2.7	

TABLE 2. PROBABILITES OF PARTICULAR EVENTS FOLLOWING A MATING: the first-order conditional probabilities of the occurrence of different events immediately following a mating, under different conditions for the Texel ram. (OE - oestrous ewe; DIE - di-oestrous ewe; PRE - pro-oestrous ewe)

	ONE ram	TWO rams	ONE EWE in oestrus	TWO Es in oestrus	THREE Es in oestrus
Remate the same ewe:	.52	.65	.71	.65	.58
Recourt same ewe without mating:	.10	.06	.09	.08	.07
Court another OE with mating:	.07	.04	0	.10	.12
Court another OE without mating:	.06	.06	0	.08	.14
Tease (court a PRE):	0	0	0	0	0
Test (court a DIE):	.20	.06	.17	.05	.05
Aggression toward other ram:	0	.12	-	-	-
Grazing bout:	.03	.01	.03	.03	0

ARE ELEPHANTS IN ZOOS AND CIRCUSES DISTRESSED?

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ABSTRACT.

Although most scholars concerned with the debates concerning animal welfare will agree that higher mammals at least have physiological and behavioural needs, and that causing "unnecessary animal suffering" is unacceptable, there is little agreement on how "need","unecessary" and "suffering" should be defined.

One approach to defining animals "need" which has received much publicity is to do more research on motivation in experimental situations particularly using "choice tests". There are problems with this approach.

There is an alternative approach, first mentioned by Thorpe (1965).This is developed and summarized; "That the animal has a need to perform all the behaviour in his repetoire which does not cause prolonged suffering to others". The evolutionary rational here is that all behaviour is functional. Thus any husbandry system that restricts or prevents certain activities in the species normal repetoire is likely to cause distress, *unless or until proved otherwise*.

This view leads immediately to an assessment of behavioural restriction. A first attempt at assessing this is given for elephants wild, in safari parks, in zoos and circuses.

Another approach to assessing animal welfare in the "here and now" is to measure "Prolonged Distress". This is defined as where there is:- 1)Physical desease, 2) Evidence of frequent occupational deseases, 3) The need for the use of a) drugs &/or b) surgery to maintain the system, 4) Certain behavioural differences from wild/feral or unrestricted animals, including:- a) The performance of abnormal behaviours b) Stereotypes c) A substantical increase in inter- or intra-specific aggression, d) Large difference in time budgets, e) Substancial differences in behaviour related to frustration or conflict, f) Substancial ontogenetic behavioural changed.

An assessment of "distress" in Zoo and Circus elephants is made as a result of analysis of 59 behaviours during 226 h on 35 Indian elephants and 36 h on 6 African elephants continuously observed

The conclusion is that there is some evidence of distress in zoo and circus elephants under present husbandry conditions.Practical recommendations for improvements to decrease behavioural restrictions and distress in circuses and zoos are made.

Thorpe,W.H.(1965).The assessment of pain and distress in animals. In *Report of the technical committee to enquire in to the welfare of animals kept under intensive livestock systems*, F.W.R.Brambell, (Chairman), pp71-79. H.M.S.O.London.

ELEPHANTS. Behavioural restrictions

	wild	s.park	zoo	circus	loose	tied
move freely whole body	0	0	+	+	0	++
never unenclosed	0	+	++	0	+	++
scratch, lie, get up etc.,	0	0	+	+	0	++
manipulate objects freely	0	0	+	+	+	++
choose social partners	0	0	+	+	+	++
mixed sex groups	0	+	+	+	+	++
sexual behaviour	0	+	++	++	++	++
maternal behaviour	0	0	0+	0	0	+0
monotonous environments	0	+	++	+	++	++
all gaits exercise	0	0	+	++	++	++
food, water and shelter always	+	0	0	0+	0+	+
possible change of environment	0	+	++	0	++	++
learning & occupational therapy	+0	+0	++	0	+0	++
close relationship to humans	++	++	+	0	+	+
TOTALS	4	8	14	11	15	25

KEY: 0 = No restriction; 0+ & +0= Occassional restriction; += Usual restriction; ++= Always restricted.s.park= Safari Park; Loose=loose in small enclosed area.

ELEPHANTS - Batched behaviour totals

	INDIAN	AFRICAN	CIRCUS	ZOO	LOOSE	TIED	AVERAGE	24hr
Number of hours	226	36	208	18	53	150		366
No. of individuals	36	6	26	6	17	21		36
Self directed	2,88	1,95	2,42	5,29	4,69	2,26	3,24	2,85
Social (affiliative)	3,7	4,73	3,34	7,94	5,02	3,1	4,63	0,46
Vocalise	5,6	2,79	2,73	6,6	10,17	4,67	6,55	2,79
Human contact	0,56	2,61	0,4	2,44	0,84	0,43	1,18	0,41
Object directed	9,06	1,65	8,57	12,32	9,44	9,9	8,48	8,62
Trunk use	14,22	8,16	13,35	17,61	14,61	15,07	13,83	12,2
Abnormal	1,84	1,11	1,65	3,38	4,27	0,69	2,15	3,83
Frustration	0,83	0,59	0,5	0,83	0,73	0,72	0,7	3,54
Stereotypes	13,63	6,12	13,73	12,8	7,74	15,9	11,65	12,95
Pleasure	5,88	3,64	6,61	16,0	11,64	6,74	8,41	4,87

ALL figures in occasions/elephant/hour, except Stereotypes.(minutes/elephant/hour)

* - sign test - $p<0.05$ ** - sign test - $p<0.01$

MARE-FOAL RELATIONSHIPS IN DONKEYS.

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Any comparison of mare-foal relationships in equids is complicated by the variety of living conditions under which they have been observed. The donkeys in this study lived in paddocks with access to field shelters, similar to conditions in which domestic horses have been studied.

In all equids, mares remain close to their newborn foals. This ensures that the foal's following response is correctly orientated towards his mother. Once foals can follow, their mothers approach less frequently. Foals usually initiate suckling and mares tend to move away. Feral donkey foals are often threatened by their mothers as they attempt to suckle. At weaning and with the birth of a new foal there is often a considerable change in the relationship.

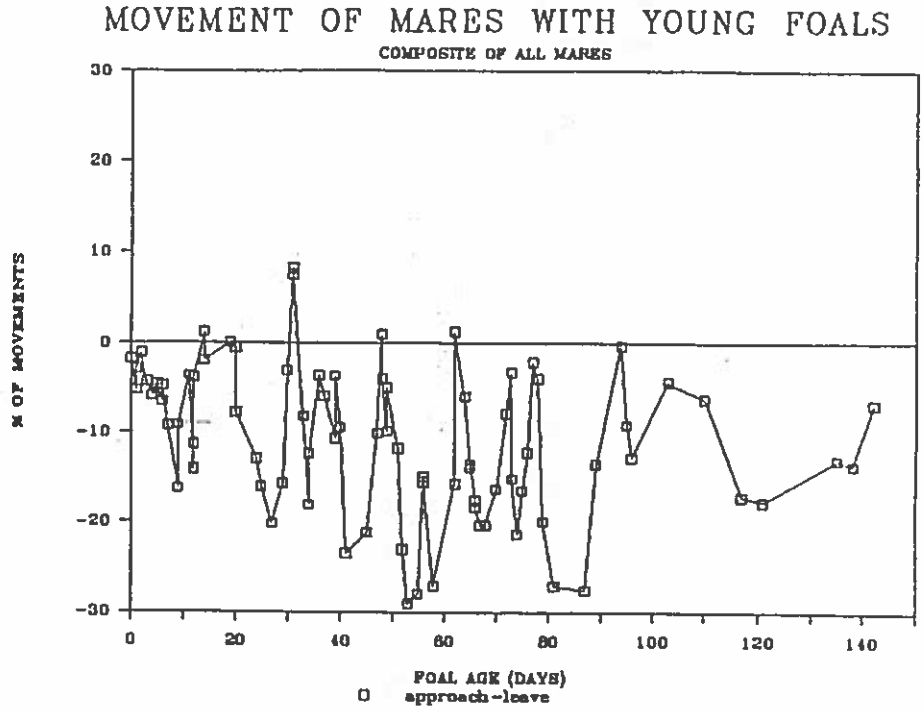
The change in the mare-foal relationship that occurs as the foal ages is reflected by changes in the distance between mare and foal.

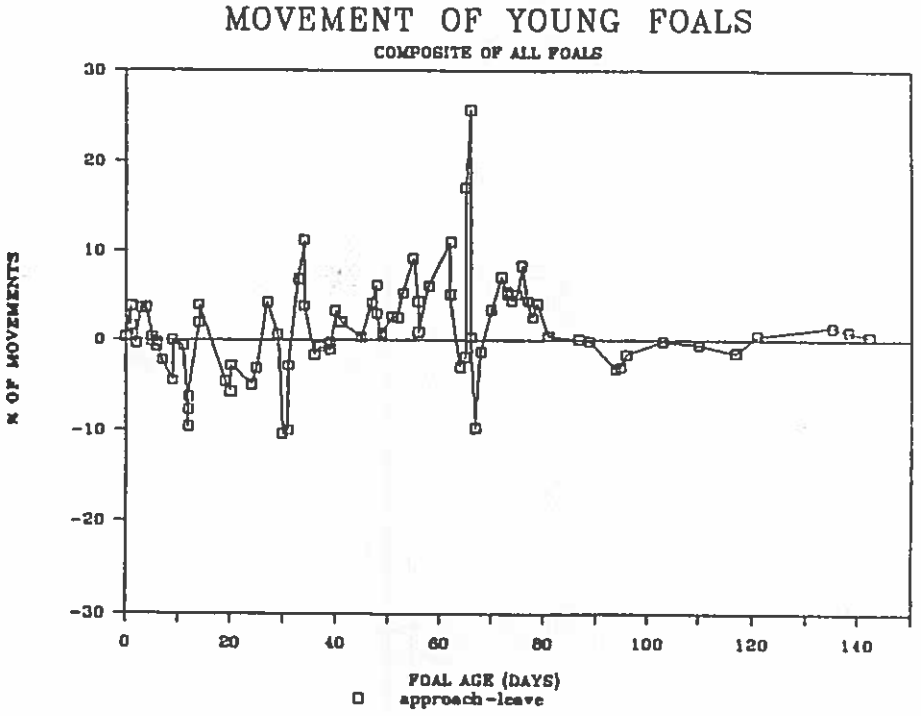
Thirteen pairs of donkey mares and their offspring were observed. Records were made of the distance between the pair, the member of the pair responsible for changing the distance, and the general activity of the donkeys (eg. graze, walk, play etc.). These measures were recorded at minute intervals for one hour. Each pair was observed at various times of the day for a total of about fifty hours. The age of offspring ranged from a few hours to 24 years.

After the first few days of the foal's life, donkey mares leave their young (pre-weaning) foals more than they approach them. Foals follow their mothers (see figures). In older foals (5 months to 2 years) periods of leaving are eventually balanced by periods of approaching. Mares also tend leave older foals, although there are large variations from day to day. If offspring remain with their mothers well into adulthood, then the relationship changes radically; both donkeys approach each other more than they leave.

Measures of distance showed that it is the donkey mare that determines the distance between herself and her foal (analysis of variance, F=3.879, D.F.= 10, 139). The mares can be said to drive the relationship. This compares with conclusions drawn from work with horses, that foals are responsible for maintaining contact with their mothers.

This study was funded by the Donkey Sanctuary, Sidmouth U.K.





TONGUE-ROLLING IN FATTENING BULLS KEPT IN DIFFERENT ENVIRONMENTS

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ABSTRACT

The aim of this study was to in more detail describe some aspects of tongue-rolling in concentrate-fed growing bulls. In a 3-year long project different Departments have co-laborated to find out if it is better for the health, production and behaviour of fattening bulls to be kept in an uninsulated house with deep litter and two different stocking densities than in a well insulated house with slatted floor and a high stocking density.

The study was carried out on Götala Research Farm outside Skara where 84 bull calves of the Swedish Red and White Cattle breed were observed. The animals were fed concentrates and straw once a day at 7-9 a.m. and had ad libitum access to concentrate. The animals were observed from about 4 to 10 months of age one hour per pen and month (tab.1). Observations were made between 4 and 7 p.m. when no employee were working. All animals in the pen were observed at the same time. Data have been pooled for each individual.

After setting a minimum time of 10 seconds to accept the behaviour as stereotyped 115 tongue-rollings had been recorded. During the whole study 26 animals showed tongue-rolling, which made up 31% of the animals (tab.1). It was a large variation in the frequency of tongue-rolling that each individual performed, from 1 to 17. The frequency of tongue-rolling showed a trend to decrease slightly with age. However, there were too few individuals at each age to be able to test this statistically.

The mean time for a tongue-rolling was 24.33 ± 13.0. No significant differences were found between the three groups with Wilcoxon rank sum test (tab.1). There were no clear changes in time for a tongue-rolling with age, but animals in the slatted floor system took slightly longer time to perform a tongue-rolling from 6 months of age and onward. Tongue-rolling was performed both when animals were standing and when they were lying. Tongue-rolling was observed both in the feeding area and in the lying area.

Before a tongue-rolling was performed a large part of the animals were inactive (standing still, lying still or sleeping) (fig.2). Explorative behaviour (sniffing, licking or biting at fittings) and comfort behaviour (licking self, scratching self or scratching against fittings) also took quite a large percentage of the observations before a tongue-rolling was performed. After a tongue-rolling was performed the most common behaviour was exploration (fig.2). Comfort behaviour also took quite a large part, as well as social behaviour (licking, sniffing, pushing, butting, mounting or rubbing against other animals) and inactivity. Feeding behaviour (eating straw, drinking, ruminating or eating concentrate) and other behaviours (yawning and playing with water) made up a relatively small part of the observed behaviours.

In this group of animals no obvious differences between the two environments were observed. However, in other studies in this project tongue-rolling has been more common in the slatted floor system.

Table 1. Description of the observed animals and some results

	Deep litter		Slatted floors
n/pen	11	15	11
pens	2	2	3
n_2	22	29	33
m^2/n	3.6	2.6	1.5
n tongue-rolling	5	8	13
% tongue-rolling	22.7	27.6	39.4
frequency/n	1-8	2-14	1-17
time (seconds)	20.12 ± 9.7	20.71 ± 7.0	28.18 ± 16.1

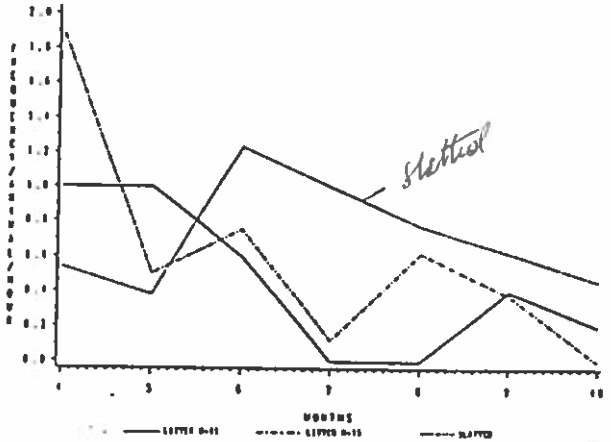

Figure 1. Frequency of tongue-rolling with age for fattening bulls

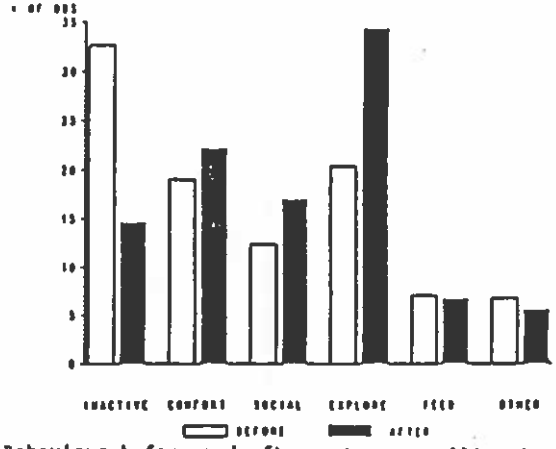

Figure 2. Behaviour before and after a tongue-rolling in fattening bulls.

DE PASSILLE, A.M.B., ROBERT, S., DURBREUIL, P., PELLETIER, G. AND BRAZEAU, P. (AGRICULTURE CANADA, LENNOXVILLE, P.Q. CANADA).

EFFECT OF HYPOTHALAMIC FACTOR TREATMENTS ON THE BEHAVIOUR OF SOWS DURING LACTATION AND ON THEIR RESPONSE TO WEANING MANAGEMENT.

The effects of daily treatments with growth hormone-releasing factor (GR:20ug kg^{-1}) and thyrotropin-releasing factor (TRF:1 or 9ug kg^{-1}) between days 5 and 25 of lactationon the behaviour or 51 primiparious lactating sows and on their behavioural and cortisol response to weaning management were studied in two experiments that differed by the weaning techniques (piglets removed, sow removed) and the dose of TRF. The sows were observed for 24 h on days 17, 27 and 28 (weaning) of lactation. During lactation, the sows receiving TRF alone or in combination with GRF spent a greater proportion of time in lateral recumbency than the control and the GRF-treated animals, in both experiments. We suggest that this difference reflects a stimulation of maternal behaviour. In experiment 1 (piglets removed), there were no residual treatment effects on sow behaviour on the day of weaning. However, in experiment 2 (sow removed), the GRF- and TRF-treated sows spent a greater proportion of time trying to escape (Table 1) but had a smaller increase in cortisol levels than the control and GRF + TRF-treated sows. We suggest that cortisol responses to a stressor are not always reflected in the behavioural response and that hypothalamic factors may influence behavioural and hormonal responses to handling at weaning.

Table 1. TREATMENT EFFECT ON SOW BEHAVIOUR DURING THE 4H FOLLOWING SOW REMOVAL*

	Control	GRF	TRF	GRFxTRF	X^2
Trying to escape	11.5	29.4	23.7	12.3	0.001
Vocalizing	38.5	48.6	51.3	41.8	0.2
Looking at alley	14.6	6.2	4.0	17.2	0.001

* Mean percent frequency.

Table 2. RESIDUAL TREATMENT EFFECTS ON SERUM CORTISOL

	PIGLETS* removed		SOW* removed	
	day 25	day 28	day 25	day 28
Control	14.6 ± 1.3A	21.9 ± 1.4B**	15.2 ± 1.2A	63.7 ± 3.6D
GRF	10.1 ± 0.7A	21.9 ± 1.5B	13.0 ± 1.4A	34.4 + 3.2E
TRF	9.8 ± 0.8A	34.3 + 2.7C	17.3 ± 1.7A	40.9 + 2.5F
GRF x TRF	9.7 ± 1.0A	17.1 ± 1.6B	15.3 +-1.4A	51.0 ± 5.0D

* Day effect, $p < 0.001$

** Values within columns with different letters differ significantly, $p < 0.001$

RANK AND MATERNAL BEHAVIOUR IN INDIVIDUALLY STALLED SOWS.

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Pregnant sows penned in group were observed in order to detect the social rank of each individual. After entering the farrowing house, the maternal behaviour of four sows per group, equally sampled from the highest- and the lowest-ranking ones, were observed continuously for a mean duration of 203 min per observation, covering scattered periods from day -4 to day +11 after farrowing (farrowing at day 0).

A total of 16 sows (8 animals per rank) have been observed in order to ascertain possible differences in maternal behaviour between different ranks. In fact, it had already been observed (Csermely, 1989) that dominant sows attack continuously subordinate ones during each meal, interrupting their feeding and confining them to the boundaries of the mash pile on the ground. It is possible that low-ranking animals become frustrated by the repetition of such atacks, although these are not really vicious, and that this frustration might affect their later behaviour when they are put into the farrowing house, where the sows have to cope with the new environment.

Some significant differences between ranks emerged before farrowing or immediately after. Subordinate sows were found to be quieter and to perform fewer stereotyped patterns, e.g. "Bar biting", "Rooting". "Vacuum chewing", however was performed more by the low-ranking sows than by the dominant ones. A dramatic change of behaviour occurred after farrowing. Low-ranking sows became very restless, changing their posture more often ($P<0.05$), and performing stereotyped/redirected patterns, such as "Blowing" and "Digging (with the fore legs)" much more frequently ($P<0.001$) in days 0-1 post-partum, and "Bar biting", "Rooting", and "Vacuum chewing" in the following days (Tab. 1).

Dominant sows performed also more than expected maternal patterns towards the litter, especially from day +2 to day +7, while subordinate individuals were less maternal. Although the mean number of sucking episodes was similar between the ranks, we recorded a higher number ($P< 0.001$) of sucking interruptions caused by the dam in low-ranking animals in the last part of the observational period, while dominant sows generally allowed the piglets to spontaneously abandon the teats, especially just after farrowing (Fig. 1).

REFERENCE

Csermely, D., 1989. Feeding behaviour in sows of different social rank. Appl. Anim. Behav. Sci., 22: 84-85.

This research was carried out with financial support of italian MPI and CNR.

Figure Captions.

Tab. 1: The behaviour patterns whose frequency between ranks was significant in each observational period considered.

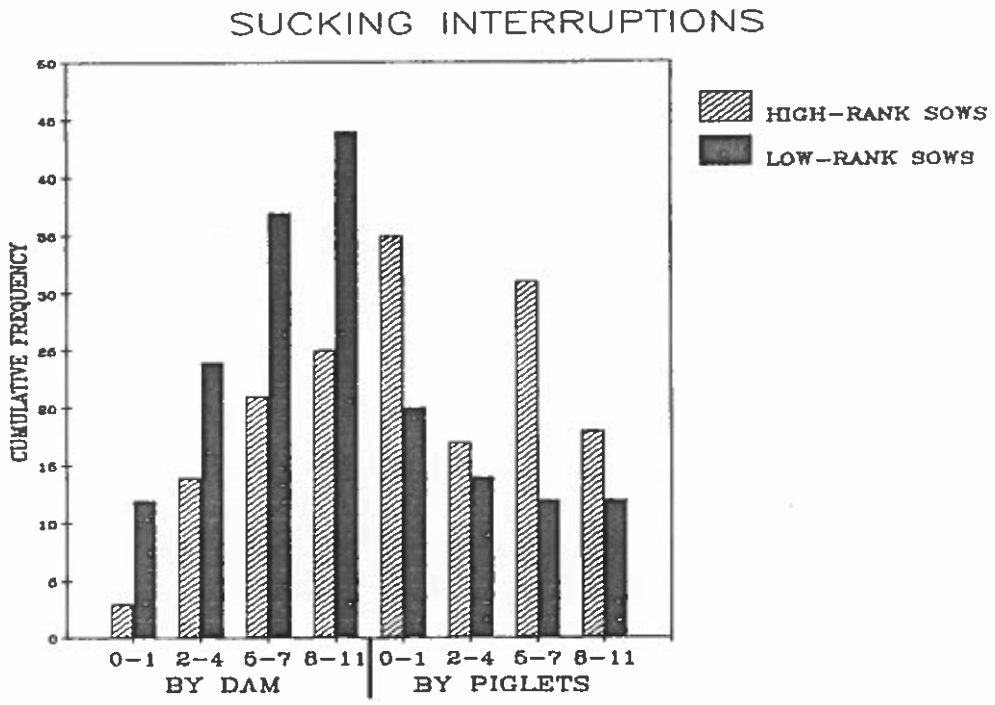
Fig. 1: The cumulative frequency of sucking interruptions due to the dam or the piglets in both ranks.

Tab. 1

PATTERNS	PRE-FARR.	0-1	2-4	5-7	8-11
Biting piglets				*	
Licking piglets					*
Sniffing piglets			*	**	
Sniff. by pigl.		***			
Feeding	*				
Drinking	*				
Standing	**	*	**	***	**
Lying on side	***	*			
Lying on udder		**	**	***	***
Bar knocking		**			
Bar biting	***		***	*	
Rooting	***		***		***
Vacuum chewing	**		**	**	*
Blowing	***	***			
Digging	***	***	***		

* = $P< 0.05$; ** = $P< 0.01$; *** = $p< 0.001$
Underlined = Frequency higher in dominant sows

Fig. 1



CHOICE-FEEDING OF PIGS: AN AID IN PREDICTING THEIR FEEDING BEHAVIOUR

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SUMMARY

When an animal is given free and continuous access to two or more feeds, and hence given a choice, it has to decide how much of each to eat and consequently what the composition of its diet should be. The problem then is to find the rules, if any, by which an animal chooses its diet composition. If there are no rules and the choice feeding of animals is based on simple individual preferences, it is clear that the outcome of choice-feeding experiments can not be predicted.

The ability of growing pigs to select a diet that meets their requirements or to select an optimum diet subject to specific constraints, when they are given a choice between two feeds with different protein contents, was investigated in two experiments. In the first experiment the type of choice offered to pigs fell into one of the three kinds: (i) both feeds were below their protein requirement: (ii) both feeds were above their requirement: and (iii) one was above and the other below the requirement (Table 1). When both feeds were below the requirement the less limiting feed was preferred, but some of the more limiting one was still eaten. The consumption of the more limiting feed may reflect the continuing exploratory behaviour of the animals, since neither of the feeds satisfied their requirements. When both feeds were above the requirement the less abundant was very strongly preferred. It is suggested that excess nutrient intake has a disadvantage and is therefore avoided. When one feed was above and the other below the requirement, then the pigs selected that mixture of the two feeds, which exactly met their requirement. In this third case, the diet selected varied with sex, pig state and previous feeding. In the second experiment pigs made excessively fat by giving them a low protein feed, were given a choice between a feed below and one above their protein requirement. Fat pigs selected a diet much higher in protein content than did normal pigs and had a reduced lipid content in their gain. Female pigs selected a diet of lower protein content than males. The above findings can be used to constitute a general theory of diet selection that asserts what choice the animal should make, when it is given access to two feeds differing in their protein (or any other nutrient) content, if its behaviour is to be consistent with the notion of evolutionary fitness.

Table 1 Diets selected by pigs on different feed pairs (15-30 kg LWT)

Feed Pair			Proportion chosen	CP selected	Gain
Feed 1	Feed 2	Type of choice	as Feed 1	(g/kg)	(g/d)
L	A	limiting-less limiting	0.29	160	866
B	H	less abundant-abundant	0.94	214	770[2]
L	H	limiting-abundant	0.45	204[1]	777[2]
A	H	limiting-abundant	0.31	201[1]	762[2]

1 - no differences in the crude protein (CP) selected by the animals on the two pairs
2 - no differences in the growth rates of these animals

DOES THE NEIGHBOUR COW HAVE EFFECT ON THE BEHAVIOUR OF THE COW KEPT TIED IN A BARN ?

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Background

Dairy cows have a tendency to keep some distance between each other. Very often the animals trie to reserve more space than they would require for carrying out physically a certain type of behaviour. For example in pasture cows maintain a distance of at least one or two meters and they avoid lying side by side near the head of another cow.

Many studies made in loose housing systems show that when space per cow decreases, the aggressive behaviour increases. It is also found that when the housing area is larger, the time spent drinking, feeding and resting increases.

One of the biggest adaption problems among industrial housing conditions is due to the lack of suitable size of lying area. Cows have difficulties to lay down and so this behaviour is often disrupted. It has been found that also a neighbour cow might have the same effect on the cow beside her when standing very close each other. In loose housing systems cows tend to lie with dorsal side towards the occupied stall. In undercrowded conditios (when there is more than one cubicle per cow) cows tend to lie solitary or in groups of two or three animals and adopt more comfortable lying postures.

In Finland most of the dairy cows are kept tied in a barn very close each other. Usually two adjacent cows have one automatic drinking unit.

The aim of this study was to investigate weather the behaviour of a cow kept tied in a barn changes when she gets another cow beside her. The behaviour patterns observed were drinking, feeding, resting and grooming behaviour.

Material and methods

Six pairs of tied-up Ayshire cows were observed by video recording. One cow of each pair was kept alone for five days so that the stalls in both side of her were empty.

The behaviour of the cow was recorded on video for 24 hours during the first, third and fifth day. Then the cow got another animal beside her and they were kept together for five days. The video recordings were again made during the first, third and fifth day.

The main things recorded from the video tapes were

- the total time spent drinking, feeding, resting and grooming
- the number and duration of drinking, feeding, resting and grooming periods
- lying posture (dorsal side towards or away from the neighbour)
- the side the cow groomed more

The behaviour during three observing days when the cow was kept alone were compared with three days with the neighbour.

Results

Results and their significance will be discussed at the congress.

BEHAVIOUR OF HENS AS AN INDICATOR OF AVERSIVENESS TO STUNNING GASES

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The narcotic effect of carbon dioxide has been known for many years. The Farm Animal Welfare Council recommended in 1982 that research should be undertaken to assess the practicability of using carbon dioxide (CO_2) to stun poultry. The present study includes the investigation of CO_2 and argon induced anoxia. The main concern when using CO_2 as a stunning gas is the possibility of stress during induction. Because it is an acidic gas, it is possible that the inhalation of CO_2 would be unpleasant and cause some distress to the birds, before they become unconscious. These effects would not necessarily apply to the use of inert gases.

The main objective of this study was to investigate the response of chickens when exposed to sub-stunning concentrations of CO_2 or argon. Hens were housed in an apparatus consisting of an upper roosting chamber connected by two descending passages to two identical gas tight feeding chambers (Figure 1). The gas concentration in either of these feeding chambers could be regulated and hence birds were allowed to feed in either a normal air atmosphere or an altered atmosphere containing a sub-stunning concentration of CO_2 or argon. The control and treatment chambers were alternated between successive treatments. For each treatment, the occupancy of the chambers was monitored during the 8 hour light period (9.00h-17.00h) for a minimum of 3 consecutive days. The percentage occupancy of each feeding chamber during gas treatments is presented in Figure 2.

The results show that when the feeding chambers contained atmospheric air, the hens did not show any preference in their occupancy of the two chambers. When one of the feeding chambers was filled with 5% CO_2, the occupancy was not significantly altered. However, when the concentration of CO_2 was raised above 5%, or the concentration of oxygen was reduced to 10% or below, the occupancy of the treatment chamber was significantly reduced ($P<0.05$).

In the context of gaseous stunning of poultry, these results indicate that the exposure of birds to increased levels of CO_2 or decreased levels of O_2 is aversive, and rapid induction of anaesthesia is recommended during stunning to keep the stress at low levels.

Figure 1. Design of the Chambers

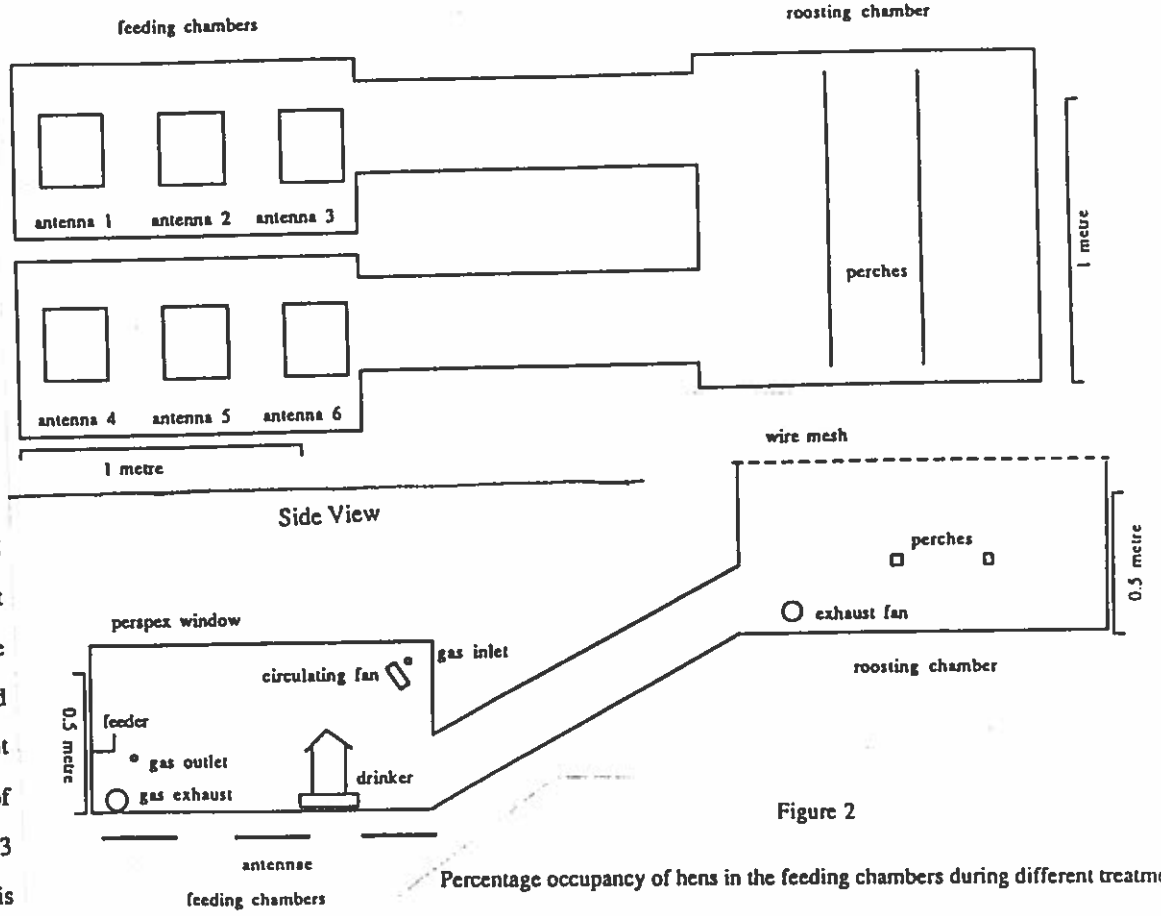
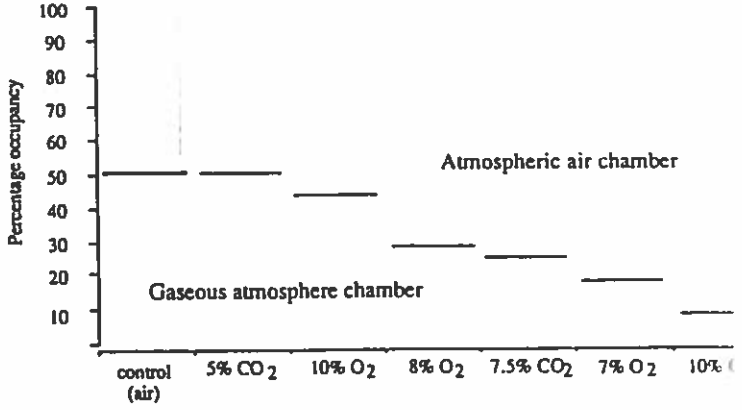


Figure 2

Percentage occupancy of hens in the feeding chambers during different treatme



BEHAVIOURAL INTERACTIONS BETWEEN MALE TYPES OF CATTLE

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The physical activity that occurs during mixing of strange animals pre-slaughter is higher in bulls than in steers. This physical activity negates the advantages of using bulls for beef production, however, the effect of vasectomy to combat behavioural problems in bulls has not been investigated. Thus, an experiment was designed at the Experimental Husbandry Farm, Loughgall (NI) to investigate the behaviour of vasectomised bulls, entire bulls and steers. The experimental animals were 15-16 month old Limousin and Simmental cross Friesian cattle.

Four groups of cattle, consisting of two of each of entire bulls, vasectomised bulls and steers were mixed and their homosexual (teasing and mounting) and aggressive (butting and pushing) behaviours were investigated for the initial four hours period.

Two-way analysis of variance of the data showed that none of the behaviours differed significantly between the groups, however, there was a significant difference ($P<0.05$) between the male types for teasing behaviour. There was no statistically significant interaction between the groups and male types.

Among the 4 groups studied, 4 vasectomised bulls, 2 entire bulls and 1 steer were found to be homosexually hyperactive and they contributed to 61%, 16% and 9% respectively to the total homosexual behavioural score (all the groups added together). This clearly indicate that the vasectomised bulls were homosexually hyperactive but less aggressive when compared to entire bulls (Table 1).

The homosexual behaviours were expressed in a preferentially unidirectional manner irrespective of the male types (Figure 1). The motive for mounting appeared to be both agonistic as well as sexual.

The aggressive behaviours occurred in retaliation to homosexual behaviours, resulting in a statistically significant correlations between them. The exhibited mounting and teasing had correlations of 0.75 ($P<0.001$) and 0.56 ($P<0.01$) respectively with the butting received.

It is suggested that vasectomy as a method of emasculation may not help to solve the behavioural problem in bulls, instead it could lead to higher incidence of high pH meat.

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Table 1

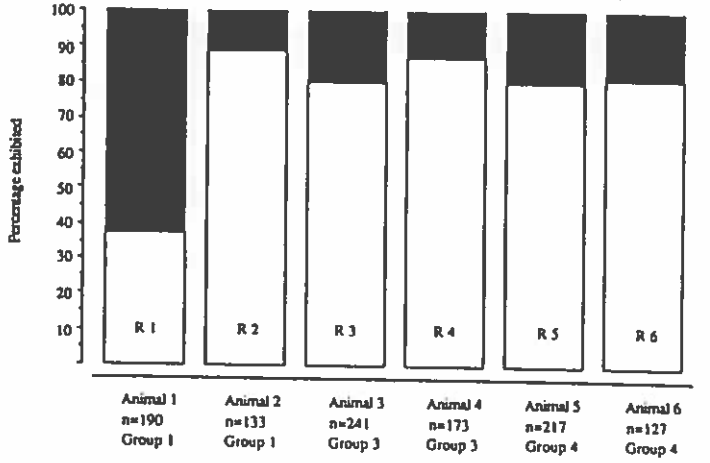
Behavioural Interactions During 4 hours After Mixing of 3 Different Male Types of Cattle

Particulars	Acts exhibited				Acts received			
	Mean	S.E.	Mean rank	χ^2 (df=2)	Mean	S.E.	Mean rank	χ^2 (df=2)
Mounting :				2.25 NS				1.75 NS
VB	50.25	17.93	2.38		15.63	8.03	1.88	
EB	19.88	8.78	2.00		55.63	21.89	2.38	
S	16.50	14.55	1.63		15.13	4.54	1.75	
Teasing :				13.19 **				1.94 NS
VB	63.38	18.09	2.94		12.63	6.65	1.69	
EB	16.75	8.17	1.94		49.00	16.05	2.38	
S	1.75	1.08	1.13		18.50	5.38	1.94	
Butting :				7.31 *				1.75 NS
VB	15.63	4.90	1.81		50.88	27.37	1.88	
EB	56.00	20.42	2.75		27.50	10.12	2.38	
S	23.63	17.40	1.44		18.13	8.38	1.75	
Pushing :				1.31 NS				6.06 *
VB	8.75	2.57	2.06		10.50	2.77	2.50	
EB	12.13	3.10	2.25		7.63	2.08	2.19	
S	5.13	3.29	1.69		3.75	1.75	1.31	

VB=vasectomised bulls; EB=entire bulls; S=steers
Statistical significance of differences between male types were calculated by Friedman's test
NS = not significant; * = $P<0.05$; ** = $P<0.01$

Figure 1

Preferential Expression of Homosexual Behaviours of Hyperactive [a] Male Sex Types in Cattle



Labels on x-axis indicate identification numbers of hyperactive animals and labels within boxes indicate identification numbers of animals which received the acts (R).

n=number of homosexual acts exhibited.

Shaded area within the boxes indicate behaviours expressed on the other animals within the same group

[a] Animals which exhibited 6 homosexual acts in 15 min period were shown as hyperactive

DOES PROVISION OF A PERCH INFLUENCE NEST BOX USE IN THE BATTERY CAGE?

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Apart from the additional space required, providing nest sites in a battery cage presents problems of hygiene through site soiling. Also, where sites are shared, long periods of sitting after laying may prevent all members of a group from using the nest, as well as causing delay in egg collection. The effect of provision of a perch on nest site soiling, and on the amount of time spent in the nest during peak laying periods was investigated.

Four flat-floored wire cages were used housing (a) 4 birds at 1200 sq.cm/bird; (b) 4 birds at 600 sq.cm/bird; (c) 2 birds at 1200 sq.cm/bird and (d) 2 birds at 600 sq.cm/bird. Each cage was fitted with traditional wooden litter lined nest boxes at the rear, 24 cm x 30 cm x 46 cm high, one per hen, and a rectangular wood perch 5 cm x 3 cm running the length of the cage to the front.

Experiment 1: Faeces were collected daily from each nest box for 9 days with a perch present, and for a further 9 days with the perch absent. The hens were then replaced with fresh birds, and faeces collected for 9 days with the perch absent, and a final 9 days with the perch present. Soiling was found to be much reduced where a perch was provided for 2 birds at 600 sq.cm/bird ($T=9$; $p<0.01$). A trend in the same direction was also observed for 4 birds at 1200 sq.cm/bird which just failed to reach significance. However, a perch had no significant effect on soiling for 2 birds at 600 sq.cm/bird, while for 4 birds at 600 sq.cm/bird soiling was significantly increased ($T=21$; $p<0.01$).

Experiment 2: Data concerning the number of visits made to the nest boxes by the hens in the 4 cages were collected by means of a photocell system recording all visits made in the peak laying period (9.00am - 1.00pm) over 20 days. Perches were present for 5 days, then removed for the 2nd 5 days. The hens were then replaced with fresh birds, and these were tested without perches for days 11-15, then with perches over days 16-20. For overall nest use, presence of a perch was found to have no significant effect. However, time spent in nest boxes varied significantly with cage and group size ($F=17.5$; df 3,36; $p<0.01$).

With regard to nest box soiling, it was concluded that the presence of a perch may be effective in soil reduction, but only after a critical space allowance has been reached. Nest box use seems to be more dependent on cage and group size than on whether or not a perch is present.

EXPERIMENT 1: Nest box soiling with and without perch. (mean faeces (g) collected over 18 days)

	2 birds/1200 sq.cm.		4 birds/1200 sq.cm.	
	Perch	No perch	Perch	No perch
Total	90.58	501.11	0.00	97.70
Mean	5.03	27.83	0.00	5.43
s.d.	4.00	16.99	0.00	12.57
	2 birds/600 sq.cm.		4 birds/600 sq.cm.	
	Perch	No perch	Perch	No perch
Total	993.20	1013.80	2067.70	921.50
Mean	55.18	56.32	114.87	51.19
s.d.	44.23	36.99	69.77	44.03

EXPERIMENT 2: Nest box use with and without perch (mean time in box(es) per bird over 10 4-hr periods)

	Time in box (secs.)			
	2 birds/1200 sq.cm.		4 birds/1200 sq.cm.	
	Perch	No perch	Perch	No perch
Total	42979.50	19216.00	12956.80	13692.00
Mean	4297.95	1921.60	1295.68	1369.20
s.d.	6384.10	1130.27	871.45	747,36
	2 birds/600 sq.cm.		4 birds/600 sq.cm.	
	Perch	No perch	Perch	No perch
Total	42929.50	37037.00	18945.30	31424.50
Mean	4292.95	3703.70	1894.53	3142.45
s.d.	2119.75	1771.24	586.94	589.63

ACTIVITY AND NURSING BEHAVIOUR OF AD LIBITUM AND RESTRICTIVELY FED SOWS

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Activity and nursing behaviour of seven lactating sows fed ad libitum have been compared with that of five restrictively fed sows. The former had free access to feed in a self-feeder, and the latter were fed twice daily according to the new Swedish scale. The sows were kept loose in farrowing pens (2.6 x 2.8 m + dunging area). From the fourth day after farrowing they had access to the dunging area. Straw was used as bedding material and distributed once daily. Video recordings were made during one 24h period on each of day 2, 10, 21 and 35 after farrowing. Lying on the sternum and on the side, walking and/or manipulating straw, nursing (pre-and postmassaging time included), occupying feed trough and staying in the dunging area were recorded. In addition it was noted whether the sow or the piglets terminated suckling.

During the first week after farrowing, the daily feed intake of the ad libitum fed sows was higher (5.8 vs 3.2 kg), and the body weight losses greater (6.8 vs 14.8kg) than that of the scale-fed animals, but not thereafter (6.6 vs 6.9 kg, and 7.9 vs 7.4kg, respectively). The scale fed sows spent less time at the feeding trough, but they walked and/or manipulated straw during a greater part of the day than the ad libitum fed sows (fig. 1).

Both groups of sows spent most of the time in the dunging area or lying in the pen. The part of the laying time which the sows spent lying on the sternum increased with the age of the piglets and this increase was most pronounced for the scale-fed sows (fig. 2). The time spent in the dunging area also increased as the lactation proceeded. On day 10 the ad libitum fed sows spent more time in the dunging area than the scale-fed animals. This might have been caused by a higher heat production, which also was supported by the shorter time the animals spent sternum-lying on this day.

It was not possible to record the behaviour in the dunging area. This excluded reliable records of the suckling frequencies. The total time spent for suckling in the pen decreased with increasing age of the piglets (fig. 1). The length of the individual sucklings decreased and the fraction of the sucklings which was interrupted by the sow increased with the age of the piglets (fig. 3). At 21 days the scale-fed sows tended to interrupt a greater fraction of the sucklings than the ad libitum fed sows. This observation was also supported by the differencies in sternum-laying behaviour.

In conclusion, this study indicated that the scale-fed sows were more prone to manipulate straw and less ready to nurse their piglets than sows with free access to feed, in spite of very similar daily feed intakes and body weight losses after the first week.

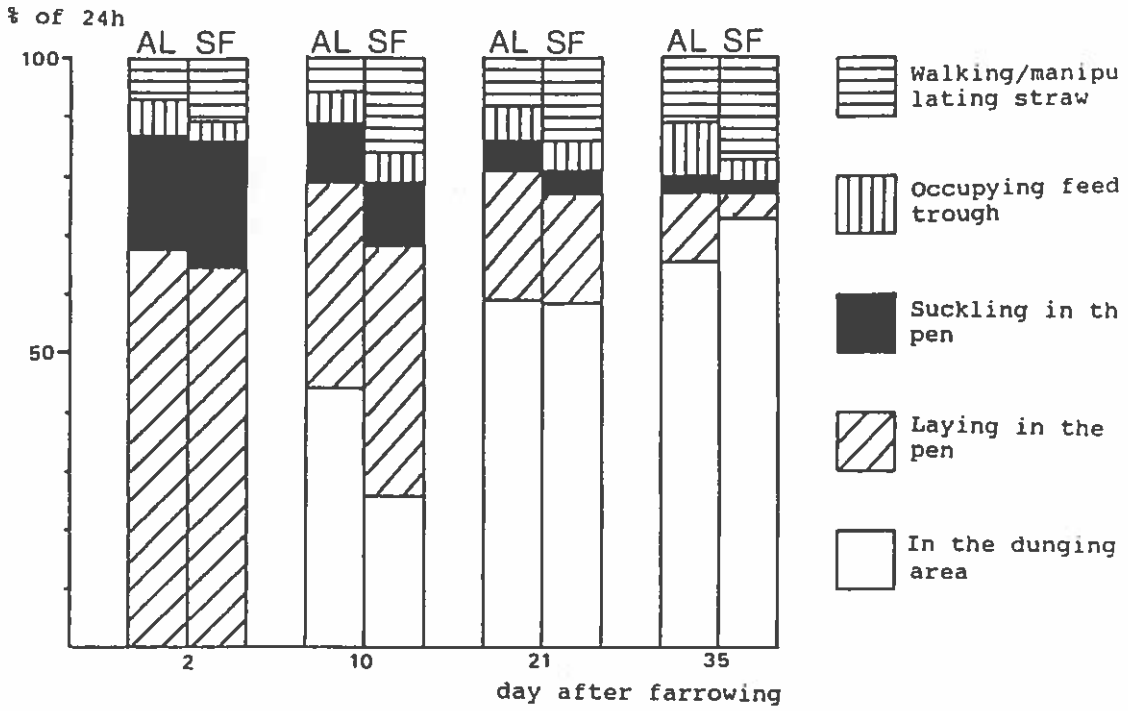

Fig. 1. Main activities of ad libitum (AL) and scale-fed (SF) sows on day 2, 10, 21 and 35 after farrowing

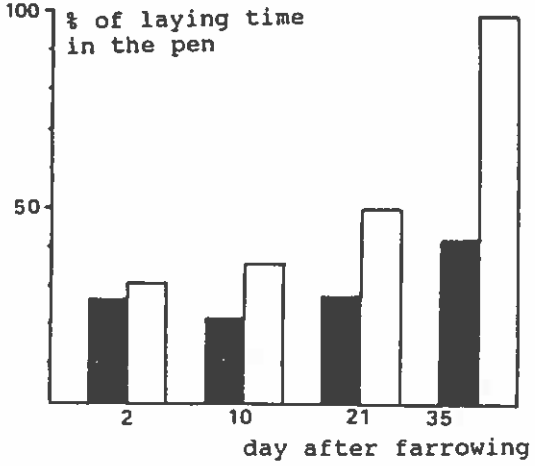

Fig. 2. Sternum-laying in per cent of total laying time in the pen. Filled bars=ad libitum fed sows, open bars= scale-fed sows

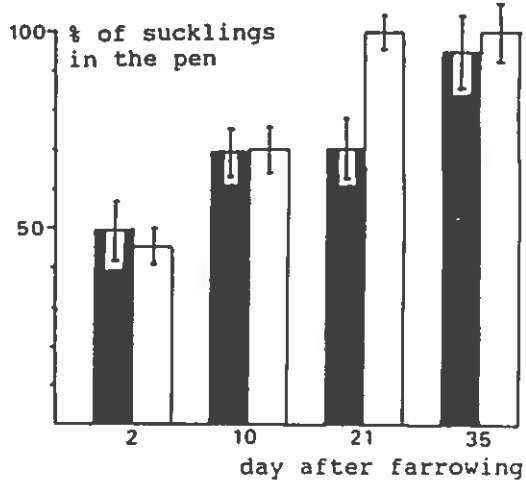

Fig. 3. Per cent of sucklings, which was interrupted by the sow. Filled bars= ad libitum fed sows, open bars=scale-fed sows

Telemetric Monitoring of Pulse Rate in Sows to the End of Pregnancy during Parturition and in the Course of Lactation

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Telemetric monitoring of functional activities of organ and organ systems belong to modern methods of clinical physiologic research. These studies are very valuable also in complex ethologic studies on farm animals. In our study the pulse rate of young sows was investigated. The heart was used as an indicator of complex changes taking place in the animal organism and the analysis of its activity, i.e. pulse rate, served as a model of trigged neuro-endocrine mechanisms which can be used for the elaboration of working hypotheses about parallel physiological processes and manifestations of behaviour of sows.

At the Congres on Applied Ethology in 1988 we had referred also about differences in the development of pulse rate before and during both spontaneous and cloprostenol - induced parturitions. In the study information is presented about our results of telemetric monitoring of pulse rate in sows before and during the parturition induced by a natural PGF-2-alpha (Dinolytic, Upjohn) and these data are compared with our results of telemetric monitoring of pulse rate in sows after the application of a synthetic analogon PGF-2-alpha, i.e. cloprostenol (Oestrophan, Spofa). Further the results from our telemetric monitoring of pulse rate during the lactation are presented.

The following conclusions may be drawn on the base of comparsion of pulse rate of sows before and during the cloprostenol - induced parturition on the one hand and PGF-2-alpha - induced parturition on the other.

Pregnant sows practically did not respond to the injection of cloprostenol after its application as far as the immediate increase in the pulse rate was concerned while their response to PGF-2-alpha was very marked.

These different responses to the application of Oestrophan and Dinolytic were, however, compensated through a greater and/or smaller increase in pulse rate approximately 6 hours after the application of prostaglandine. In our opinion, this wave of increased heart activity was causedby the ability of exogenous prostaglandine to induce the production of endogenous prostaglandine in the uterus sows. It is known that cloprostenol is biologically much more effective than natural PGF-2-alpha. We suppose therefore that its effect reached the treshold level in sow's organism which resulted in a marked increase in the production of endogenous substances inhibiting both the formation and general effectiveness of prostaglandine. The animal organism responded therefore to the application of cloprostenol as late as 6 hours afterwards when the effect of inhibiting substances was not so marked. On the other hand, natural PGF-2-alpha did not iduce such a marked blockade of its effects and for that reason an immediate increase in the pulse rate and the inhibiting effect occurred a little later. This significantly explains the differences in the behaviour of sows after the application of these two substances when inducing the parturition.

In the course of our studies on pulse rate of sows during the lactaion it was found out that the highest pulse rate was reached in a layning position when the piglets were suckling the milk regardless to the day of lactation.

Fig.1

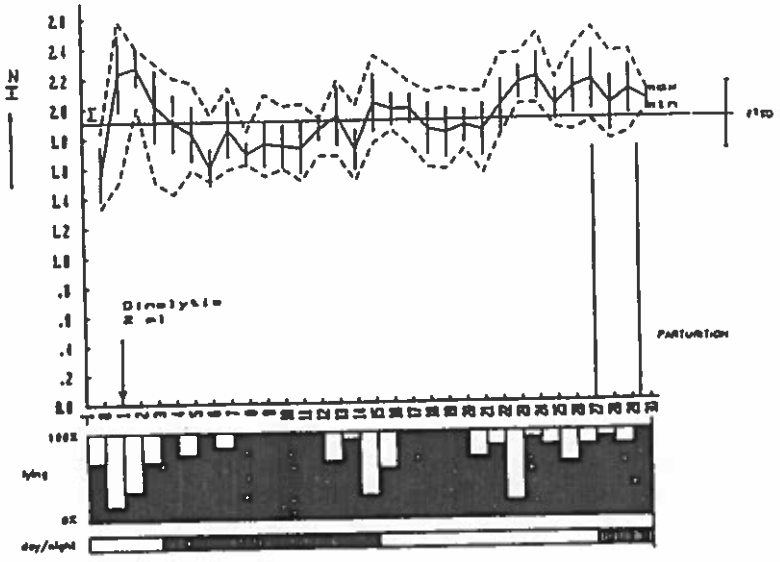
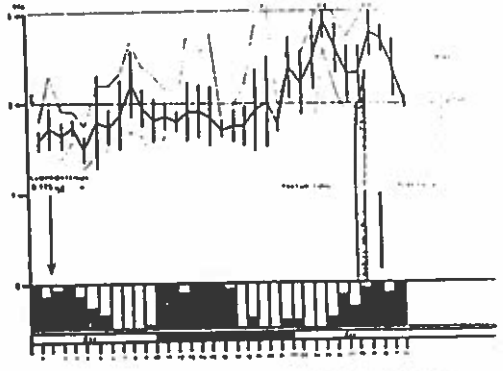
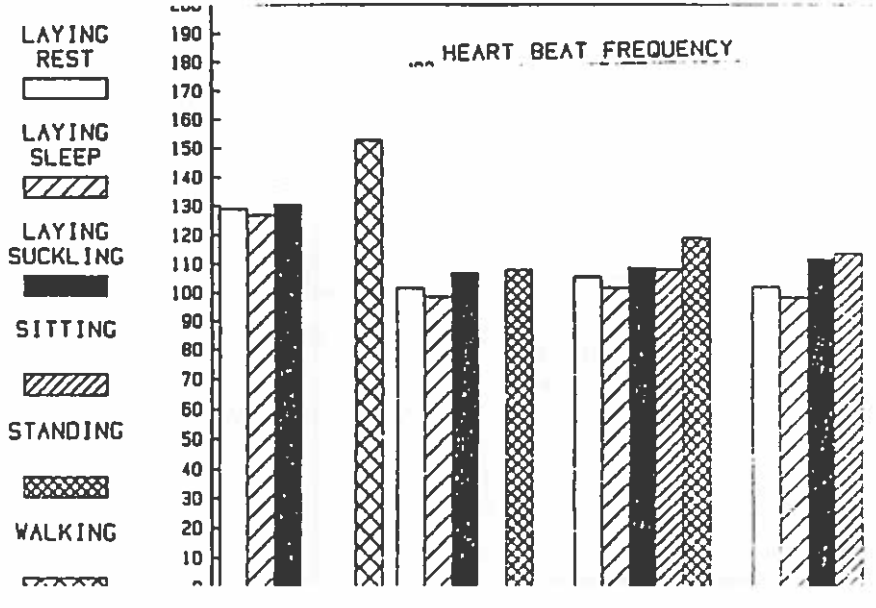


Fig.1 Pulse rate of sows before and during the PGF-2-alpha - induced parturition (Dinolytic,Upjohn)

Fig.2 Pulse rate of sows before and during the cloprostenol - induced parturition (Oestrophan, Spofa)

Fig.3 Level of pulse rate in the course of one week intervals of lactation (laying-rest, laying-sleep, laying-suckling of piglets, sitting, standing, walking)





SUMMARY

MOTIVATIONAL ASPECTS OF ANIMAL PROBLEMS
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Most, if not all animals' problems have a motivational basis, at least in the individuals of a group which show abnormal behaviour. One of the large challenges to applied ethologists is to find this basis and reveal the relevant developmental pathway(s), and the circumstance(s) and environmental deficience(s) that lead to the abnormality. Stereotypies in tethered sows, weaving in horses and fur sucking in calves are examples. However, in only very few cases do we know the motivational basis of the problems. Additionally, when the abnormal behaviour appears there may be more motivational systems involved simultaneously, e.g. during conflicts, and that complicates the analysis. Furthermore, in grown up animals the behaviour may have become more or less emancipated from the original situation and/or motivation, and thereby the tracing of the original underlying motivation will be difficult, if not impossible.

These points will be illustrated by studies from the red junglefowl and the domestic fowl. In grown up hens type(s) and strength of motivation(s) may be assessed during "deprivation choice tests". In these tests hens are offered 2 or more environments simultaneously, but once the choice has been made the other options are not available before the next test is being made. The different environments may offer consummatory stimuli for different motivation systems, and thereby the choice may tell us which motivation was the most significant. The amount of consummatory behaviour may indicate the strength of the motivation. It is of the greatest importance that the design of the study is based on knowledge about the normal behaviour of the species so that relevant environments can be offered, and motivations should also be controlled before tests. Such tests may show which motivations are significant.

Surprisingly few studies on abnormal behaviours have combined developmental and motivational aspects. Such studies may be very useful, because if animals are observed from early on we would know when the abnormal behaviour started, in which situations it first appeared and the further course of development could be traced and described. Furthermore, the situation in which it first appeared would indicate the underlying motivation.

An analysis of data from simultaneous observations of dustbathing behaviour, allopecking, and social behaviour in small groups of red junglefowl chicks revealed that the birds probably developed feather pecking from dustbathing behaviour. Feathers were perceived as "dust" , and dominant peckers generally pecked the bodies of the subordinates, whereas some of the subordinates "misused" the allopreening system while pecking the necks of penmates in their search for dust. Furthermore, peckers often failed to participate during dustbathing events in their group, and tonic immobility tests showed that these birds were fearful. This example illustrates the usefulness of combined motivational and developmental analysis.

Some of the results that indicate the link between dustbathing, feather pecking and fear appear from table 1 and 2.

	Plumage scores			
Category	Head	Neck	Body	Total (incl.head and neck)
Rich	0.3	0.4 *	2.7	3.4
Poor	0.4	1.6	2.6	4.6
Groups without US birds	0.5	0.0	0.6	1.1
Groups with US birds	0.3	1.3	3.4 *	5.0 *

Table 1. Mean plumage scores of rich and poor birds and of birds in groups with and without unsynchronized (US) birds in them. (* = $P<0.05$ indicates significant differences between group scores) (= mean of scores of birds within a group). Scores for "Total" and "body" was based on scores for 8 and 6 different areas of the plumage, respectively. Scoring was made as follows: 0 = no damages, 1 = slight damage on few feathers; 2 = severe, but located damages and/or less than $5cm^2$ naked skin visible; 3 = severe and extended feather damages and/or more than $5cm^2$ of naked skin visible. Unsynchronized birds were those that often failed to participate during dustbathing events in their group (they participated in one third or less of the dustbathing events).

		Age (weeks)	
	N	8-13	25-40
Synchronized birds	16	196	269
Unsynchronized birds	8	479	661
Statistical sign. of difference		NS	P<0.002

Table 2. Mean righting times (seconds) of synchronized and unsynchronized birds.(Mann-Whitney U-test).