Healing or Hype? Systematic Review of BPC-157 in Orthopedic Sports Medicine Applications

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INTRODUCTION:
Body protective compound 157 (BPC-157) is a naturally occurring gastric peptide that is increasingly being utilized by athletes. Several preclinical studies demonstrate regenerative potential in a variety of musculoskeletal disease states, including fracture, tendon rupture, ligament tears, and muscle tears. BPC-157 is not FDA approved, but is readily available for purchase online, and cash practices even offer intra-articular injections to treat musculoskeletal injuries. Increasingly, athletes have turned to BPC-157 as a means of augmenting musculoskeletal healing and recovery, evidenced by the recent bans since 2022 by athletic organizations including the NFL, UFC, NCAA, and WADA (table 1). The purpose of this novel systematic review is to provide a comprehensive synthesis of the BPC-157 literature for sports medicine clinicians and athletes to elucidate the mechanism of action, musculoskeletal effects, and safety profile.
METHODS:
A systematic review of the English-language literature from PubMed, Cochrane, and Embase was performed according to the PRISMA guidelines. Articles relevant to BPC-157 mechanism of action, musculoskeletal outcomes, metabolism and safety profiles were included. Reviews, meta-analyses, editorials, and conference abstracts were excluded. Data specific to each article type or topic (e.g. clinical study, preclinical model) were extracted, assessed, and presented in tables. The heterogeneity of the study data precluded meta-analyses.
RESULTS:
The literature search yielded 544 abstracts, and a total of 39 articles from 1993 to 2024 were identified for inclusion. Twenty-two studies report the pleiotropic mechanism of action. BPC-157 induces direct and indirect increased VEGF (angiogenesis), FAK/PAXILLIN (cell adhesion and proliferation), NOS (cytoprotection from free radicals), KRAS (cell proliferation), MAPK (cell proliferation), and growth hormone receptor gene expression. Fifteen studies report musculoskeletal effects. In four preclinical muscle transection and crush models, BPC-157 treatment was associated with improved load to failure, motor function indices, and muscle myofibril and macroscopic diameters. In eight tendon and ligament transection models, BPC-157 treatment was associated with reduced instability and postinjury contracture, and restored biomechanics and motor function indices. In one fracture model, BPC-157 performed similarly to autologous bone marrow injection and bone grafting, promoting callous mineralization and resolution of the bone defect with predominantly lamellar bone formation versus fibrous scar tissue. In the sole human study, of 12 patients surveyed at 6 to 12 months following intra-articular injection (2 - 4 mcg of 2000 mcg/ml solution) of BPC-157 for an unspecified knee pain, 7 reported subjective improvement in pain for more than 6 months. Four studies assessed the preclinical safety and reported no lethal/toxic dose and no adverse effects in several organ systems. No studies report on in-human clinical safety or adverse events.
DISCUSSION AND CONCLUSION:
The pleiotropic cytoprotective mechanism of BPC-157 promotes structural and functional recovery in preclinical tendon rupture, ligament tear, muscle tear, and fracture models. Although no adverse effects of BPC-157 were reported in preclinical studies, the in-human safety remains unknown. Due to the lack of high-quality clinical evidence, we caution against the use of BPC-157 by clinicians and athletes. Further basic science and clinical studies are warranted to validate these early reported findings regarding BPC-157.