Original Research

Effect of the Work Performed by Tourism Carriage Horses on Physiological and Blood Parameters

Fernando Vergara, Tamara A. Tadich*

Departamento de Fomento de la Producción Animal, Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, La Pintana, Santiago, Chile

ABSTRACT

Welfare of working horses is a matter of public concern, with scarce information on their possible physiological coping mechanisms. The aim of this study was to assess changes in possible physiological welfare indicators in working horses, as a result of pulling tourism carriages under field conditions. A descriptive field study of the work performed by tourism carriage horses and their physiological, hematological, and blood biochemistry implications was performed. For this, 10 tourism carriage horses were studied under normal working conditions. For description of work, speed, distance, and force were calculated. To assess welfare, physiological variables including heart rate, respiratory rate, rectal temperature, and hematological and blood biochemistry parameters were evaluated before, during, and after work. Results show that tourism carriage horses exerted a sub-maximal effort in terms of speed, force, and physiological variables assessed. The heart and respiratory rate showed significant increases \((P < .05)\) after work, but recovered to basal values within the first 10 minutes. Blood variables did not show significant changes that could be related to poor welfare. Lactate and packed cell volume (PCV) were the only blood variables with significant differences across work \((P < .05)\) with lactate decreasing over time and PCV increasing with work and returning to basal levels at 10 minutes after work. Physiological variables showed a possible adaptation to work by the carriage horses but were not sufficient to diagnose a welfare problem. Management practices and other animal-based indicators should be included in further studies to obtain a holistic conclusion.

1. Introduction

Working equines still play a crucial role in the provision of traction energy, and although it is difficult to find information on the economic impact of these animals in today’s society, a large proportion of the world population still depends on them [1].

The management and use of carriage horses, as a tourism instrument in cities, has been recently highlighted as a matter of public concern in terms of the welfare of these equines [2,3]. In many countries, animal rights advocates are pushing for the ban of activities that involve working horses, but often, no scientific evidence accompanies these petitions. There is scarce information on the welfare needs of this group of working horses, contrary to the available information on other types of working equids in developing countries [4–8], which encounter different welfare risks making it difficult to compare.

Normally, we would expect to see draught breeds pulling carriages for tourism, but in developing countries, it is common to see lighter crossbred horses performing this work [5]. This provides husbandry advantages for their owners who usually do not have incomes to maintain in proper conditions Percheron, Belgian, or other draught...
breeds as those reported by Rosser and Ardis [3] in South Carolina, or the Standardbreds, Morgans, and draught crossbreds used by Amish communities [9].

Working horses in Chile have been described as crossbreeds with morphology corresponding to speed type, with live weights between 300 and 400 kg and height’s to the withers between 140 and 145 cm [5,10]. The use of these lighter horses opens the question of whether they are physically adapted to perform this work without negatively affecting their welfare. The work performed by carriage horses develops physiological changes, as in any other physical activity, especially draught work that requires force and resistance for prolonged periods of time [11,12]. All these changes are in favor of coping with increases in the demand of oxygen by muscles under aerobic exercise and include changes in cardiac, respiratory, musculoskeletal, and endocrine systems [11–15] and consequently allow the individuals to promote their welfare. The use of objective physiological indicators associated with changes in these systems could allow veterinarians to assess the welfare of these horses and ensure provision of evidence-based feedback on good husbandry practices to the owners. At the same time, reference values obtained abroad may not be fully applicable under local conditions because factors such as breed, environment, management conditions, and type of work are not the same [16,17]; this is why it is important to have local data and when possible compare individuals with their own baselines.

This is why the aim of this study was to assess changes in classical physiological indicators of welfare as a result of the work performed by tourism carriage horses under real working conditions.

2. Materials and Methods

2.1. Animals

For the study, 10 carriage horses, five mares and five geldings, all light crossbreed with an average weight of 420 kg (380–500 kg), between 2 and 10 years of age were used and with a height to the withers of 148 cm in average. Body condition score (BCS) was assessed using a 0–5 scale, with two horses presenting a BCS of 2, and eight a BCS of 3. These horses are not allowed to work above 8 hours a day and must present a health certificate twice a year to the local authority (municipality). Horses were selected according to disposition of owners to participate and in coordination with the municipal authority from the city of Viña del Mar, Chile. The experiment was approved by the Animal Use and Care Ethical Committee of the Veterinary Faculty at the University of Chile and Fondecyt Iniciación 11121467.

2.2. Effort Test

The study was conducted during two normal working days of the tourism carriage horses in December 2013 (summer). The route used consisted in the one authorized by the Municipality of Viña del Mar, with one stop at the “Folk Museum” of less than 10 minutes. All samples were taken between 11 AM and 5 PM. Before the effort test, each horse underwent a clinical examination to determine if they were sound. Lame horses or with any evident health issue were excluded from the study. For sampling, five times were established:

\( T_0: \) at rest previous to a tour route
\( T_1: \) at the first stop of the tour
\( T_2: \) at initiation of the second part of the tour
\( T_3: \) at final stop
\( T_4: \) at 10 minutes after the tour was completed. Minimum time required by the municipality for drivers to wait until the next tour.

For each time, information on heart rate (HR), respiratory rate (RR), and rectal temperature (RT) was obtained. Blood samples were only taken at \( T_0, T_3, \) and \( T_4. \)

Each tour was done with two passengers (the researcher and a helper) and the driver. For assessing the maximum force exerted by horses, a digital dynamometer (GSE Model 250) was attached between the breast band and the carriage. These devices store the information of the maximum force exerted by the horse during movement, which was then used for analysis. The unit measured is given in kilograms of force (kgf) that was then transformed to kN for the statistical analysis. For determining the speed and distance traveled by each horse, the Polar G3 GPS sensor W.I.N.D. was attached to the girth.

2.3. HR, RR, and RT

For HR, a Polar Equine H2 Heart Rate monitoring system was used during the whole effort test and the Polar Equine RS800CX training computer software was used for subsequent analysis. Respiratory rate was assessed by the researcher by observing the horse’s torso for the movement of the rib cage and belly, and the RT was assessed with a digital thermometer at each sampling time.

2.4. Blood Hematology and Biochemistry

Blood samples were obtained by jugular puncture at \( T_0, T_3, \) and \( T_4. \) A volume of 12 mL was withdrawn and divided into three tubes, one with EDTA for hematology (packed cell volume [PCV], fibrinogen, total proteins, plasmatic albumin, globulins, neutrophils, and lymphocytes), one with heparin for glutathione peroxidase (GPx), and one with no additives for obtaining serum and blood biochemistry (lactate dehydrogenase [LDH], aspartate aminotransferase [AST], creatine kinase [CK]) and hormones (cortisol). Lactate was assessed by the Accutrend BM-Lactate from Roche at the moment of sampling.

2.5. Statistical Analysis

All variables were inserted in a Microsoft Excel spreadsheet for descriptive statistics. The distance traveled, the time required for each effort test, speed, force, and latency time for recovery of HR were analyzed with descriptive statistics.