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The welfare of weanling bulls transported from Ireland to Italy

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Introduction

Transportation of livestock is perceived as an acute stressor and involves several potential stressors. The overall objective of the study was to investigate the physiological, immunological and behavioural responses of weanling bulls transported to Italy under present EU legislation and to evaluate the implications in terms of animal welfare.

Objectives

1. To make appropriate physiological measurements on the animals to quantify the effect of transport on the degree of stress imposed and the ability of the animals to cope with that stress.
2. To monitor and record the environmental conditions on the vehicle (as normal) thus enabling the heat and moisture production of the animals to be determined.

Materials and Methods

Twenty-six weanling continental x beef bulls (414±55.8kg) were transported (T) from Ireland to Italy on a roll-on roll-off ferry (RO-RO), onwards by road for 3-hours to a French lairage, unloaded and rested for 24 hours, and then transported by road on an 18-hour journey through France to a feedlot in Italy. On the morning of the journey, T animals were blood sampled (day (d)0) by jugular venipuncture to provide baseline physiological levels on the farm of origin and again at arrival in France (d 2), and at 12 and 24 hours after arrival, on arrival at the farm in Italy (d 5) and on d 7, 9, 11 and 40 after arrival. Twenty-two continental x beef breed bull calves (416±60.0kg) were weaned at the same time as the transported animals and remained in Ireland (C) on one farm and were blood sampled at times corresponding to the T animals. T and C animals were weighed on d 0, 3, 5, 11 and 40 of the study. Blood samples collected by jugular venipuncture and placed into heparinised tubes were centrifuged and the plasma separated for subsequent analysis of: creatine phosphokinase (CK), haptoglobin, and interferon-γ (measure of immune function). Serum was collected from whole blood for antibody titre determination using ELISA assays for infective bovine

rhinotracheitis (IBR) virus, respiratory syncytial virus (RSV) and parainfluenza-3 respiratory viruses.

The animals in Italy were fed an *ad libitum* finishing diet ((Concentrate; dry matter 888g/kg; Oil A 16.8 g/kg; crude protein 200g/kg); (Hay; dry matter (DM) 897g/kg; crude protein 153; dry matter digestibility (DMD) 629; ash 137g/kg DM; ADF 329 g/kg DM; NDF 573 g/kg DM); (Straw; DM 918g/kg; CP 65.7g/kgDM, DMD 533; ash 88.6 g/kgDM; ADF 457 g/kgDM; NDF 766 g/kgDM); (Maize silage; 236 DM; CP 63.8g/kg DM; DMD 349 g/kg DM; Ash 132 g/kg DM; water soluble carbohydrates (WSC) 4.3; Lactate 2.3; Ammonia N (NH_3) 7.2; ADF 452 g/kg DM; NDF 783 g/kg DM).

The control animals remaining on the farm in Ireland were maintained on an *ad libitum* silage diet and concentrates (2kg/head) (Concentrate; DM 861g/kg; Oil A 13.3g/kg; Crude protein 141 g/kg DM); (Silage; DM 167g/kg; Crude protein 171 g/kg DM; DMD 653 g/kg DM; Ash 76.3 g/kg DM; WSC 6.9; Lactate 31.5; NH_3 77.0; ADF 312 g/kg DM; NDF 549 g/kg DM).

The haematological variables including red blood cell (RBC) numbers, white blood cell numbers (WBC) were determined for unclotted (K_3-EDTA) whole blood samples. Lying and standing behaviour of the bulls on the transporter were monitored and video-recorded continuously using 460 lines high resolution black-white cameras (Eneo, Germany) with built in 12 watt infra red lighting. Data for liveweight and physiological variables (represented as mean ± s.d) were analysed by ANOVA using PROC GLM repeated measures option in SAS/STAT® to test the effects of treatment while controlling for time effects. A paired t-test or Wilcoxon where appropriate was used for the difference between sampling periods. Analysis was performed on the rank scores of variables (median with minimum and maximum values) that failed the test for normality.

Results and Discussion

Prior to transport (Day 0) the median rectal body temperature for control animals was 38.8^{o}C and ranged from 38 to 41.1^{o}C. The temperatures of the animals assigned to transport were 39^{o}C and ranged from 37.9 to 40.7^{o}C, respectively ($P<0.04$ versus control). In general, the rectal body temperature of transported animals was significantly lower at all time points compared with control animals, with a significant treatment x time interaction ($P < 0.0001$). While body temperature were significantly lower for the transported animals, they were still within the normal clinical range (37.8 - 38.8^{o}C) (Anderson, 1993). In animals, normal cellular function depends on a relatively constant body temperature, which is the sum of heat production (or conservation) and heat loss. This temperature is regulated by a central mechanism within the hypothalamus in the brain which activates both physiological and behavioural activities.

Animals transported to France lost 7.0 % of their bodyweight by d3 (Table 1). T animals had lower (P≤0.001) bodyweight on d 3, 5 and 11 while C animals had lower (P≤0.001) bodyweight on d 5 and 11. T animals spent 63.5% and 35.4% of time lying down during the 24-h sea crossing and the road journey from France to Italy, respectively. There was no difference in physiological and haematological variables prior to transport between control and transported animals. RBC numbers were increased (P≤0.001) at arrival in France (11.8±1.22), 12 hours after arrival (11.3±0.84) and at arrival in Italy (11.2±1.16), and were lower on d 40 (10.0±1.10) of the study compared with pre-transport baseline numbers (10.6±0.99). C animals had higher (P≤0.001) RBC numbers on d 3 (12.2±0.96), 7 (11.7±1.00) of the study and lower (P≤0.001) numbers on d 11 (10.15±1.14) and 40 (10.3±0.83) compared with baseline levels (11.8±1.09). WBC numbers were higher (P≤0.001) in T animals on d 3 ((12.6 (8.3-19.0) vs 10.5 (7.0-17.8)) post-transport while Control animals had lower (P≤0.001) WBC numbers on d 2 (9.1 ((5.9-14.4)) vs 10.3 (7.7-18.1)) compared with baseline levels. Following transport, CK levels were increased (P≤0.001) on d 2, 3, 4 and 5 and lower (P≤0.001) on days 9, 11 and 40 while C animals had lower (P≤0.001) CK levels on d 7, 9, 11 and 40 compared with their respective baseline levels. T animals had lower (P≤0.001) PHA-induced IFN-γ levels on d 4 (0.295 (0.052-2.714)) and 9 (0.345 (0.017-2.00)) of the study compared with pre-transport baseline levels (0.466 (0.073-2.003)). C animals had lower (P≤0.001) IFN-γ levels on d 7 (0.263 (0.043-1.367)) of the study compared with baseline levels (0.445 (0.146-1.336)). Plasma haptoglobin levels were higher in T animals (P≤0.001) from d 2 to 40. C animals had higher (P≤0.001) plasma haptoglobin levels on d 3, 5, 7 and 9. There was no difference (P≥0.05) in IBR serum antibody titres before or after transport between C and T animals. C animals had higher (P≤0.001) RSV antibody titers on d 40 (0.269 (0.0-0.673)) compared with baseline levels (0.002 (0.001-0.020)). T animals had higher (P≤0.001) RSV titers on d 11 (0.062 (0.00-1.281)) and 40 (0.527 (0.00-1.397)) respectively. C and T animals had higher (P≤0.001) PI-3 titers on d 40 compared with baseline levels.

Table 1: Changes in liveweight in control and transported weanling bulls. The values are expressed as mean (kg) ± s.d.

Treatment	Day 0	Day 3	Day 5	Day 11	Day 40
Control	416± 60.0^{ax}	411± 64.7^{ax}	409± 60.6^{bx}	406± 57.5^{bx}	424± 63.1^{ax}
Transport	414± 55.8^{ax}	385± 52.9^{bx}	382± 53.9^{bx}	385± 55.3^{bx}	431± 61.0^{ax}

$^{a, b}$ Within row, levels with a different superscript letter are different at P≤0.001.

^{x,y}Within column, levels with a different superscript letter are different at P≤0.001

The study concluded that transport had no adverse effect on the welfare of weanling bulls transported from Ireland to Italy. Based on the physiological, immunological and behavioural measurements made, the transport journey under the present conditions is not unacceptable from the viewpoint of animal welfare. There was little evidence that transport affected physiological, haematological and immunological variables in the present study, and there was no evidence to suggest that it adversely affected the health or the performance of the animals post transport.