

**STUDY OF THE CHANGES IN SOME PHYSIOLOGICAL SIGNS IN DELAYED ONSET
MUSCLE SORENESS IN RACES HORSES TREATED WITH BLACK TEA
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ABSTRACT

Background: The purpose of this study was to investigate the effect of Black Tea on Physiological Signs of delayed onset muscle soreness in Races Horses. **Methods:** In an experimental study, 15 healthy Stallion Local horses of races, the horses divided randomly into 3 groups, including: Black Tea intake 5 hour before racing (BTBR), Black Tea intake immediately after racing (BTAR) and Control group (C). Treated horses fed 10 % Black Tea in their feed before and after exercise. The exercise protocol consisted of a 20 minute start running all of them at same time under supervision by Racecourse Executive. Muscle soreness scores, isometric strength and surroundings of thigh muscle, and hip range of locomotion were recorded at mentioned times. **Results:** The results revealed a significant decrease of pain in BTBR compared to BTAR after 24 and 48hr of racing and BTAR compared to Control group ($p < 0.05$). The other factor did not change importantly. **Conclusion:** The outcomes of this study indicate that 10 % of Black Tea may have an analgesic effect on DOMS.

KEYWORDS: Physiological Signs, Muscle Soreness, Races Horses.**INTRODUCTION**

Delayed onset muscle soreness (DOMS) is an unfavorable and unsightly feeling with pain and muscle stiffness consequence of training or racing of horses which frequently endure from delayed onset muscle soreness (DOMS) which is muscle soreness or stiffness that can happen 1-3 days after the original action^[1]. While it is a common misconception that DOMS is reasoned by lactic acid build up in the muscles, it is in fact the product of harm to the muscle cell membranes caused by the free radicals (highly reactive compounds that want to combine with everything) remains from the energy generative processes which support the performance of muscles^[2]. The open muscle cell will then shed its contents of proteins and enzymes into the surrounding areas resulting in inflammation, limb lameness and reduced performance^[3].

Fortunately, dissimilar to the costly treatments for arthritis, treating muscle pain possibly diminish only by guaranteeing that your stallion is consuming a ration appropriate for its level of work and life stage consolidated with a sensible training schedule^[4]. Some horses will experience chronic muscle soreness, mainly over their back: these horses in particular seem to benefit greatly from a re-evaluation of their feeding program,

giving careful consideration to the nutrients critical for muscle health^[5]. For steeds encountering either ceaseless or intense muscle soreness, the nutrients most implicated in muscle function and efficiency are vitamin E, thiamine, selenium, and magnesium^[6].

Five important signs of DOMS are acute inflammation, pain, swelling, loss of function and range of motion^[7] and increase in Thigh circumference^[8].

Several treatment planes, both preventive and rehabilitative, have been suggested to help relieve the severity of DOMS. Some of the presented treatments including herbal remedy^[9]. Nutritional supplements^[10]. However, little scientific evidence exists to support the full effectiveness of any of these therapeutic interventions^[11].

Black Tea, commonly known as *Camellia sinensis*, has been widely used in all around world. It represent Chinese medicine for arthritis, rheumatism, sprains and muscular aches. It has shown analgesic and anti-inflammatory effects^[12]. Black Tea constituents inhibit arachidonic acid metabolism and thus prostaglandin synthesis^[13]. It is found to inhibit cyclooxygenases and prevents specific prostaglandin release and hereby

interacting with the vanilloid receptor TRPV1, which is known to play a role in processing nociceptive signals^[14]. Daily consumption of raw and heat-treated Black Tea resulted in moderate-to-large reductions in muscle pain following exercise induced muscle injury in horses. Consuming a 90 gm dose of Black Tea has also been shown to increase recovery of the fast phase of oxygen consumption after a maximal exercise test and reduces cardiovascular recovery time^[15].

MATERIALS AND METHODS

Horses and Study Design

Fifteen healthy adult local racing Stallion are selected randomly. The horses were ranging in age from 2 to 5 years old and a mean body weight of 344 ± 12 kg and had raced five times each time for 20 minutes. During the experimental period, horses were housed in individual stalls and consistently fed concentrated pelleted feed provided with 10% Black Tea and hay (*Cynodon dactylon*). Water was given *ad libitum*. All horses are managed in the same way with individual boxes, photoperiod of 4:30 AM to 9 PM, a natural indoor temperature (18C–20C), and the same feeding and training schedules. The horses, which appeared healthy, were submitted to a complete clinical examination, and then divided into the three experimental groups: Black Tea intake 5 hours before racing (BTBR), Black Tea intake immediately after racing (BTAR) and Control group (C).

Table 1 shows time course of Black Tea Supplementation.

Group	1 hour before racing	Immediately after racing
BTBR	Pelleted Black Tea Ration	No added ration
BTAR	No added ration	Pelleted Black Tea Ration
C	No added ration	No added ration

Measurement

Pain was measured by using a self-reporting visual analog scale (VAS) including a horizontal line, 100 mm in length, anchored by word descriptors at each end “no pain” and “severe pain”^[16]. All Signs were before and after racing and then draw a line on the scale corresponding to their level of soreness. Range of motion (ROM) of hip was taken by Special Jamar goniometer. Researcher placed the center of the goniometer on the greater trochanter of hip^[17]. Data were recorded for an average of three times.

Thigh muscle circumference was measured using a Gulick anthropometric tape. A mark was placed on each participant's thigh for the next measurement^[18].

Statistical Analysis

ANOVA was used for checking the differences within groups in different times and Repeated Measure and Bonferroni post hoc were used for checking the

differences between groups. Moreover, to compare the results in different measurement between groups. The interaction effect of time and group was also measured. All statistical analysis were performed using SPSS 20. The significant level was considered at $p \leq 0.05$.

RESULTS

According to Table 2, there is significant ($P \leq 0.05$) increasing in Right and Left thigh circumference of BTAR group in comparing with BTBR and Control groups. While the result of ANOVA of Right Hip Range of motion showed no important varies among all groups. About the left thigh circumference values, there is significant ($P \leq 0.05$) increasing in BTAR group in comparing with other groups. So statistical analysis showed significant decreasing in Thigh muscle pain of BTBR group if had been compared with control group, while the values of BTAR are recorded lowest level in comparing with other groups.

Table 2. Mean \pm SD of thigh circumference, hip range of motion and thigh muscle pain.

Variable Group	C	BTBR	BTAR
Right thigh circumference	254.7 \pm 1.69	254.9 \pm 2.15	257.7 \pm 1.03*
Left thigh circumference	254.2 \pm 1.37	254.2 \pm 1.19	257.4 \pm 2.74*
Right Hip Range Of Motion	197.3 \pm 1.52	197.7 \pm 2.3	198.6 \pm 2.34
Left Hip Range Of Motion	193 \pm 1.19	193 \pm 2.08	198.8 \pm 2.46*
Thigh muscle pain	158.75 \pm 1.8	153.7 \pm 1.32*	133.3 \pm 2.85*

* Significant difference ($p \leq 0.05$), (mean \pm SD)

DISCUSSION

The aim of the current study was to examine the biological effect of oral feeding of 10% Black Tea on some functional factors of delayed onset muscle soreness (DOMS) before and after 20 minutes of racing. Right and left thigh muscle circumference, ROM of right and left hip, isometric strength of thigh before racing did not differ between BTBR and control conditions but the ratio of pain were significantly varied among groups. Black Tea exhibited hypoalgesic effect on quadriceps pain intensity in BTBR and BTAR compared with C. Finding that Black Tea reduced muscle pain as a result of delayed onset muscle soreness caused by racing or exercise is consisted with studies^[19] demonstrating that 2gm use of raw Black Tea can reduce arm pain in human after eccentric elbow action. One study showed that administration of 15 mg Black Tea powder daily for three days produce analgesia in students with primary dysmenorrhea^[20]. Black Tea act as a pain relief in patients with knee's osteoarthritis^[21]. But ingesting 2 gm of Black Tea doesn't have any effect on quadriceps muscle pain during and after moderate-intensity cycling exercise^[16] and this may be because of the sternness of

the protocol was used. Proanthocyanidins (polymer chains of flavonoids) is one of a main biologically active compounds found in the leaves of black tea that have analgesic effects^[22]. To explain the impacts of Black Tea on pain relief, it has been informed that Black Tea flavonoids inhibits cyclooxygenase and lipoxygenase pathways in prostaglandin and leukotriene synthesis and the anti-inflammatory property of Black Tea has been attributed to inhibition of prostaglandin synthesis^[13]. Inflammatory response ends up in autacoid leukotriene synthesis. ProstaglandinE2 PGE2 directly causes pain by sensitizing types III and IV pain receptors^[23]. In the current study, perception of soreness in BTBR was less than BTAR and C and this perhaps caused by the inhibitory effect of Black Tea on prostaglandin's release. It seems that utilization of Black Tea before exercise could cease the cascade of inflammatory factors and thereby caused a lesser pain report^[24]. The main signs of DOMS are ache, diminish in domain of movement, decrease in muscle strength and swelling which is frequently linked to acute inflammation^[25]. Many studies investigate an association between DOMS and swelling, loss of function and strength is associated with lack of power generating capacity^[26]. Our findings of increased thigh muscle volume and decreases hip ROM and isometric strength, obviously illustrated that the exercise protocol resulted in muscle damage, but Black Tea couldn't ameliorate these symptoms. Black Tea didn't change arm volume and elbow ROM after racing. The rise in isometric strength of thigh 1 hour after racing may be owed to better use of dynamometer. The decrease in ROM was related with decrease in isometric strength and this suggests that muscular tightness can impair maximum isometric energy construction^[27]. In summery the results of the present study suggest that Black Tea supplement could reduce pain and inflammation caused by racing. It could be used as an effective herbal in healing DOMS.

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