

THE EFFECTS OF TRANSPORT STRESS ON SHEEP WELFARE

EFECTELE STRESULUI DE TRANSPORT ASUPRA BUNASTARII OILOR

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Animal transport in vehicles, regardless of how well organized, implies a sudden change of living conditions from the ones in the farms together with an adaptation effort on the animals' part which subsequently modifies the quality level of their welfare. This fact is therefore expressed in a typical stress reaction, state to which the animals are subject to during transport.

Research has monitored transport related stress on sheep welfare (n: 35), by looking at their physiological responses both during transport and when destination was reached. Along the three monitored situations, the travel time differed from 7h to 14h and 20h, to two final destinations – a farm and a slaughterhouse. Transport conditions were identical for journeys longer than 8h and different for the one up to 8h long. The sheep welfare physiological indicators monitored highlighted variations of heart rate and plasmatic cortisol levels i.e. their significant increase only at sheep loading and unloading times, regardless of the type of platform used for this manoeuvre. Plasmatic glucose levels decreased when the travel time was long, while urea levels showed an increase in all three cases. Bodyweight decreased (4,9% - 7,19%) depending on the travel time and lack of fodder and water during this time. The travel time may be considered one of the essential transport related stress factors leading to the decrease of the sheep welfare quality level.

Key words: sheep, stress, transport, and welfare

Introduction

The study of transport stress effects on sheep welfare became a necessity within the larger context of implementation and enforcement of EU legislation. The EC Regulation 1/2005 concerning animal protection during transport states among other things that sheep travel time should be 8h, or 14h under special circumstances with 1h break followed by another 14h journey.

Animal welfare during transport may be influenced by many stress factors among which we mention vehicle movement, engine noise, loading/unloading manoeuvres (Parrott and col. 1998a), vehicle microclimate (Fischer and col. 2005), or the informational flow between animals and their environment. Research on sheep transport has also indicated that the animals respond differently to lack of

fodder over 24h with increases of metabolic plasmatic concentrations (Warris and col.1989). Boivin and collaborators demonstrated the fact that sheep are able to distinguish between their caretakers who have a calming effect on them under stressful conditions and other unknown people in 1997. The mandatory stops when taking longer than 8h journeys are very important for sheep welfare (Krawczel and col.2007). During our research, we observed that sheep consider stressful only the loading and unloading times due to their being not used to the subsequent manoeuvres. The animals will adapt relatively fast to the journey if the road is good, the driver competent, and the loading surface and microclimate conditions appropriate. Other research results have confirmed that sheep that are deprived of fodder and water for 16 h, were dehydrated – aspect highlighted by the physiological indicator values both during water and fodder deprivation and following feeding and watering upon reaching destination. Transport stress clearly appears when sheep are challenged physically, physiologically and behaviourally and try to cope with their new environment.

Materials and Methods

Research has been conducted on 35 adult sheep (n: 35), of Țigaie breed, males and females with an average weight of 39 kg. These animals have been randomly selected out of the group that was going to be transported to a slaughterhouse and a collecting farm and have been identified with a marker spray.

The transport was made in special vehicles; out of which two featured mobile loading platforms and one used a fixed loading platform taken from the farm. Two of the vehicles had mixed ventilation whereas the third one had only natural ventilation. Each sheep was allotted a loading area of 0,20m², and the caretakers were instructed as to how they should handle the animals in order to load them onto the vehicle. All three transports were made in spring, on different days but under the same weather conditions.

The identified sheep participants to the study were clinically examined 4h prior to departure. They had their head contained in order to apply an intravenous catheter into the jugular that was kept 24h after animal unloading.

Blood samples was collected in the farm box 2h prior to loading; within 7h for the first destination (A, n: 10), within 14h for the second destination (B, n: 10) but also on the vehicle (C), and within 20h for the third destination (C, n: 15). The last sampling was made 24h following unloading upon reaching destination of each transport (table 1). The blood samples were taken in 1,3 ml Vacutainer tubes with Lithium-Heparine (LH/1,3) that were kept according to working protocol during travel time. Working and analysis of blood tests was performed in the laboratory.

The level of plasmatic cortisol was obtained by RIA method, heart rate (by means of a POLAR cardio-monitor), uraemia and glucose by means of chemical analysis (using IDEXX Vet Test 8008). All the sheep were weighed on an electronically display balance.

Table 1.

The moment of performing different operations in order to determine the sheep welfare quality levels during transport

Journey time/no. of hours	Operations made for those three lots	Lamb location in time of monitoring moments
2h before loading	Application of the cardiac monitor, weighing, taken blood sampling	Farm before loading (A, B, C)
7h after departure	Monitoring the heart rate, weighing, taken blood sampling	Farm after unloading (A), vehicul (B,C)
14h travelling	Monitoring the heart rate, weighing, taken blood sampling	Slaughterhouse pen (A, B), vehicul (C, within rested stop 1h)
20h travelling	Monitoring the heart rate, weighing, taken blood sampling	Slaughterhouse pen (A, B, C)
24h after unloading	Monitoring the heart rate, weighing, taken blood sampling	Farm and slaughterhouse pen (A, B, C)

Results and Discussions

The sheep response as adaptation reaction to transport conditions was highlighted by measurements of plasmatic cortisol. Its increased levels reaches 44 nmol/l, after 7h of the journey, compared to 27.6 nmol/l measured 2h prior to loading (fig.1).

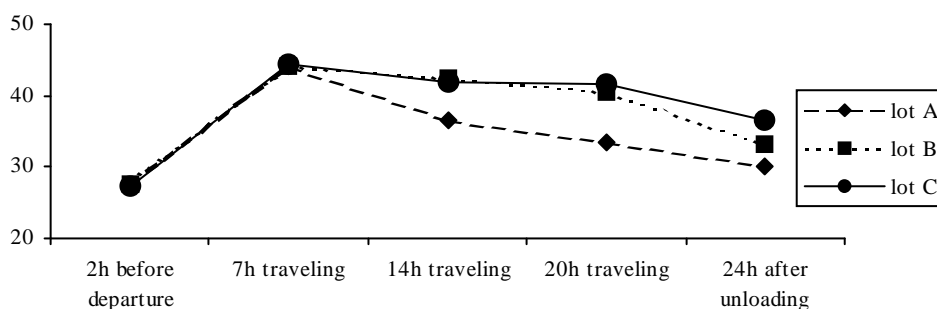


Fig 1. Plasmatic cortisol level (nmol/l) in sheep during journey and at destination

This increase in cortisol levels is due to the sheep loading and unloading manoeuvres and handling, as these are stressful operations for them. Thus, following departure the plasmatic cortisol levels increases up to a maximum value after which we can record a progressive decrease with constant levels even 24h after unloading. This fact demonstrates that the sheep adapted to the travel stress during the 7h, and transport became a moderate stressor.

The high cortisol level stayed at 30.1 nmol/l even 24h following unloading, compared to 27.6 nmol/l recorded prior to departure. Cockram and col. (1999) considers that the steady increased levels of cortisol are due to lack of fodder in the case of lambs transported over long travel time.

Measurements of both heart rate and cortisol levels show an increase only during the first 7h of journey after which they decrease to the initial values upon reaching destination (fig.2). This variation may be explained by the fact that sheep adapted relatively fast to the journey and the loading and unloading manoeuvres alone were stressful to the animals.

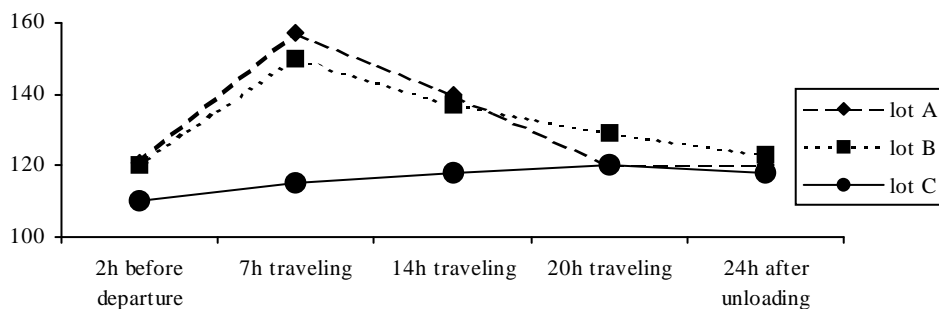


Fig 2. Heart rate level (bpm) in sheep during journey and at destination

Due to lack of fodder, during the 14h and 20h respectively there was an acceleration of protein catabolism, which was conducive to an increase of uraemia (fig.3). These variations demonstrated that sheep have protein and lipid reserves, which are turned into energy. Krawczel and col. (2007) demonstrated that loss of weight in lambs during transport over long distances is lowered by 1% of the initial weight in case the driver makes the planned mandatory stops throughout the journey. The decrease of uraemia was accompanied by a decrease of the bodyweight by up to 7.19% in case of the 20h journey. We must state the fact that sheep that had one hour break after 14h of journey had less water and fodder out of the amount made available to them by the driver and caretaker, which demonstrate that their boy had the necessary water supply at the time. However, upon reaching destination following the 6h journey the animals drank and eat.

There is a plasmatic glucose response in sheep transported over longer journey durations with a decrease in its levels. The metabolic changes in sheep during transport are significant and constant over a longer period of time due to the lack of fodder and animal movement restrictions on the vehicle. Up to 80% of the metabolic energy necessary to the sheep results out of the volatile fatty acids produced in the rumen. In case of lack of feeding, the volatile fatty acids are no longer produced and the amount of acetate used as energy source is approx up to 2% (Broom and col.1996).

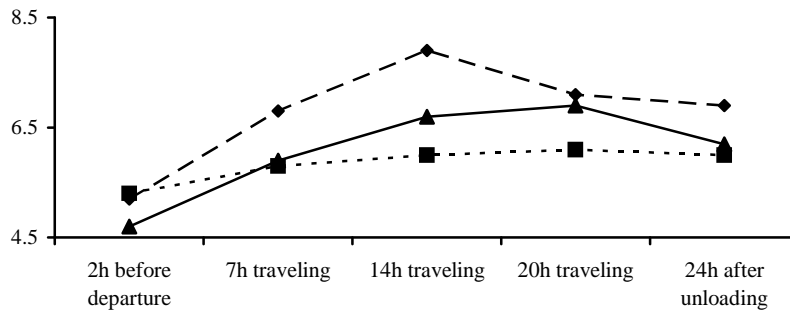


Fig 3. Uraemia level (mmol/l) in sheep during journey and at destination

After 9h of journey the animal body realises its reserves and uses glucose as energy source until the existing supply of hepatic glycogen is exhausted, generally within 24h. Under these circumstances the plasmatic glucose, the plasmatic acetate and plasmatic free fatty acids are used as energy source for the muscles. The glucose level (fig.4) goes back to the physiological limits only after the sheep are watered and fed.

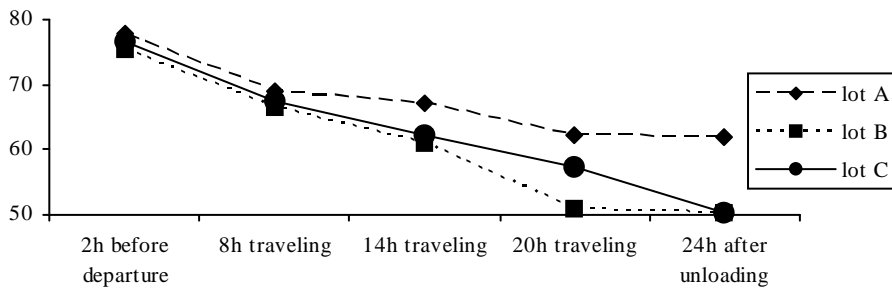


Fig 4. Plasmatic glucose level (mg/ml) in sheep during journey and at destination

Similarly to the uraemia levels, the plasmatic glucose is an indicator of fodder deprivation in sheep especially during long travel times.

Conclusions

During transport, the sheep welfare quality levels determined by means of the physiological indicators measured varied with journey length.

The heart rate and plasmatic cortisol levels showed increases only at loading and unloading times, while the transport itself proved to be a moderate stressor for the animals. This may be controlled and reduced by exposing the animals to handling and loading on the platform manoeuvres as early as their upraising and living at the farm and by creating similar conditions to loading so that they are used to it.

Plasmatic glucose and urea may be considered indicators of fodder deprivation in sheep because their levels go back to normal after the animals have been fed and watered.

Bodyweight decreased by aprox 7.19% compared to the initial one due to dehydration in animals that traveled 14h and 20h respectively without water and fodder up until the moment of their unloading.

Greater consideration must be paid to journey planning and breaks in case travel time exceeds 8h, the latter offering the sheep the opportunity to rest, feed and drink so that their welfare and meat quality will not be influenced, especially where animals due to be slaughtered are concerned.

Bibliography

1. **Boivin, X., R.Nowak, P.Le Neindre, H.Tournadre,** (1997) - *Discrimination between shepherds by lambs reared under artificial conditions.* Journal of Animal Science 75:2892-2898.
2. **Bradshaw, R.H., S.J.G. Hall, D.M. Broom,** (1996) - *Behavioural and cortisol response of pigs and sheep during transport.* Veterinary Record 138: 10, 233-234.
3. **Broom, D.M., J.A. Goode, S.J.G Hall, D.M. Lloyd, R.F. Parrott,** (1996) -*Hormonal and physiological effects of a 15 hour road journey in sheep: comparison with the responses to loading, handling and penning in the absence of transport.* British Veterinary Journal 152: 5, 593-604.
4. **Cockram, M.S., J.E. Kent, P.J. Goddard, N.K. Waran, I.M. McGilp, R.E. Jackson, G.M. Muwanga, S. Prytherch,** (1996) - *Effect of space allowance during transport on the behavioural and physiological responses of lambs during and after transport.* Animal Science 62: 3, 461-477.
5. **Fischer, A.D., M.Stewart, D.M.Duganzich, J.Tacon, L.R.Matthews,** (2005) - *The effects of stationary periods and external temperature and humidity on thermal stress conditions within sheep transport vehicle.* New Zealand Veterinary Journal. 53:6-9.
6. **Krawczel P.D., T.H.Friend, D.J.Caldwell, G.Archer, K.Ameiss,** (2007) - *Effect of continuous versus intermittent transport on plasma constituents and antibody response of lambs.* Journal of Animal Science, 85:468-476.
7. **Parrott R.F., S.J.G.Hall, D.M. Lloyd,** (1998a) – *Heart rate and stress hormones responses of sheep to road transport following two different loading procedures.* Animal Welfare. 7:257-267.
8. **Warris P.D., E.A. Bevis, S.N. Brown, J.G. Ashby,** (1989) – *An examination of potential indices fasting time in commercially slaughtered sheep.* British Veterinary Journal, 145: 242-248.
9. *** Council Regulation (EC) No 1/2005 on the protection of animals during transport and related operations and amending Directives 64/432EEC and 93/119EC and Regulation (EC) No 1255/97.