Minireview Article

USE OF EQUINES AS AN EXPERIMENTAL MODEL IN SCIENTIFIC RESEARCH

ABSTRACT

The horse is a quadrupedal mammal with a cylindrical body, flexible spine and neck, being a therapeutic, strong, large, docile and easy to handle animal. Hippotherapy is a therapeutic method that aims to recover people with disabilities and specific needs to achieve motor, cognitive and affective therapeutic goals. For the profile of horses selected in hippotherapy, motor, morphological and behavioral aspects were taken into account. In the selection of the profile for the production of antivenom, large animals were used, as they are able to better tolerate the process of obtaining plasma because they have more blood circulating in the body. And, finally, in the selection of horses for the practice of equestrian sports, taking into account that each breed has greater ability for each existing category, being evaluated the obedience, physical intensity and agility of each equine. The present study aimed to evaluate the selection of horses as an experimental model in hippotherapy, production of antivenom and in equestrian sports activities with high-intensity physical effort. To carry out this, a search was carried out in the google scholar and scielo databases, considering the period from 2000 to 2024.

Keywords: equine; hippotherapy; hyperimmune plasma; equestrianism.

1. INTRODUCTION

Horses play a crucial role in our society, particularly after the domestication process, which introduced changes in various behavioral and physiological aspects. They are affectionate animals, large in size, easy to handle, and capable of forming bonds with humans [1]. Horses have evolved alongside human development, being utilized for sports and in rural areas. They are also used in therapeutic settings, aiding in emotional and physical treatments [2].

Equine therapy is a therapeutic method aimed at the recovery of individuals with disabilities and specific needs. Its goal is to help participants develop balance, muscle tone, strength, body awareness, coordination, attention, and other basic bodily needs. In equine therapy, horses are used to achieve motor, cognitive, and emotional objectives [2]. Regarding their profile, horses must be evaluated to participate in equine therapy sessions and trained to effectively contribute to the treatment of practitioners.

Antivenom serum is a pharmaceutical used to treat snake envenomations. In Brazil, this medication is essential for the rural population, who have more contact with snakes. On average, snake bites occur over twenty thousand times a year, resulting in approximately one hundred fatalities annually [3]. The process of producing antivenom serums is complex; although it is a medication, it is a biological product produced in stages, including the breeding and management of these animals for venom collection, the use of technology for biochemical processes to fractionate hyperimmune plasma, and the final product formulation [4,5].

Sports activities demand high physical effort from horses due to increasing competitiveness, often leading to stress and severe training regimens, which can result in injuries among these athletes [6]. A competent team of veterinarians, trainers, and caretakers must work together to maximize the horse's performance, pushing them to their limits while remaining within each horse's capacity. Brazil has witnessed significant growth in the Three Barrels competition, with the main objective of achieving optimal performance from horses for competition. During competitions, horses are subjected to extreme physical demands, but these efforts are brief [7]. One of the primary sources of income for horse owners is their competitive performance. Competitive horses involved in equestrian sports, such as show jumping, attract special attention and interest, especially since it is an Olympic discipline. This requires a more in-depth evaluation of each horse's abilities, aiming for the appropriate intensity of each exercise and their capabilities according to their training [8].

Recognizing the diverse applications of horses in today's society, the objective of this review is to outline the criteria for selecting horses as experimental models in research involving individuals in equine therapy, antivenom production, and equestrian sports.

2. METHODOLOGY

For the preparation of the literature review on horses as experimental models, bibliographic searches were conducted in the Google Scholar database. The keywords used were: selection, horses, equine therapy, show jumping, and antivenom serum. The inclusion criteria consisted of articles published with relevant information and interest concerning the selection of horses to be utilized as experimental models in equine therapy, antivenom production, and equestrian sports.

3. RESULTS AND DISCUSSION

3.1 SELECTION OF HORSES IN EQUINE THERAPY

In equine therapy, several factors are of utmost importance for selecting the horses that will perform this function. Aspects such as motor, morphological, and behavioral criteria are essential for the choice of these individuals. Duarte et al. [9], in their work on the selection process of horses for therapeutic activities, utilized the following morphological evaluation criteria: length of the lumbosacral region, length of the pastern, angulation, height of the back, alignment of the withers and croup, neck conformation, and height at the withers. Motor aspects considered included the kinematics of the walk. Behavioral aspects assessed included docility, obedience to commands, and scores for desensitization to tactile, auditory, and visual stimuli.

The characteristics that led to the exclusion of individuals from selection included the presence of a pacing gait and behavioral deviations such as biting and kicking. The horses that underwent the selection process exhibited a regular lumbosacral region, a medium-length pastern, aligned withers and croup, and an average height at the withers of 1.50 meters. Additionally, obedient and docile behavior were also characteristics of the approved individuals.
Similarly, Pereira et al. [10], in their research on the conditioning of horses for their maintenance in equine therapy, also used criteria for selecting evaluated individuals that included animals with diverse gaits, a docile temperament, and an average height of 1.43 meters.

3.2 SELECTION OF HORSES FOR ANTIVENOM PRODUCTION

In antivenom production, large animals are generally used to provide a substantial volume of product in each production cycle. The most commonly used species are horses (Equus caballus) and sheep (Ovis aries) [11]. In Brazil, horses are used as an experimental model for antivenom production. According to the Butantan Institute [12], horses have the size and strength required to tolerate the entire production process well. The larger the individual, the more blood circulates through their body, increasing the amount of plasma, which enhances serum production. Additionally, horses are calm, easy to control, and more easily trained for the tasks required by scientists.

Parra [13], evaluating blood count variation in production horses, used 20 serum-producing horses in his research, of no specific breed, weighing an average of 400 kg, and clinically deemed healthy and fit for the serum production process.

Monteiro [14], in his study assessing hematological parameters in serum-producing horses, used 100 healthy, non-breed-specific horses, aged between seven and twenty years. The individuals underwent a veterinary evaluation, where each was weighed, and their body condition score was assessed on a scale of 1 to 5 (1 – emaciated; 2 – thin; 3 – ideal weight; 4 – overweight; 5 – obese), with animals scoring below 2 being excluded from the study.

Souza [15] used nine healthy, non-breed-specific horses weighing approximately 360 kg to 570 kg as experimental models in his study of base immunization with *Bothrops* antigen in serum-producing horses, aiming for an immune response.

All researchers emphasized weight and the health of the individuals as key criteria for selecting them as serum producers

3.3 Selection of Horses for Equestrian Sports

In equestrian sports, certain horse breeds exhibit greater aptitude and skill for specific categories, making them the preferred choice for practitioners. Factors such as obedience, agility, and physical constitution are of utmost importance. According to the Brazilian Equestrian Confederation (CBH), there are 8 categories: show jumping, dressage, eventing, endurance, driving, vaulting, and barrel racing.

Table 1: Table of horse breeds most commonly used in each category.

Categories	**Most Commonly Used Breeds**
Show Jumping	Lusitano, Andalusian, Westphalian, Brazilian Sport Horse, Belgian Warmblood, Anglo-Arab.
Dressage	Brazilian Sport Horse, Thoroughbred, Andalusian, and Lusitano.
Complete equestrian	Anglo-Arab, Arabian Thoroughbred, Brazilian Sport Horse, and Thoroughbred.
Endurance	Anglo-Arab, Arabian Thoroughbred, and Arabian Cross.
Driving	Breton, Percheron, Arabian, Lusitano, and Andalusian.

Vaulting	Brazilian Sport Horse, Breton, Andalusian, and Lusitano.
Barrel Racing	Quarter Horse, Appaloosa, and Paint Horse.

Source: Authors, 2024.

Santos [16] conducted research with 17 Brazilian Sport Horses participating in show jumping, focusing on the variation of hematological and biochemical parameters. Similarly, Soares [17], in his evaluation of tests for measuring the physical conditioning of show jumping horses, worked with 16 Brazilian Sport Horses.

Santiago et al. [18] studied 16 Brazilian Sport Horses, assessing hematology and serum biochemistry of horses in eventing during training. Nothaft [19], in her research on eventing competition horses, worked with 18 Brazilian Sport Horses.

Sala et al. [20] conducted research with four Quarter Horses participating in the barrel racing modality, as did Barbosa et al. [21], who evaluated 16 Quarter Horses undergoing training in the same discipline.

The Quarter Horse breed is the most commonly used in the barrel racing category due to its ability to accelerate rapidly over the first quarter of a mile (402 meters) in a race, surpassing the acceleration of horses of any other breed [22], making it ideal for events that demand speed.

The Brazilian Sport Horse breed was developed in Brazil with the specific goal of producing horses for equestrian sports. According to the Brazilian Association of Sport Horse Breeders (ABCCH), this breed is a mix of over 20 different breeds, with origins ranging from Europe to Latin America. Some of these breeds include Anglo-European, Bavarian, Bayern, Friesian, Hessen, Argentine Warmblood, Belgian Warmblood, Danish Warmblood, Uruguayan Warmblood, Trakehner, Württemberg, Zangersheide, and Zweibrücken, which contribute to making this breed an excellent choice for equestrian sports.

4. CONCLUSION

Considering the observed aspects, each function to be performed requires different selection criteria. Horses used in equine therapy are chosen based on their morphological evaluation, with particular emphasis on withers height, diversity in gait, and behavior. In antivenom production, the health and weight of the animals are the most important criteria due to the need for plasma production. For equestrian sports, it was noted that certain breeds are preferred for specific modalities, making these breeds the most desirable in research involving competition horses.

REFERENCES

1. Robacher MC. Physiotherapeutic analysis of gait in spastic hemiplegic patients using hippotherapy. Equine Therapy – Magazine of the National Association of Equine Therapy (ANDE-BRASIL). 2003 Jul;5(7):8.

2. Oliveira E, Rodrigues L, Ceacero P, Teodoro I, Oliveira F, Teixeira R. Equine therapy: the use of the horse in therapeutic practices. In: IV IFMG Science and Technology Week; 2011.

3. Ministry of Health (BR), Health Surveillance Secretariat, Epidemiological Surveillance Department, General Coordination of Communicable Diseases, Surveillance Coordination of

Vector-Borne Diseases and Anthropozoonoses. History of snakebite [Internet]. Available at: www.portal.saude.gov.br/portal/arquivos/pdt/historico-ofidismo.pdf. Accessed on: 1 Aug. 2024.

4. Lalloo DG, Theakston RDG. Snake antivenoms: antivenoms. J Toxicol Clin Toxicol. 2003;41(3):277-90.

5. Burnouf T, Griffiths E, Padilla A, Seddik S, Stephano MA, Gutiérrez JM. Assessment of the viral safety of antigens fractionated from equine plasma. Biologicals. 2004;32(3):115-28.

6. Resende AM. Myositis in the athletic horse. In: II Athletic Horse Symposium/IV Horse Week. Proceedings... II Symposium on the Athlete Horse – IV Horse Week; Federal University of Minas Gerais, Belo Horizonte. 2005. p. 56-75.

7. Xavier I. Detection of diseases of the locomotor system through physical examination in vaquejada horses. Mossoró: Mossoró Higher School of Agriculture; 2002.

8. Thornton JR. Exercise testing. Vet Clin North Am Equine Pract. 1985;1(3):573-95.

9. Duarte ACDA, Oliveira KD, Araújo MS, Oliveira GAC, Kai KSS. Selection process for horses in therapeutic activity: activity of the UNESP/Dracena equine therapy project. In: UNESP University Extension Congress; 2015 September; São Paulo State University (Unesp). p. 1-4.

10. Pereira RVG, Villanova DFQ, Tafuri NMA, Minighin DC, Carvalho WTV, Baumgratz JL. Conditioning the horse for its maintenance in equine therapy. Pubvet. 2018;12:131.

11. Theakston RDG, Warrell DA. Antivenoms: a list of hyperimmune will be currently available for the treatment of envenomation by bites and stings. Toxic, 21: 739-752.

12. Butantan. Why are only horses used for serum production? Butantan Portal [Internet]. 2021. Available at: https://butantan.gov.br/bubutantan/por-que-sobre-cavalos-sao-usados-para-a-producao-de-soros.

13. Parra AC. Variations in blood crasis during hyperimmunization and after bleeding and plasmapheresis in horses producing anti-crothalic hyperimmune serum [PhD thesis]. São Paulo: University of São Paulo; 2005.

14. Monteiro TK. Evaluation of hematological parameters in seroproducing horses undergoing automated plasmapheresis at the Butantan Institute. São Paulo: Instituto Butantan; 2020.

15. Souza RDJ. Basic immunization with Bothrops genus antigen in seroproducing horses aiming for an immunological response. São Paulo: Instituto Butantan; 2019.

16. Santos VPD. Effect of exercise protocol on hematological and biochemical variables in jumping horses. São Paulo: University of São Paulo; 2006.

17. Soares OAB. Evaluation of tests to measure the physical conditioning of jumping horses. São Paulo: University of São Paulo; 2012.

18. Santiago JM, Almeida FQ, Silva LLF, Miranda ACT, Azevedo JF, Oliveira CAA, Carrilho SS. Hematology and serum biochemistry of horses in full riding competition in training. Arq Bras Med Vet Zootec. 2013;65:383-92.

19. Nothaft IT. Effect of training interruption on the physical conditioning of horses in full riding competitions. São Paulo: University of São Paulo; 2022.

20. Sala LCC, Elui MC, Jardim MC. Thermographic evaluation of the pelvic muscles of horses in three-barrel sports. Pubvet. 2012;6.

21. Barbosa JP, Denadai DS, Gerardi B, Pereira MA, Chaves AA, Gomide LMW, et al. Endoscopic evaluation of the airways, gas profile, electrolytes and acid-base balance in horses undergoing three-barrel training. Arq Bras Med Vet Zootec. 2016;68:1152-8.

22. Nielsen BD, Turner KK, Ventura BA, Woodward AD, O'Connor CI. Racing speeds of quarter horses, thoroughbreds and Arabians. Equine Vet J. 2006;38(S36):128-32.