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EVALUATION OF ANIMAL STRESS AND WELFARE DURING LONG DISTANCE TRANSPORT OF CATTLE IN FINLAND

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Background

Long distance cattle transport vehicles have developed very much in Finland in the 1990's (1 and 2). This study focusses on animal handling, last feeding and loading at farm, group size/pen size, animal behaviour, live weight losses and carcass bruisings during transport, unloading, lairage, effect of lairage on animal behaviour and DFD occurrence. Thus, the most stressful factors were evaluated at farm and during transport and lairage.

Objectives

The purpose was to develop long distance vehicles that comply with Finnish and EU standards for cattle transport in Northern Finland (Lapland). The vehicles must be economical and safe and animal welfare and meat quality must always be optimal.

Material and methods

Six long and four short distance transports were made by two road trains and by two road trains, a lorry and a semitrailer, respectively. This study observed the transport of a total of 300 cattle. Stress levels were evaluated by a commercial heart-rate monitor, the Polar® Vantage NV, that was installed on the farm two days before loading. Thus the heart-rates of 16 cattle were monitored on the farm, during loading, transport, unloading and overnight lairage until stunning. Moreover, stress levels of 130 cattle were evaluated by blood samples collected by jugular venepuncture into heparinized tubes on the farm two days before loading and after transport before unloading. Blood was analyzed for adrenalin and noradrenalin (HPLC EC method), cortisol (radioimmunologic method, Spectra Cortisol, Orion Diagnostica, Finland) and creatine kinase activity (CK, UV method, Nordic Enzyme Committee).
Animal behaviour was monitored by two observation cameras (Philips) in the transport box during loading, transport and unloading. Outputs were recorded in the cabin. Carcass bruisings were evaluated 50 min after stunning. Meat quality was measured by the pH value of the *M. Longissimus dorsi*, values of 6.00 and above indicated DFD meat.

Results and discussion

The average long distance transport time was 9.5 ± 2.7 hours (min 6.1 and max 18.0 hours), whereas the average short distance transport time was 4.6 ± 2.3 hours (min 1.0 and max 9.0 hours). Moreover, 28 % of the long distance cattle were transported for less than 8.0 hours due to the collection route and were "normal" in this respect.

Heart-rates of 16 unbound bulls and heifers were monitored during transport. The average heart-rate varied from 60 to 120 bpm at the farm. A temporary maximum value of 200 bpm did, however, occur during feeding. During loading, the average heart-rate varied from 90 to 130 bpm, the maximum value being 200 bpm. During transport, the average heart-rate varied from 60 to 200 bpm. Heart-rates were higher with short than long transport times of cattle. In fact, in the former case heart-rates were over 100 bpm, whereas in the latter case heart-rates were below 100 bpm for two hours after loading. This shows that bulls and heifers of short transport times of 3 - 5 hours did not adapt as well as those of longer transport times of 7 - 12 hours (figure).

During unloading, the average heart-rate was below 100 bpm, but the maximum value was 200 bpm. Cattle of short transport distances had higher heart-rates than those of long transport distances. In lairage, after two or three hours, heart-rates decreased below 100 bpm and varied from 60 to 80 bpm in the night. During the drive to stunning, heart-rates increased to the level of unloading.

The average changes in stress hormone levels from the farm to unloading were as follows: noradrenalin from 0.85 to 1.73 ng/ml, adrenalin from 0.30 to 0.34 ng/ml, cortisol from 47.6 to 84.3 mmol/l and CK activity from 141 to 638 Units/l. At the farm, long distance cattle had a higher stress level than short distance cattle. The difference in the noradrenalin and adrenalin levels was significant ($P<0.01$ and $P<0.05$). However, after transport, long distance cattle had a lower stress level compared to short distance animals. During unloading, the average stress hormone levels of long and short distance animals were: noradrenalin 1.58 and 1.93 ng/ml, adrenalin 0.34 and 0.34 ng/ml, cortisol 71.9 and 100.8 mmol/l, CK activity 518 and 799 Units/l, respectively. The difference in cortisol values was significant ($P<0.05$).

This and earlier research on long distance transports of cattle have shown that two-animal pens are optimal for minimising aggressive behaviour and carcass bruisings during loading, transportation and unloading in Finland (1 and 2). They are also safest for the people handling the animals. During long distance transport it is usual that one of the two bulls in the same pen from a single farm lies down after having been

transported for two to three hours. On the other hand, trucks that travel short distances have larger pens of 3 to 4 animals. In the latter case there is always one restless bull that causes continuous movement of the group: as a result, none of the animals can lie down during transport.

Animals transported for short distances had higher occurrence of carcass bruisings (45.4 % slight and 9.3 % extreme) than those transported for long distances (21.4 % slight and 4.4 % extreme). About 3.0 % of bruisings occurred in lairage.

Animal handling in lairage had a prominent effect on cattle stress and meat quality in this study. Earlier research on cattle placed in single pens has shown that bulls, heifers and cows must be kept in separate and peaceful areas in lairage according to sex and slaughtering practice. Even though this fact was known, three long distance bulls were placed behind two long distance heifers. During overnight lairage, the bulls opened the gates between the single pens creating a large, long pen with three bulls and two heifers. This explains why DFD occurrence was higher in long distance cattle (5.0 %) than in short distance cattle (3.7 %).

Conclusions

The artificial time limit of eight hours had no scientific background. Moreover, when the first animal is loaded more than eight hours before unloading, the last animals are usually loaded less than eight hours before unloading. Thus, there is mixture of long and short distance animals in the same vehicle. Our results showed that cattle of long transport distances adapted better than those of short distances. This was indicated by the lower heart-rates and cortisol levels. If this was the result of the vehicle and better animal handling, as it seems to be, then it is most important to develop vehicles, whereas the time interval of 0 - 16 hours is not very important. Finally, the farm, transportation and the slaughterhouse are important links in the production chain and meat quality is determined by the poorest link in the chain.

Acknowledgements

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Literature

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FIGURE. HEART-RATE OF SHORT AND LONG DISTANCE CATTLE