

## Berberine and musculoskeletal disorders: The therapeutic potential and underlying molecular mechanisms.

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### Abstract

**BACKGROUND:** Musculoskeletal disorders are a group of disorders that affect the joints, bones, and muscles, causing long-term disability. Berberine, an isoquinoline alkaloid, has been previously established to exhibit beneficial properties in preventing various diseases, including musculoskeletal disorders.

**PURPOSE:** This review article aims to recapitulate the therapeutic potential of berberine and its mechanism of action in treating musculoskeletal disorders.

**METHODS:** A wide range of literature illustrating the effects of berberine in ameliorating musculoskeletal disorders was retrieved from online electronic databases (PubMed and Medline) and reviewed.

**RESULTS:** Berberine may potentially retard the progression of osteoporosis, osteoarthritis and rheumatoid arthritis. Limited studies reported the effects of berberine in suppressing the proliferation of osteosarcoma cells. These beneficial properties of berberine are mediated in part through its ability to target multiple signaling pathways, including PKA, p38 MAPK, Wnt/ $\beta$ -catenin, AMPK, RANK/RANKL/OPG, PI3K/Akt, NFAT, NF- $\kappa$ B, Hedgehog, and oxidative stress signaling. In addition, berberine exhibited anti-apoptotic, anti-inflammatory, and immunosuppressive properties.

**CONCLUSION:** The current evidence indicates that berberine may be effective in preventing musculoskeletal disorders. However, findings from in vitro and in vivo investigations await further validation from human clinical trial.

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**KEYWORDS:** Alkaloid; Bone; Joint; Osteoarthritis; Osteoporosis; Palmatine

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