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nmunological response to long-term transport stress in nature horses and effects of adaptogenic dietary upplementation as an immunomodulator

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ywords: horse; transportation; CD^+; lymphocytes; stress; cortisol; adaptogens

nmary

asons for performing study: Little information exists on the nmunological effects of transport or the use of supplements minimise transport stress.

jectives: To establish baseline ranges and evaluate nmunophenotypic and functional changes associated with ansport and a nutritional 'adaptogen' supplement.

thods: Horses received either supplement (n = 10) or lacebos (n = 9) during the 30 day study. After 28 days in alls, 12 horses (6 supplement; 6 placebo) were transported r 24 h, then unloaded and recovered. Venous blood samples ere collected on Days 1, 14 and 28 to establish baselines, nd on Days 28, 29 and 30 to examine changes during ansport and recovery.

sults: Transport prompted elevations ($P<0.05$) in cortisol ncentration, neutrophil count and white blood cell counts, hile lymphocyte subpopulation counts ($CD3^+$, $CD4^+$, $D8^+$, $CD21^+$) decreased ($P<0.05$). Normal phenotypic mphocyte profiles returned within 24 h of recovery. upplement effects on immunophenotype ($CD21^+$ and $D8^+$) were observed in stabled horses ($P<0.05$), but not in ansported horses.

nclusions: These results provide insights into the mmunological mechanisms associated with long-term ansport.

ential relevance: The existence of a small window of mmunological uncertainty follows long-term transportation, hancing the potential risk of infectious disease in sceptible individuals.

roduction

longed travel for horses is stressful, fatiguing and increases the of disorders such as respiratory disease, poor performance, colic enterocolitis (Oikawa *et al.* 1995; Jones 1999; Stull and Rodiek 0). While many of these could be attributed to metabolic ngements, those with an infectious component are probably ciated with transportation-induced changes in immune function don *et al.* 1990; Austin *et al.* 1995). The impact of transport on cellular immunity has been well established in other species (Murata *et al.* 1987; Murata and Hirose 1991; Dalin *et al.* 1993; Dixit *et al.* 2001; Eicher 2001), but little information is available on the effects of long-term transport on the equine immune system. Studies examining horses travelling for 24 h, either individually cross-tied or loose in small groups, showed an increase in white blood cell (WBC) counts, dehydration indices and the stress parameters of cortisol and neutrophil to lymphocyte ratio (N:L) (Stull and Rodiek 2000, 2002). Elevation in head position compromises the immune system and increases the number of bacteria in transtracheal aspirates (Raidal *et al.* 1995, 1996). Many efforts have been made towards improving transportation through husbandry, care, training, and trailer design. However, there have been no controlled studies examining the effects of nutritional supplements to assist in minimising the physiological effects of stress. For more than 50 years, certain plants have been categorised as 'adaptogens' by Russian researchers due to their ability to increase resistance to chemical, biological and physical stressors, and have been used medicinally in eastern Europe and Asia (Lazarev 1947; Wagner *et al.* 1992). The immunomodulatory effects reported in man include increased numbers of T-lymphocytes, including $CD4^+$ or T helper cells, and T-suppressor/cytotoxic cells (Bohn *et al.* 1987), which may be beneficial to horses during long-term transport.

The primary objectives of this study were to establish baseline ranges from phenotypic and functional analyses of peripheral blood mononuclear cell subpopulations in mature horses and to evaluate the immunophysiological effects of 24 h of road transport. Additionally, the immunological effects of a commercially available 'adaptogen' herb extract supplement were evaluated at rest and during transport.

Materials and methods

Animals and study design

Nineteen mature horses (mares, n = 12; geldings, n = 7), age 5–15 years (mean ± s.e. 10.6 ± 0.8 years), were housed individually in partially covered stalls (3.7 x 7.4 m) during the 30 day study. Horses were placed in stalls 7 days prior to the study period to accustom all horses to the environment and feeding

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