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Multi Enzyme Complex for the Management of Delayed Onset Muscle Soreness after Eccentric Exercise: A Randomized, Double Blind, Placebo Controlled Study

Majeed M, Siva KA,Shaheen M,Priti V and Kiran KV*

ClinWorld Private Limited, Peenya Industrial Area, Bangalore, Karnataka

Abstract

Background: Delayed onset muscle soreness (DOMS) results from muscle overload or strenuous exercise that goes beyond the intensity or duration for which the muscle is accustomed to perform. It is accompanied with the sensation of pain, tenderness, deep ache, and stiffness in muscles that usually begins several hours after the XQDFFXVWRPHG H[HUFLVH 7KH DLP RI WKLV VWXG\ ZDV WR FRPSDUH WKH HI¿FDF placebo in reducing pain associated with DOMS induced by standardized eccentric exercise.

Methods: Twenty healthy males (10 pairs) were randomized in this double blind, placebo controlled trial to receive a placebo or multi enzyme complex capsule (50 mg) thrice a day for a period of 3 days. Mean differences within the group and between groups were assessed at each data collection time-point using Analysis of Covariance (ANCOVA) and Wilcoxon signed rank sum test for all outcome measures.

Results: In this controlled clinical study, intake of multi enzyme complex for 3 days resulted in no statistically VLJQL¿FDQW FKDQJHV LQ WKH GHVFULSWLYH VWDWLVWLFV DQG HI¿FDF\ DQDO\VL KDQG KHOG G\QDPRPHWHU $OJRPHWHU UHDGLQJV RI WKLJK PXVFOH VKRZHG VWD ZHUH REVHUYHG LQ 0F*LOO 3DLQ 4XHVWLRQQDLUH VKRZLQJ KLJK VWDWLVWLFDO bio markers of muscle damage (creatine kinase and lactate dehydrogenase) as well.

Conclusion: The study results suggest that compared to placebo, Multi enzyme complex supplementation improves the outcome measures related to DOMS induced by standardized eccentric exercise.

Keywords: Delayed onset muscle soreness (DOMS); Muscle soreness questionnaire (MSQ); Pressure pain threshold (PPT); Hand held dynamometer; Illinois agility run test; Multi-enzyme complex

Introduction

Delayed onset muscle soreness is related to muscle damage occurring several hours a er unaccustomed exercise, particularly when eccentric muscle activity is involved [1,2]. Contracting muscles are forcibly lengthened with eccentric exercise like downhill running which limits physical function for several days [3,4]. is triggers an in ammatory response and the production of reactive oxygen species (ROS) that sustain in ammation and oxidative stress by promoting the activation of transcription factors like the nuclear factor- (NF—), a pro-in ammatory master switch that controls the production of in ammatory markers and mediators [5]. e in ammatory response ensures musculoskeletal injury; uncontrolled in ammation may prolong skeletal muscle recovery [4].

Delayed onset muscle soreness (DOMS) is a well-documented phenomenon, o en occurring as the result of the unaccustomed or high intensity eccentric exercise. Associated symptoms include muscle shortening, increased passive sti ness, swelling, decreases in strength and power, localized soreness and disturbed proprioception. Symptoms will o en occur within 24 h post-exercise and typically subside a er 3-4 days. e severity of damage and soreness varies as a function of several factors [6].

Considerable amount of research on the treatment of DOMS has been carried out till date but no single treatment has been proven successful in consistently preventing or treating DOMS. Treatment strategies have o en integrated multiple therapeutic approaches such as cryo therapy, ultrasound, compression therapy, stretching and deep tissue massage [7-11]. ere is some evidence that ibuprofen, naproxen, and massage may accelerate the resolution of DOMS [12]. In addition, several dietary supplements have been tested in the treatment of DOMS including protein, vitamin C, proteases (enzymes), phosphatidylserine, chondroitin sulphate, and sh oil, all with variable success [4,12-18].

Non-steroidal anti-in ammatory drugs (NSAIDs) like ibuprofen are used widely as anti-DOMS recourse. NSAIDs are known to interfere with chemo taxis of monocytes as well as inhibit neutrophil aggregation [19]. Monocytes produce cytokines, which are responsible for most of the physiological responses accompanying injury, and neutrophils produce elastase and collagenase, which increase vascula permeability via degradation of the vasculature and healthy tissue near the injury site [20]. It is possible that the use of NSAIDs may impair and lengthen the healing process.

In spite of inconsistencies, dose and timing of various NSAIDs also in di erent studies there are side e ects such as gastrointestinal distress and hypertension. Hence NSAIDs are not an optimal choice for treating DOMS [12]. Using enzymes to combat DOMS is also well established.

*Corresponding author: Vuppala KK, M.Ph, ClinWorld Private Limited, Peenya Industrial Area, Bangalore, Karnataka, Tel: +917760956367; E-mail: kiran@clinworld.org

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blindness of the study and concealment of allocations. Computer generated random allocation so ware (version 2.0) was used for the allocation of concealment. Block randomization (only one block) was followed wherein the subjects were randomized to receive either active or placebo. e randomization codes were kept strictly con dential and were accessible only to authorized persons on an emergency basis as per the Sponsor standard operating procedures until the time of unblinding.

Blinding

e study was double blinded wherein neither the Investigator nor the trial participants knew whether they would receive the active or the placebo. e investigational products were provided in pre labelled containers to avoid bias.

Figure 2: Hand-held dynamometer (HHD) readings of maximal voluntary isometric contraction (MVC) at three different positions of knee range of motion (0 degrees, 90 degrees, 120 degrees) of both active and placebo.

Figure 3: Aglometer readings to quantify pressure pain threshold (ppt) of thigh PXVFOH 3 EHWZHHQ WKH WUHDWPHQW JURXSV

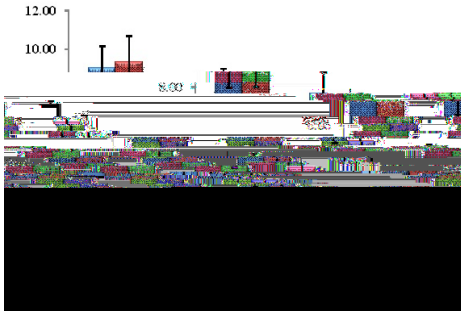

Figure 4: Aglometer readings to quantify pressure pain threshold (ppt) calf muscle.

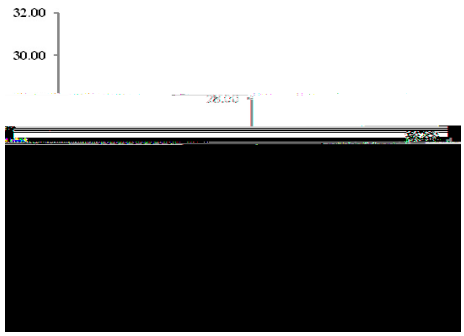

Figure 5: Illinois agility run test on length of 10 meters and the width (distance EHWZHHQ VWDU DQG ¿QLVK SRLQWV PHWHUV

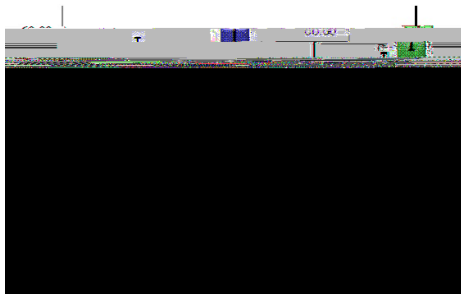

Figure 6: The muscle soreness questionnaires (MSQ) on scale of 1 to 10 of ERWK DFWLYH DQG SODFHER S EHWZHHQ WKH W

Tenderness assessment

On the tenderness quotient, subjects taking multi enzyme complex demonstrated signi cantly less tenderness, 72 hours a er exercise (p=0.042).

Muscle damage assessments

Liberation of biochemical substances such as creatine kinase, lactate dehydrogenase, protein metabolites and myoglobin occurs from muscle cells approximately 24 hours post exercise and have been found in plasma up to 48 hours [29]. Creatine kinase being a surrogate index of muscle damages more indicative of damage or gaps in the sarcolemma [30]. e CK response was less in the multi enzyme complex group suggesting the membrane integrity was maintained to greater extent than the placebo group.

24 hours post exercise, subjects on the placebo group showed trend towards a higher level of CK than the multi enzyme complex group. is trend continued through the 72 hour assessment. Di erence between the multi enzyme complex group and placebo in CK values was not statistically signi cant. Lactate dehydrogenase also showed a similar phenomenon, which trended higher at 24 and 72 hours post-exercise in the placebo group (Figures 7-8).

Flexion and extension measurements

On analysing the pre exercise leg exion measurements, they were found to be equal between the groups for the le leg. Whereas the exion measurement was found to be signi cantly greater (p=0.049) for the right leg in the placebo group.

When the post exercise exion measurements were analysed, only the 24-hour right leg exion measurement was found to be signi cant (p=0.004) in the multi enzyme complex group.

Safety evaluations

Vital signs such as Blood Pressure, Respiratory Rate, Pulse Rate and any abnormal laboratory parameters were considered for safety evaluations. No clinically signi cant changes were recorded for descriptive physical examination in both the groups (Multi enzyme complex and placebo). e safety of multi enzyme complex was assessed using adverse event data (occurrence, intensity, and relationship to study drug). No adverse events were noticed in the study.

Discussion

Multi enzyme complex capsules contain alpha-amylase, neutral protease, lipase, lactase and cellulase. e capsule containsfree broad acting enzymes obtained from the fermentation process

In the present study multi-enzyme complex capsules demonstrated signi cant improvement in subjective pain and tenderness, with no signi cant improvement in levels of markers of in ammation, muscle damage or muscle exion. Multi-enzyme complex contains a multiple enzymes that are indicated for relieving the symptoms of DOMS.

e ndings of this study suggest that multi enzyme complex can have several potential clinical applications. Protease supplementation when coupled with a well-managed training programme can result in more rapid recovery of the damage caused to contractile mechanism by DOMS.

Registration

e trial was registered on the Clinical Trial Registry of India with the registration number CTRzrpl9res demonstrated

with A s pergillu s oryze, including manufacturing technique ensures that the gastric enzymes from A s pergillu s oryze are delivered a small intestine, respectively. Various studies have shown protease supplementation may attenuate muscle soreness a er downhill running [31].

A subsequent series of four studies have evaluated papain, in combination with other proteases, in small samples of male athletes, especially with regard to its e ectiveness in attenuating DOMS post eccentric exercise. Two of the studies were able to show better exion in the tested limb post eccentric load which was hypothesised to be mediated by regulation of leukocyte activity and in ammation. Two further studies showed an improvement in contractile function and subjective pain and tenderness ratings but not in biochemical measures of DOMS. Further interpretation of these studies is di cult as all four used a combination of papain with other proteolytic enzymes (e.g. bromelain, amylase, lysozyme, and trypsin) [8].

In the present study we sought to investigate the e ects of multi enzyme complex on delayed onset muscle soreness induced by eccentric exercise.

Delayed onset muscle soreness (DOMS) due to eccentric muscle activity is associated with in ammatory responses and production of reactive oxygen species (ROS) that sustain both in ammation and oxidative stress. A er eccentric exercise, damage to the contractile element of the muscle leads to the occurrence of DOMS. e results of this study suggest that supplementation with Multi enzyme complex supplementation helps in the recovery of this contractile fraction of the muscles.

18. Lenn J, Uhl T, Mattacola C, Boissonneault G, Yates J, et al. (2002) The effects RI ¿VK RLO DQG LVRÀDYRQHV RQ GHOD\HG RQVHW Exerc 34: 1605-1613.

19. *RRGZLQ -6 0HFKDQLVP RI DFWLRQ RI QRQ agents. Am J Med 104:2S-8S.

20. Evans WJ, Cannon JG (1991) The metabolic effects of exercise-induced muscle damage. Exerc Sport Sci Rev 19: 99-125.

21. ,QQHU ¿HOG , 7KH DQWL LQÀDPPDWRU\ HIIHFW proteases. Ann N Y Acad Sci 68: 167-77.

22. :RROI 50 6QRZ -: :DONHU -+ %URDGEHQW 7 LQGXFHG KHPDWRPD DQG WKH LQÀXHQFH RI D 491-493.

23. Cirelli MG (1964) Clinical experience with bromelains in proteolytic enzyme WKHUDS\ RI LQÀDPPDWLRQ DQG HGHPD 0HGLFDO 7LPHV

24. Miller PC, Derr JS, Bailey SP, Hall EE, Barnes ME (2004) The effects of protease supplementation on skeletal muscle function and DOMS following downhill running. Journal of Sports Sciences 22: 365-372.

25. Kelln BM, McKeon PO, Gontkof LM, Hertel J (2008) Hand-held dynamometry: reliability of lower extremity muscle testing in healthy, physically active, young adults. J Sport Rehabil 17: 160-170.

26. *HHWRKHOO %DQWL LQÀDPPDWRU\ PHDQV D <RXQ RI OLI

27. Melzack R (1975) The McGill pain questionnaire: major properties and scoring methods. Pain 1: 277-299.

28. Sullivan MJL, Rodgers W, Wilson MP, Fraser SN (2002) An experimental investigation of the relation between catastrophizing and activity intolerance. Pain 100: 47-53.

29. Clarkson PM, Nosaka K, Braun B (1992) Muscle functions after exercise-induced muscle damage and rapid adaptation. Med Sci Sports Exerc 24: 512-520.

30. Jackman SR, Witard OC, Jeukendrup AE, Tipton KD (2010) Branched-chain amino acid ingestion can ameliorate soreness from eccentric exercise. Med Sci Sports Exerc 42: 962-970.

31. Au RY, Al-Talib TK, Au AY, Phan PV, Frondoza CG (2007) Avocado soybean XQVDSRQL¿DEOHV $68 VXSSUHVV 71) DOSKD ,/