

SOME FACTORS AFFECTING RESTING BEHAVIOUR OF SHEEP IN SLAUGHTERHOUSE LAIRAGES AFTER TRANSPORT FROM FARMS

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Abstract

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The resting behaviour of 64 groups of sheep was observed in the lairages of two slaughterhouses after transport for about four hours in a commercial livestock transporter. The sheep were scanned at five minute intervals for the initial three hours in the lairage pen. The median percentage of time spent lying per group was 17 per cent (range 1 to 63). The percentage of time spent lying was not significantly related to the duration of transport, time of arrival or slaughterhouse. There was a significant positive relationship between space allowance (range 0.22 to 0.98 m² per sheep) and percentage of time spent lying per group (P<0.001). Increased space allowance also tended to be associated with a decrease in the occurrence of all interactions between the sheep (P = 0.05). Groups penned with two unfamiliar groups tended to spend less time lying than those penned on their own or with one other group (P = 0.07). There was no significant difference in the total percentage of time spent lying by groups penned on slats and those penned on straw. The results indicated that the ability of sheep to rest in the lairage may be compromised by providing low space allowances.

Keywords: *animal welfare, behaviour, lairage, resting, sheep*

Introduction

Approximately 16 million sheep are slaughtered each year in the UK, and more than 50 per cent are held in lairage pens overnight before slaughter (Warriss *et al* 1990). The time spent in lairage allows ante-mortem inspection, enables production at the slaughterhouse to be maintained (Guise 1991) and is traditionally seen as an opportunity for animals to rest and recover from the effects of transport. Animals might also be held in lairage before and during long journeys.

Ability to rest in the lairage may depend on conditions within the lairage, such as presence of bedding, disturbance levels (Cockram 1990, 1991), space allowance per animal and source (Kim *et al* 1994). This study examined the effect of space allowance, floor type and social composition on the resting behaviour of sheep from similar sources and with known transport histories during the initial three-hour period in a slaughterhouse lairage.

Methods

Animals and lairage conditions

Sheep which had been transported from farms in a commercial livestock transporter were observed at two slaughterhouses (mean journey time: slaughterhouse A 207min, SEM = 13, n = 17; slaughterhouse B 248min, SEM = 11, n = 47). The sheep were mainly Blackface, Greyface and Suffolk crosses and were from two lamb marketing groups. Sheep from the same farm were transported together and were defined as a group. Group size ranged from 7 to 107 (median 30). Mean liveweight of the sheep, calculated as 2.17xcold weight, was 40.2kg (SEM = 0.4, n = 58). Mean space allowance during transport was 0.007m² kg⁻¹ (range 0.004 to 0.014); equivalent to 0.29m² per sheep (range 0.16 to 0.77m² per sheep). The vehicle had 3 decks which were split into two, three or four pens by movable pen divisions.

All groups arrived at the slaughterhouses between 1355h and 1630h where they were held in a lairage pen until slaughter the following day. Activity levels within both lairages between 1355h and 1930h were generally low. The main source of noise and potential disturbance was the arrival of other livestock and their movement into pens. There was also occasional minor disturbance from movement of staff along the passages and the cleaning of other pens in the lairage. Sheep in the pens were also disturbed by being moved between pens, by a person entering the pen to add hay and by additional sheep being added to the pen.

Both lairages consisted of pens located at either side of a central corridor. The walls of the lairage pens were constructed of metal bars at one slaughterhouse and had solid sides at the other slaughterhouse, with tubular metal gates opening on to the central passage. The concrete floor of each pen was covered with either straw bedding (34 groups) or platforms of 50mm wide wooden slats with 20mm gaps (30 groups). Water was available from either troughs or containers but for the majority of groups (51 groups) no food was available during the observations. The floor surface area of the pens ranged from 16.0 to 44.0m² and the median number of sheep per pen was 48 (n = 62, range 23 to 107). The overall mean space allowance per sheep at the end of observations was 0.54m² (n = 61, SEM = 0.02, range 0.22 to 0.98). The mean time that sheep spent in the lairage was 18.1h (n = 63, SEM = 0.2, range 14.4 to 19.8).

Behavioural observations

The behaviour of 64 groups of sheep (n = 2148) in the lairages was observed on 13 occasions (median 5 groups per day) between November and April, by direct observation from an adjacent passageway. After unloading, each group was placed in a lairage pen. Groups of sheep were distinguished by coloured spray paint markings made before transport. The number of sheep lying down (lying) in each group was recorded by scan sampling at five minute intervals for three hours beginning when the group entered the lairage pen. For each group the occurrence of all events which might potentially cause injury was recorded, and a mean value per sheep was calculated. The events recorded were riding behaviour, head-butting, falls and slips (Jarvis & Cockram 1994).

Statistical analyses

For each group, the total number of sheep minutes during the observation period was defined as 180 minutes multiplied by the number of sheep. The total number of sheep minutes spent

lying per group was calculated by multiplying the number of sheep lying at each time interval by five and summing the results. These values were then used to calculate the percentage of time spent lying per group during the three hour period.

Mann-Whitney and Kruskal-Wallis tests were used to examine the effect of floor type, slaughterhouse, disturbance and number of groups per pen on the percentage of time spent lying per group. The difference between mean space allowances per sheep for groups on straw and slats was tested using an unpaired *t* test. The effect of time of arrival on lying behaviour was tested by regressing the latency time (ie time taken for the first sheep per group to lie down), and the percentage of time spent lying per group, against the time of arrival. Regression analysis was used to investigate the effects of mean space allowance in the lairage pen, duration of transport and group size on the percentage of time spent lying per group. The relationship between mean space allowance and the average number of events per sheep per group which could potentially cause injury was tested by regression analysis.

Results

The median percentage of time spent lying per group in the three-hour observation period was 17 per cent ($n = 64$, range 1 to 63). In every group at least one sheep lay down once during the three-hour observation period. Typically one or more sheep lay down within 30 minutes (0.6 of groups), and then others followed (Figure 1). Eleven groups were disturbed during observations, by being moved to a different pen (five groups), a person entering the pen to provide food (three groups) and by the addition of sheep to the pen (three groups). Although disturbances of this kind normally caused some or all of a group to stand up (Figure 2), the percentage of time spent lying by disturbed groups was not significantly different from undisturbed groups (not disturbed: median 16%, $n = 53$; disturbed: median 22%, $n = 11$; $P > 0.05$). General activity in the lairage, such as the movement of people or animals in passages, caused minor temporary changes in the behaviour of most groups but this effect was not quantified.

There was no difference between the percentage of time spent lying per group in the two lairages (slaughterhouse A: median 16%, $n = 17$; slaughterhouse B: median 17%, $n = 47$; $P > 0.05$). Duration of transport was not significantly related to the percentage of time spent lying in the lairage. There was no significant effect of time of arrival either on the time taken for the first sheep in a group to lie down or on the percentage of time spent lying per group. Group size was not significantly related to the percentage of time spent lying per group.

There was a tendency for the number of groups per pen to affect the percentage of time spent lying per group, although this relationship was not statistically significant (one group/pen: median 21%, $n = 21$; two groups/pen: median 22%, $n = 31$; three groups/pen: median 10%, $n = 12$; $P = 0.07$). There was no significant difference between the mean space allowance per sheep in these categories.

The percentage of time spent lying per group did not differ between floor types (slats: median 21%, $n = 30$; straw: median 14%, $n = 34$; $P > 0.05$) (Figure 1). There was no difference in space allowance for sheep on slats compared with those on straw (mean space allowance slats: 0.51m^2 , SEM = 0.03, $n = 27$; straw: 0.56m^2 , SEM = 0.02, $n = 34$; $P > 0.05$).

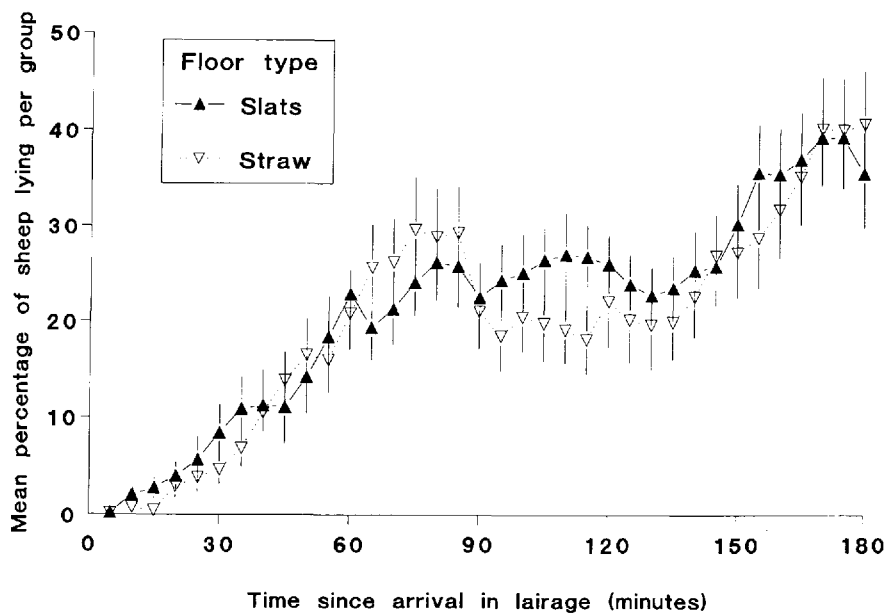


Figure 1 Effect of floor type on the mean percentage of sheep per group lying in the lairage. Bars represent standard errors.

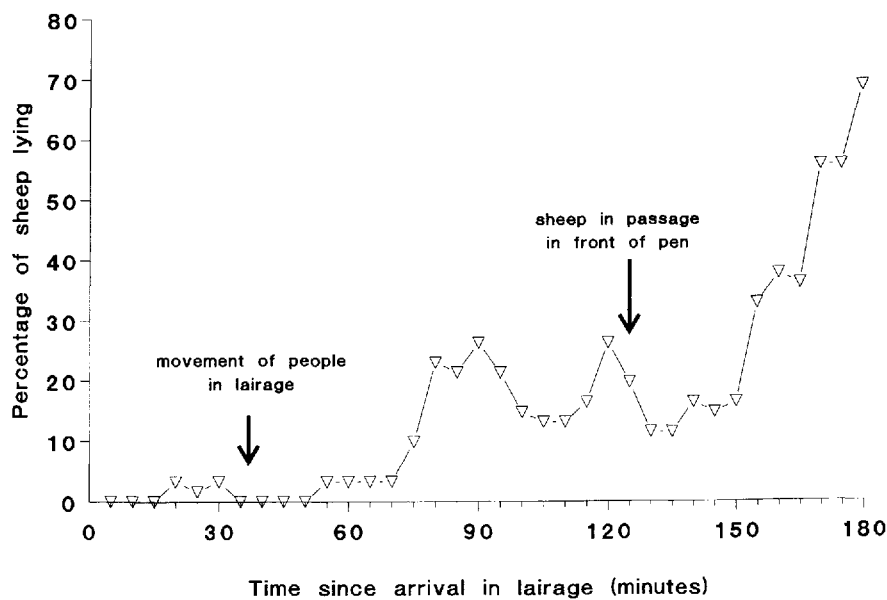


Figure 2 Lying behaviour of a group of sheep on straw bedding in a slaughterhouse lairage. (Group size = 61; space allowance = 0.59m² per sheep).

There was a significant relationship between the mean space allowance per sheep per group and the percentage of time spent lying per group (percentage of time lying = $-6.86 + 52.0m^2$ per sheep, $n = 61$, $r = 0.49$, $P < 0.001$) (Figure 3). When groups that had been disturbed were removed from this analysis, this relationship became stronger (percentage of time lying = $-8.76 + 53.1m^2$ per sheep, $n = 38$, $r = 0.60$, $P < 0.001$).

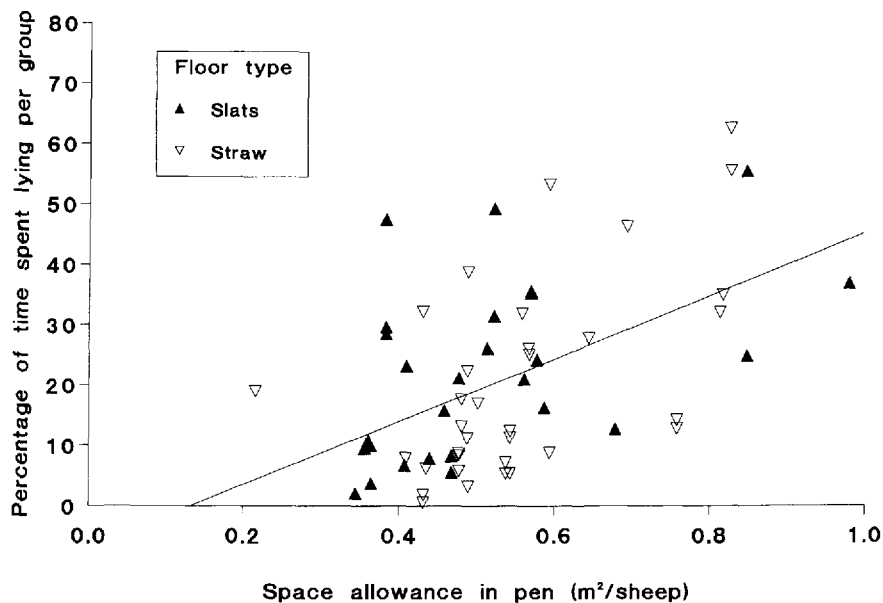


Figure 3 Effect of space allowance on the mean percentage of time that sheep spend lying during the first three hours in a lairage pen. (Mean percentage of time spent lying = $-6.86 + 52.0m^2$ per sheep, $n = 61$, $r = 0.49$, $P < 0.001$.)

The occurrence of potentially injurious events was relatively rare, with an overall mean occurrence of 0.06 per sheep (SEM = 0.01; $n = 64$). The majority of events observed were riding (89%), with the remainder being head-butts (10%) and hitting part of the pen (1%). There was a trend for the mean number of potential bruising events per sheep to decrease as the space allowance per sheep increased (mean events = $0.12 - 0.12m^2$ /sheep, $n = 61$, $r = 0.21$, $P = 0.054$). There was no effect of time of arrival on the mean number of potential bruising events per sheep.

Discussion

The results of this study give some indication of factors affecting the ability of sheep to rest in a slaughterhouse lairage. Any detrimental effects of a lairage environment on the ability of sheep to rest are likely to be most apparent during the initial few hours in the lairage.

Although group size varied, the sheep in this study had relatively similar backgrounds with known transport histories and had travelled for similar distances and times direct from farms to the slaughterhouses. Differences in lying behaviour within the lairage were therefore more likely to be related to conditions in the lairage than to the effects of transport conditions or previous treatment. In this study, lying behaviour is used as an indicator of resting behaviour. Laurentie *et al* (1989) found that, although it may be possible for sheep to rest without lying down, lying was associated with brain patterns indicative of rest.

The Farm Animal Welfare Council (1984) recommended the provision of clean straw bedding for animals kept in lairage. The provision of slats rather than straw eliminates the need for the removal and re-littering of straw, but cleaning pens with slats usually requires that the slats are removed, and the initial capital cost is high. Sheep penned on slats require lower space allowances and the drier, cleaner lying area results in cleaner fleeces compared with sheep penned on straw (Bryson 1984). However, these advantages may be outweighed in welfare terms if the ability of the animals to rest is compromised. In this study there was no significant difference in the total percentage of time spent lying by groups of sheep on the two floor types, and therefore no evidence that either slats or straw-covered floors are superior in terms of the ability of sheep to rest.

Lying behaviour appeared to be reduced by mixing groups of unfamiliar sheep in a pen. Sheep penned along with two other groups spent less time lying than those penned on their own or with one other group. Sheep represent a species with dominance hierarchies and social structures (Lynch *et al* 1992) and mixing social groups in lairage pens is likely to be detrimental in terms of their ability to recover from the effects of transport and handling. Penning established social groups separately would be beneficial both in terms of the increased ability of the animals to rest, and in the reduced need for pre-slaughter handling to separate groups prior to slaughter.

Work on cattle (Cockram 1990, 1991) and sheep (Kim *et al* 1994) has shown that lying behaviour is influenced by human activity in the lairage. The eleven groups in this study which were disturbed by people or animals entering the pen or were moved during observations, did not spend a lower percentage of time resting than groups which were not disturbed. This may have been due to the relatively small number of groups that were disturbed, combined with the large variation in resting behaviour even in undisturbed groups.

In this study lying behaviour increased as space allowance per animal increased. Sheep must have sufficient space to stand up, lie down and turn around (The Scottish Office Agriculture and Fisheries Department 1992). Sheep have clear preferences in the way they position themselves in enclosed areas, tending to lie next to, and parallel to, open pen walls (Hutson 1984). Standing sheep tend to face the nearest adjacent pen of sheep and distribute themselves regularly in the pen; each sheep thus maximising the distance to its nearest neighbour (Hutson 1984). In groups penned at low space allowances where free movement is restricted, it is likely that these spatial requirements will also be compromised (McBride 1971), and this may be detrimental to the ability of the animals to rest.

The Meat and Livestock Commission (1974) recommended a space allowance of 0.56m² per sheep in lairage pens, and Grandin (1990) recommended a minimum space allowance of 0.5m² per slaughterweight lamb. The Farm Building Information Centre (1983) recommended

space allowances of 0.75-0.95m² and 0.55-0.75m² for 32kg hoggs (yearling sheep) on straw and slats, respectively. Mean liveweight in this study was 40.2kg, suggesting that optimal minimum space allowances should have been greater than 0.55m². However, almost two thirds (66%) of the groups observed in this study had a space allowance of less than 0.56m² per sheep, and the mean space allowance on straw and slats was 0.56m² and 0.51m², respectively. A previous study concluded that lying behaviour in a slaughterhouse lairage was affected by space allowance and that an area greater than 1m² per sheep was required before most sheep within a group lay down (Kim *et al* 1994). In the present study, no groups had a space allowance greater than 1m² per sheep.

At low space allowances even if animals can lie down it may be difficult to stand up again to change position or to avoid being trampled by other animals. In four groups, sheep were observed to walk across the backs of other sheep: these groups had space allowances equal to, or lower than, 0.56m² per sheep (0.21, 0.36, 0.41, 0.56m² per sheep), possibly indicating a lack of sufficient space to manoeuvre easily. Increased space allowance in this study tended to be associated with a decrease in the occurrence of interactions and potentially injurious events.

Animal welfare implications

The ability of sheep to rest in a slaughterhouse lairage may be compromised by providing low space allowances within pens. The majority of groups of sheep observed were penned at space allowances below those recommended in previous studies. The mixing of several social groups within a pen might also have an effect on lying behaviour. There was no significant difference in the lying behaviour of sheep penned on straw and on wooden slats during the first three hours in the lairage.

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