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Safety of Injectable BPC-157 and TB-500 in Adult Horses

Introduction

Peptides, short chains of amino acids smaller than proteins, have a long history of investigation, isolation, synthesis and pharmaceutical use as cell signaling molecules. Insulin, a peptide hormone, has been used as a life-saving treatment for type 1 diabetes since 1923. In the intervening years, over 100 peptide drugs have been approved by the FDA. More recently, public interest in peptides has intensified with the success of GLP-1 drugs such as Ozempic. As of 2026, the FDA has announced that it will review 12 peptides, including BPC-157 and TB-500, for potential approval as compounded medication. These peptides are no longer Category 2 prohibited compounds but remain available as research products. As the peptide landscape undergoes rapid transformation due to increased demand, it is vital that clinical investigation provides the safety and efficacy data required to guide safe administration protocols.

BPC-157, first isolated from gastric juice in 1991, has been shown in animal models to accelerate healing and recovery of muscle, bone, tendon and ligament tissues. BPC-157 is widely used in human sports medicine to increase vascularity (angiogenesis), reduce inflammation, and modulate scar tissue formation with the aim of hastening recovery and improving function of injured soft tissues. The widespread use of BPC-157 despite an ambiguous regulatory framework, can be partly attributed to its remarkable safety index, with no toxic dose identified in animal studies and no reported adverse events at therapeutic doses in humans.

TB-500 is a synthetic fragment from the active region of the thymosin beta-4 (TB4) peptide, a natural repair factor that plays a key role in wound healing and tissue damage repair. Human and animal studies have demonstrated TB4's ability to promote tissue growth and regeneration by stimulating stem cell migration and blood vessel formation. No dose-limiting toxicity or serious adverse events associated with TB4 have been identified in preclinical animal studies or clinical human studies.

To our knowledge, there are no published safety or efficacy studies of BPC-157 or TB-500 in horses, yet equine athletes have an immense potential to benefit from the regenerative properties of peptide therapy. Sport horses are known to suffer a disproportionate number of musculoskeletal injuries relative to the duration of their athletic careers. Equine veterinarians, horse owners, riders, and trainers are often faced with the challenge of rehabilitating injuries to structures with poor blood supply and low cell density, where healing is slow and often results in a biomechanically and functionally inferior tissue.

Methods

Animals

11 healthy horses were enrolled in a safety study utilizing BPC-157 and TB-500. Enrollment was restricted to horses undergoing controlled rehabilitation for a naturally occurring soft tissue or bone injury, reflective of the most likely use-case for equine peptide therapy. Each horse was evaluated at baseline by a veterinarian performing a physical exam, complete blood count (CBC), serum chemistry (Chem), fibrinogen, and serum amyloid A (SAA). Horses were included if lameness was grade 2/5 or less on the AAEP scale, and they showed no evidence of systemic disease on physical exam and blood work. Ultimately enrollment was contingent upon the horse owner's written approval following explanation of the proposed intervention and potential risks associated with peptide therapy. The final population of enrolled horses was composed of 6 geldings and 5 mares between the ages of 8 and 27 years (median 16 years). Breeds included in the study were: 6 warmblood horses, 2 ponies, 1 mustang, 1 thoroughbred, and 1 thoroughbred/warmblood cross.

Study Design

Each horse was evaluated at baseline prior to administering 2.5 mg BPC-157 and 2.5 mg TB-500 daily via subcutaneous injection for an intervention period of 40 days. All peptides were provided as freeze-dried powder for reconstitution with bacteriostatic water by VetBioLogix. Serial evaluations performed by an equine veterinarian included physical exam, hematology (CBC), serum chemistry (Chem), fibrinogen, and SAA at baseline, day 7 of treatment, day 40 of treatment, and 30 days after the final injection. Owners were provided with a survey to monitor adverse events and injection site reactions.

Clinicopathological Analysis

Blood samples were analyzed at Rood & Riddle Equine Hospital in Wellington, Florida. A total of 40 blood parameters were measured at each timepoint. Parameters were compared across timepoints using a paired *t*-test for normally distributed parameters or Wilcoxon Signed Rank test for non-normally distributed parameters. Significance was set at $p < 0.05$ for all analyses.

Results

11 horses completed the study and there were no adverse events, no injection site reactions, and no clinically relevant abnormalities on physical exam observed or reported for any horse during the 40-day treatment period or the 30-day follow-up.

Of the 40 blood parameters measuring hepatic and renal function, hematologic indices, electrolyte balance, metabolic status, and immune function – 34 demonstrated no statistically significant change across any pairwise timepoint comparison (Baseline, Day 7, Day 40, and Post 30). Statistically significant changes were identified in 6 parameters: mean cell volume (MCV), red cell distribution width (RDWc), mean cell hemoglobin concentration (MCHC), creatine kinase (CK), glucose (GLU), and globulins (GLOB).

A large portion of statistically significant changes in blood work parameters were related to measures of red blood cells (RBCs). MCV and RDWc were increased between baseline and the 30-day follow-up. MCHC decreased at both baseline and the 40-day treatment timepoints relative to the 30-day follow-up. MCV, RDWc and MCHC remained within normal laboratory reference ranges for all horses throughout the study.

CK values showed a statistically significant increase from baseline to the 30-day follow-up timepoint. GLU showed a statistically significant decrease from baseline across all treatment timepoints and the 30-day follow-up. CK and GLU values did not vary outside laboratory reference ranges for any horse during the study.

GLOB trended down from baseline with a statistically significant difference between baseline and the 30-day follow-up. GLOB values in 5 horses were mildly below laboratory reference ranges at various timepoints throughout the study.

Mean values and statistical comparisons for all significant parameters are displayed in Figure 1.

Figure 1

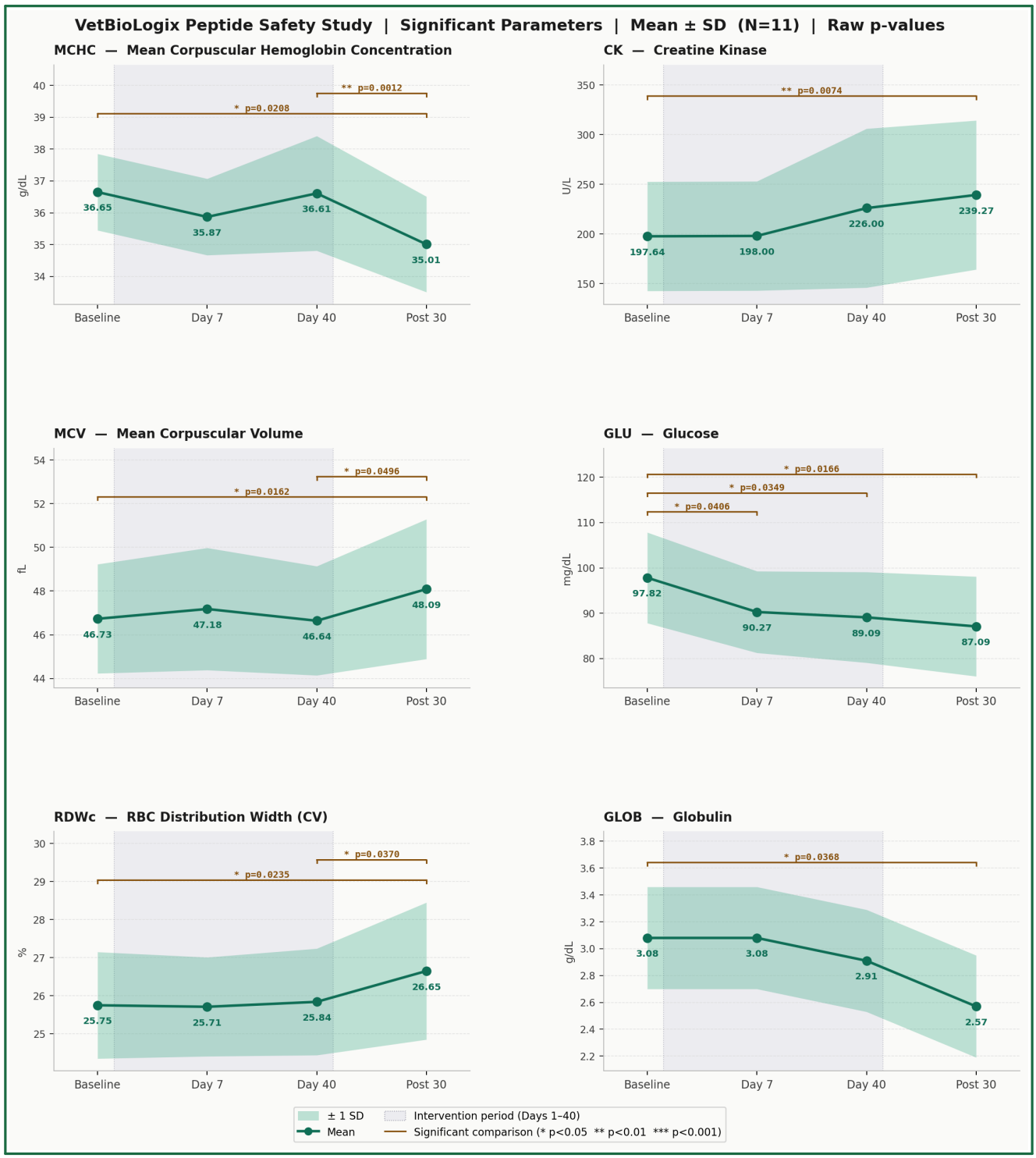

Figure 1. Statistically significant blood parameters — Mean ± SD (N=11) with raw p-values. *Each panel displays the mean (dark teal line), ±1 SD band (light teal shading), and the intervention period (Days 1–40, grey shading). Significant pairwise comparisons are indicated by horizontal brackets with asterisks (* p<0.05, ** p<0.01). MCHC = Mean Corpuscular Hemoglobin Concentration; CK = Creatine Kinase; MCV = Mean Corpuscular Volume; GLU = Glucose; RDWc = RBC Distribution Width (CV); GLOB = Globulin.*

Discussion

Daily subcutaneous injection of BPC-157 and TB-500 was well tolerated and safe in adult healthy horses. Throughout the study period and 30-day follow-up, there were no adverse reactions, changes in behavior, or pathological changes in blood work.

Minor elevations in MCV and RDWc coupled with decreased MCHC at the 30-day follow-up timepoint is consistent with increased red blood cell (RBC) production in bone marrow (regenerative erythropoiesis). Newly produced red blood cells are characteristically larger (MCV) and lower in hemoglobin concentration (MCHC) than their mature counterparts. Studies in which horses were administered erythropoietin (EPO) to stimulate production of red cells in bone marrow similarly demonstrated increased RDWc and MCV values. Other potential explanations for increased MCV and RDWc with decreased MCHC include known artifacts due to red cell swelling in blood samples prior to sample analysis. Further research examining red cell morphology utilizing blood smears is indicated to determine if BPC-157 and TB-500 have a true regenerative effect on red cell production.

CK values showed a trivial upward trend during the study period which was statistically significant between baseline and the 30-day follow-up timepoints. CK is an enzyme released by muscle cells during normal activity and cell turnover. The small increases in CK did not vary outside the laboratory reference range and may reflect increased muscle turnover or stimulation of skeletal muscle repair mechanisms. Alternatively, small CK elevations can occur secondary to red cell damage (hemolysis) during blood collection, sample storage, or processing that results in an artificial increase in the measured CK value not reflective of actual changes in muscle metabolism.

Glucose (blood sugar) levels showed a gradual, mild decline across the study, though all values remained within the normal range. In support of the possibility that peptide therapy had a beneficial effect on glucose metabolism, animal studies have shown that thymosin beta-4 (from which TB-500 is derived) can improve glucose profiles following repeated oral sugar tests. Other possible explanations for fluctuation in blood sugar levels include variability in meal timing relative to blood collection and glucose metabolism by red blood cells after sample collection and prior to analysis. Further investigation is indicated to explore the effects of BPC-157 and TB-500 on glucose metabolism.

Globulins are a broad family of blood proteins that include immunoglobulins (antibodies) and acute phase proteins, the latter of which rise sharply in response to infection, tissue damage, and systemic inflammation. This study identified a very small but statistically significant decrease in globulins between baseline and the 30-day follow-up timepoint. Mildly low globulins have been reported in athletic and otherwise healthy horses with no link to pathologic conditions. In the absence of other adverse clinical findings, it is possible that the mild downward trend observed is reflective of a reduction in inflammatory tone and the result of low levels of circulating acute phase proteins.

Peptide therapy is a novel treatment modality in horses that has the potential to enhance natural recovery from injury and repetitive stress on the musculoskeletal system. The findings provide an important foundation of safety for equine practitioners, equine professionals, and horse owners who are considering peptide therapy as part of a regenerative medicine program.

Disclosure: *Peptides used in this study were provided by VetBioLogix. This document is intended for educational and informational purposes for licensed veterinary professionals.*

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References

1. Al Musaimi O. Exploring FDA-approved frontiers: insights into natural and engineered peptide analogues in the GLP-1, GIP, GHRH, CCK, ACTH, and α-MSH realms. *Biomolecules.* 2024;14(3):264. doi:10.3390/biom14030264

2. Gwyer D, Wragg NM, Wilson SL. Gastric pentadecapeptide body protection compound BPC 157 and its role in accelerating musculoskeletal soft tissue healing. *Cell Tissue Res.* 2019;377(2):153–159. doi:10.1007/s00441-019-03016-8

3. Vasireddi N, Hahamyan H, Salata MJ, Karns M, Calcei JG, Voos JE, Apostolakos JM. Emerging use of BPC-157 in orthopaedic sports medicine: a systematic review. *HSS J.* 2025;21(4):15563316251355551. doi:10.1177/15563316251355551

4. Lee E, Padgett B. Intra-articular injection of BPC 157 for multiple types of knee pain. *Altern Ther Health Med.* 2021;27(4):8–13.

5. Lee E, Burgess K. Safety of intravenous infusion of BPC 157 in humans: a pilot study. *Altern Ther Health Med.* 2025;31:20–24.

6. Cushman CJ, Ibrahim AF, Smith AD, Hernandez EJ, MacKay B, Zumwalt M. Local and systemic peptide therapies for soft tissue regeneration: a narrative review. *Yale J Biol Med.* 2024;97(3):399–413. doi:10.59249/TKNM3388

7. Esposito S, Deventer K, Goeman J, Van der Eycken J, Van Eenoo P. Synthesis and characterization of the N-terminal acetylated 17–23 fragment of thymosin beta 4 identified in TB-500, a product suspected to possess doping potential. *Drug Test Anal.* 2012;4(9):733–738. doi:10.1002/dta.1402

8. Sosne G, Qui P, Goldstein AL, Kleinman HK. Biological activities of thymosin beta 4 defined by active sites in short peptide sequences. *FASEB J.* 2010;24(7):2144–2151. doi:10.1096/fj.09-142307

9. Xing Y, Ye Y, Zuo H, Li Y. Progress on the function and application of thymosin β4. *Front Endocrinol (Lausanne).* 2021;12:767785. doi:10.3389/fendo.2021.767785

10. Kämpf S, Seiler E, Bujok J, Hofmann-Lehmann R, Riond B, Makhro A, Bogdanova A. Aging markers in equine red blood cells. *Front Physiol.* 2019;10:893. doi:10.3389/fphys.2019.00893

11. Zhu J, Su LP, Ye L, Lee KO, Ma JH. Thymosin beta 4 ameliorates hyperglycemia and improves insulin resistance of KK Cg-Ay/J mouse. *Diabetes Res Clin Pract.* 2012;96(1):53–59. doi:10.1016/j.diabres.2011.12.009

12. Stokol T. eClinPath: online textbook of veterinary clinical pathology. Cornell University College of Veterinary Medicine. Available at: https://eclinpath.com. Accessed 2026.

13. Liphook Equine Hospital. Globulins. Laboratory A–Z tests. Available at: https://liphookequinehospital.co.uk/laboratory/a-z-tests/globulins/. Accessed 2026.