

EFFECTS OF MIXING AND DURATION OF JOURNEY ON THE WELFARE OF PIGS DURING TRANSPORT

R. H. Bradshaw¹, R. F. Parrott², J. A. Goode², D. M. Lloyd², R. G. Rodway³ & D. M. Broom¹.

¹*Department of Clinical Veterinary Medicine, Madingley Road, Cambridge CB3 0ES*

²*MAFF Laboratory of Welfare and Behaviour, The Babraham Institute, Cambridge CB2 4ET*

³*Department of Animal Physiology and Nutrition, University of Leeds, Leeds LS2 9JT*

Abstract

Two studies were carried out in order to investigate the effects of mixing and duration of journey on the welfare of pigs during transport. In our first study twelve groups of four 90 kg pigs were transported in a commercial livestock lorry for 1.5 h. Half the animals were transported in their social groups (unmixed condition) and half were transported with groups of previously unfamiliar pigs mixed together (mixed condition). Behaviour was recorded and saliva samples taken at different stages of the journey for analysis of cortisol. In the unmixed condition pigs spent most of their time standing. In the mixed condition pigs stood and the direct effects of the journey (travel sickness) were delayed due to fighting which exhausted the animals. Levels of salivary cortisol were significantly higher in the mixed condition throughout the journey. In order to examine the effects of duration of journey on welfare plasma concentration of cortisol and beta-endorphin were monitored over the course of an 8 h journey. Six 35 kg pigs with jugular vein catheters were loaded onto a commercial livestock lorry and blood samples were taken at 30 min intervals while the vehicle remained stationary with the engine off (control) and on a subsequent day when the vehicle was driven for 8 h. Mean concentration of cortisol was significantly greater (relative to control) at all stages of the journey. In conclusion, mixing unfamiliar pigs, loading procedures and the first 5 h of a long distance journey are particularly stressful.

Introduction

In recent years there has been a considerable upsurge of interest in the subject of animal welfare and particular attention has been focused upon a number of domestic species. One area of particular concern is the effect of road transport on welfare and there has been a growing interest in this field in recent years (e.g. Lambooy 1988; Lambooy and Engel 1988; Warriss et al. 1991; Dalin et al. 1993; Geers et al. 1994). Despite this interest there have still been surprisingly few studies which have specifically sought to investigate the welfare of pigs during transport. The present EU seminar will, it is hoped, begin to redress the balance. In our paper we employ behavioural and physiological techniques in order to investigate the welfare of pigs during short and long term road transport journeys.

In examining the welfare of pigs during transport a number of approaches may be employed. Simple behavioural time budgets may be investigated in order to establish the behaviours usually expressed by pigs in transit. This involves either making video tape recordings of the animals or travelling with them in the main body of the lorry. Analysing simple time budgets (e.g. whether pigs stand up or lie down) provides valuable information which may be then used to

establish the particular physical conditions pigs require in order to perform particular behaviour patterns (Bradshaw et al. 1995). In addition, the social environment is no less important as a consideration of welfare. It is a well known that pigs will fight when mixed with unfamiliar animals (e.g. Tan & Shackleton 1989; Jensen 1994; Geverink 1995) and whether pigs fight during transport journeys has not directly been studied. Thus behaviour may be studied in order to establish whether any modification can be made either to the physical or social environment to improve welfare.

Another approach to the study of welfare is to investigate various aspects of the physiology of pigs during transport. Some recent studies have specifically looked at stress hormones before and after journeys (e.g. Dalin et al. 1988; Geers et al. 1994; Rojanasthien 1989) or during the course of a short journey (e.g. Becker et al. 1985; Dalin et al. 1993). Saliva samples may be taken from pigs at particular points during a journey in order to investigate concentrations of the stress hormone cortisol (Parrott et al. 1989). Also blood samples may be taken during transport but this has been attempted by few researchers most likely due to the practical difficulties involved in carrying out such a procedure.

In the present paper behavioural observations, concentrations of cortisol in saliva and concentrations of cortisol and beta-endorphin in the blood were examined. In this presentation we specifically investigated the behavioural and physiological responses of pigs in order to establish whether mixing unfamiliar pigs causes stress during transport and also whether pigs adapt to long distance road transport (8 h) or continue to find it stressful.

Materials and methods

Study 1: 12 mixed sex groups of four 90 kg pigs were used in the study. All pigs were transported on a livestock lorry for 1.5 h. Half the animals were transported in their individual groups of 4 (unmixed condition) and half the animals were mixed together (mixed condition). All pigs were penned at a stocking density of 0.49 m² per pig and food was withdrawn three hours before transport. Pigs were scanned every 4 minutes throughout the journey and the number of animals standing and lying noted. A general activity index was also scored based on a qualitative assessment of the general levels of pig activity every 4 min (5 = high activity; 1 = low activity). Incidences of retching, vomiting and fighting were recorded as they occurred. Mean number of pigs standing or lying, mean activity index and total frequencies of retching, vomiting and fighting were calculated for each condition. Saliva samples were collected from each pig before loading, after loading, in the middle and at the end of the journey. A t-test was conducted to compare cortisol concentrations in mixed and unmixed conditions.

Study 2: Six 35 kg male pigs, surgically prepared with a jugular vein catheter, were individually loaded onto a lorry at (0930) which remained stationary and samples were taken every 30 min throughout the following 8 h period (control condition). The first sample was taken just before loading. Food had been withdrawn at 1700 the previous evening. Following a two day interval the

Power and lighting was provided by a portable generator to allow samples to be centrifuged and frozen in dry ice. Averaged results obtained for cortisol and beta endorphin during each 3 h period (or 2.5 h in the case of the final period) under stationary and driven conditions were compared using t-tests.

Results

Study 1: Pigs spent all their time standing in the unmixed condition (number of pigs = 24) and most of their time standing in the mixed (number of pigs = 23). The mean activity index was more than three times greater in the mixed rather than unmixed condition (3.2 in mixed; 1 in unmixed). The frequency of fights was greater in the mixed compared with the unmixed (mixed: 20; unmixed: 0). Unmixed pigs became travel sick towards the end of the journey (and began to lie down). Thus frequency of retching and vomiting was much higher in the unmixed condition compared with the mixed (unmixed retching: 2; unmixed vomiting 9; mixed retching and vomiting: 0). There was no difference between conditions in concentrations of cortisol before loading (mean unmixed: 3.2 nmol/l; mean mixed: 2.6 nmol/l). A t-test revealed that levels were significantly higher in the mixed condition at the beginning (mean unmixed 3.2 nmol/l; mean mixed 10.6 nmol/l; $p < 0.05$), in the middle (mean unmixed 4.7 nmol/l; mean mixed 9.9 nmol/l; $p < 0.05$); $p < 0.01$) and at the end (mean unmixed 7.0 nmol/l; mean mixed 11.6 nmol/l; $p < 0.05$) of the journey.

Study 2:

Cortisol: Immediately after loading concentrations of cortisol were substantially raised in both conditions. After a peak in the control condition after 1.5 h (mean peak concentration: 179.8 nmol/l) cortisol levels decreased to pre-loading levels over the next 1.5 h period. In the experimental condition concentrations remained higher for longer (mean peak concentration at 2 h: 196.2 nmol/l) and did not decline rapidly to pre-loading levels. As a consequence of these changes, animals in the experimental condition showed significantly higher mean concentrations of cortisol than those in the control during the first 180 min period ($p < 0.05$). After 180 min, concentrations of cortisol still did not decline rapidly and continued to remain substantially higher (relative to control) between 180 and 360 min ($p < 0.01$). Finally between 360 and 510 min the experimental concentrations decreased (relative to control) but still remained significantly higher ($p < 0.05$).

Beta-endorphin: Concentrations of beta-endorphin rose in both conditions in response to loading. Following a peak immediately after loading (control mean peak concentration: 202.3 pmol/l; experimental mean peak concentration: 157.0 pmol/l), concentrations of beta-endorphin decreased over the remainder of the first 180 min period (and fell below the experimental condition after 90 min). In the experimental condition concentrations decreased less rapidly over this period. There was no significant difference between the two conditions during the first two 3 h periods. Finally

between 360 and 510 min the control concentrations remained consistently and significantly higher than in the experimental condition ($p < 0.01$).

Discussion

It is clear from our first study that unfamiliar pigs fight during transport and that pigs suffer from travel sickness (which supports the findings of Bradshaw et al. 1995). This fighting amongst unfamiliar pigs appears to delay the direct effects of the transport journey (and the pigs do not become travel sick). In the case of the unmixed condition pigs showed early signs of travel sickness in response to transport. It is clear from our study that mixing unfamiliar pigs at the point of loading leads to fighting which stresses and exhausts the animals. There may be economic considerations in not mixing unfamiliar pigs because fighting may cause considerable skin damage and bruising. It is clear that unfamiliar pigs should not be mixed during transport as this leads to poor welfare, increases stress and may effect meat quality.

The results presented in our second study indicated that pigs find long distance travel stressful. They do not adapt rapidly to the conditions they experienced and concentrations of cortisol and beta-endorphin rose markedly during loading procedures indicating pigs found this procedure very stressful. While, in the present study, the loading procedures were not identical to normal commercial loading practice, they do to some degree mimic the level of disruption the pigs would experience in normal commercial practice. After loading levels of cortisol did not decline rapidly in the experimental condition but remained high compared with the control. Thus pigs do not adapt well to long distance travel and find the first five hours particularly stressful after which concentrations of both cortisol and beta-endorphin declined.

Pigs in our first study were fed three hours before transport. This decision was taken in order to exacerbate any possibly potential signs of travel sickness and thereby render it detectable. It was clear that pigs in the unmixed condition became very travel sick and that the mixed pigs would have suffered these same effects at some point after the cessation of fighting (beyond the 1.5 h of the current journey studied). In our second study the pigs were not fed prior to transport and food was withdrawn the night before loading the following morning. One of the pigs was sick despite not having been fed and others showed signs of travel sickness. These symptoms were less overt than in our first study but it was clear that they exhibited many of the symptoms displayed by the pigs in the first study; they began to chew repeatedly, slightly foam at the mouth and sniff the air. Thus it appears that pigs in the second study became nauseous but signs of travel sickness were less overt. Travel sickness appears to be a particular problem associated with the welfare of pigs during transport.

There is considerable scope for further research. Our study revealed the potential need for guidelines of welfare in relation to the transport of livestock to be species specific since pigs appear

to be particularly sensitive to transport journeys. It is necessary to investigate further the effects of loading and unloading during long distance travel and particularly whether, from the point of view of welfare, it would be better to allow the animals to remain on the transport lorry and continue their journey and thereby not be fed and watered, or whether it would be better to unload them for a rest period after a certain period of time and allow them a rest period with access to food and water. Evidence from the present study appears to suggest that, because loading and unloading is a very stressful period, and the animals become travel sick, unloading the pigs during a long distance journey in order to rest them and allow them food and water (and subsequently re-loading them back onto the vehicle before stomachs are empty), may be the worst possible course of action. It may be better for pigs not to eat and drink, and remain on the vehicle and continue their journey (having settled down after the first 5 h period of transport). The best course of action would clearly be to slaughter the pigs before any transport takes place since pigs are sensitive to journeys of short and long duration and are prone to travel sickness. Since this is not practically possible the need to answer the question of duration of journey is pressing and is crucial to our understanding of the needs of pigs during long distance road transport. Finally, it is highly likely that the particular journey length and degree of 'roughness' directly affects meat quality and it is therefore in the interest of all concerned to answer this question.

It is concluded that mixing unfamiliar pigs causes fighting during transport and considerably increases stress, pigs become travel sick and that long distance travel is also stressful. Further research is needed in order to investigate the procedures necessary to decrease stress and formulate guidelines of welfare that have direct practical application to the industry. It is envisaged that this would lead to direct economic benefits.

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