Orthopedic & Muscular System: Current Research

OPEN ACCESS Freely available online

Short Communication

The Role of *Antrodia cinnamomea* in Combatting Bone Loss After Ovariectomy

Andrea Bianchi*

Department of Bone Health and Metabolism, University of Florence, Florence, Italy

ABOUT THE STUDY

Osteoporosis, a condition characterized by reduced bone mass and increased fracture risk, is prevalent among postmenopausal women due to the loss of estrogen. Estrogen plays an important role in maintaining bone density, and its decline after menopause leads to accelerated bone loss. Among the various animal models used to study osteoporosis, the Ovariectomized Rodent (OVX) rat model is frequently used because it mimics the hormonal changes that occur after menopause in women.

Types of bone loss in ovariectomized animals

Bone loss after ovariectomy can be classified into different types based on the mechanisms and bone structure involved, including:

Trabecular bone loss: Trabecular bone, mainly in the vertebrae and ends of long bones, is highly sensitive to hormonal changes. In OVX models, it undergoes thinning, reducing bone strength and increasing fracture risk [1].

Cortical bone loss: Cortical bone, while less affected by estrogen deficiency than trabecular bone, still experiences slow degradation post-ovariectomy, contributing to overall bone fragility.

Increased bone resorption: After ovariectomy, osteoclast activity increases, leading to an imbalance in bone remodeling where resorption outpaces bone formation. This results in a net loss of bone mass and deteriorated bone microarchitecture [2].

Decreased bone formation: The lack of estrogen also impairs osteoblast function, leading to decreased bone formation [3]. Osteoblasts are responsible for synthesizing new bone matrix, and their dysfunction contributes to the decrease in bone density observed after ovariectomy.

Causes of ovariectomized-promoted bone loss

Bone loss after Ovariectomy (OVX) results from decreased estrogen, disrupting bone homeostasis by unbalancing osteoblast and osteoclast activity. Key causes include:

Increased osteoclast activity: Estrogen inhibits the differentiation and activity of osteoclasts, the cells responsible for bone resorption [4]. After ovariectomy, the reduced estrogen levels lead to an over activation of osteoclasts, causing excessive bone breakdown.

Decreased osteoblast function: Estrogen directly promotes osteoblast differentiation and bone matrix production. Without estrogen, osteoblast activity is reduced, leading to lower bone formation and a negative balance between bone resorption and formation [5].

Inflammation and cytokine imbalance: Estrogen deficiency also leads to the release of pro-inflammatory cytokines such as Tumor Necrosis Factor-Alpha (TNF-α) and interleukins, which can stimulate osteoclastogenesis and inhibit osteoblast function, further accelerating bone loss.

Altered calcium metabolism: Estrogen influences calcium absorption in the gut and its deposition in bones. After ovariectomy, decreased calcium retention and altered calcium homeostasis contribute to bone density loss [6].

Antrodia cinnamomea and its mechanism of action

Antrodia cinnamomea, a well-known traditional Chinese medicine, has been studied for its various health benefits, including antioxidant, anti-inflammatory, and immune-modulating effects [7]. Recent studies have shown that *Antrodia cinnamomea* may offer significant protection against bone loss in OVX-induced osteoporotic models.

Anti-Inflammatory effects: *Antrodia cinnamomea*, rich in triterpenoids and polysaccharides, reduces pro-inflammatory cytokines like TNF-α and interleukin-6, helping mitigate inflammation that accelerates osteoclastogenesis and bone resorption post-ovariectomy [8].

Regulation of osteoclast and osteoblast activity: Research shows that *Antrodia cinnamomea* restores the balance between osteoclasts and osteoblasts by suppressing osteoclast activity through RANKL modulation and enhancing osteoblast activity to promote bone formation [9].

Correspondence to: Andrea Bianchi, Department of Orthopaedic Surgery, University of Florence, Florence, Italy, E-mail: Andreabianchi@unina.it

Received: 19-Aug-2024, Manuscript No. OMCR-24-35630; **Editor assigned:** 22-Aug-2024, PreQC No. OMCR-24-35630 (PQ); **Reviewed:** 06-Sep-2024, QC No. OMCR-24-35630; **Revised:** 13-Sep-2024, Manuscript No. OMCR-24-35630 (R); **Published:** 20-Sep-2024, DOI: 10.35248/2161-0533.24.13.399

Citation: Bianchi A (2024). The Role of *Antrodia cinnamomea* in Combatting Bone Loss After Ovariectomy. Orthop Muscular Syst. 13:399.

Antioxidant properties: The oxidative stress induced by estrogen deficiency plays a significant role in bone loss. *Antrodia cinnamomea* contains potent antioxidants, including polyphenols and flavonoids, that can neutralize free radicals, reducing oxidative damage to bone cells and tissues. This antioxidative action helps protect the integrity of both trabecular and cortical bone.

Calcium metabolism regulation: *Antrodia cinnamomea* has been shown to influence calcium metabolism by improving calcium retention in bones and regulating the expression of proteins involved in calcium transport. This contributes to the stabilization of bone mineral density [10].

Prevention of ovariectomized-promoted bone loss with *Antrodia cinnamomea*

The prevention of bone loss in OVX-induced osteoporosis using *Antrodia cinnamomea* can be approached through the following strategies:

Dietary supplementation: *Antrodia cinnamomea* extracts can be administered orally as a dietary supplement to prevent bone loss in individuals at risk of postmenopausal osteoporosis. The bioactive compounds in *Antrodia cinnamomea* can help mitigate the hormonal imbalance and oxidative stress that contribute to bone degradation.

Regular monitoring and lifestyle changes: In addition to pharmacological interventions, individuals can benefit from lifestyle changes such as weight-bearing exercise, a balanced diet rich in calcium and vitamin D, and the reduction of risk factors like smoking and excessive alcohol consumption.

Ovariectomy-induced bone loss serves as an important model for studying postmenopausal osteoporosis, and *Antrodia cinnamomea* has shown potential as a natural remedy to combat this condition. Through its anti-inflammatory, antioxidant, and bone-regulating properties, *Antrodia cinnamomea* can help prevent bone degradation by restoring the balance between osteoclasts and osteoblasts, enhancing bone formation, and reducing oxidative stress. While more clinical trials are needed to confirm its efficacy in humans, this medicinal mushroom offers a potential natural approach natural approach to preventing bone loss and osteoporosis in postmenopausal women.

REFERENCES

1. Rachner TD, Khosla S, Hofbauer LC. Osteoporosis: Now and the future. Lancet. 2011;377(9773):1276-1287.
2. Cheng CF, Huang ET, Kuo JT, Liao KY, Tsai FJ. Report of clinical bone age assessment using deep learning for an Asian population in Taiwan. Biomedicine. 2021;11(3):50-58.
3. Baron R, Hesse E. Update on bone anabolics in osteoporosis treatment: Rationale, current status, and perspectives. J Clin Endocrinol Metab. 2012;97(2):311-25.
4. Wu L, Ling Z, Feng X, Mao C, Xu Z. Herb medicines against osteoporosis: Active compounds and relevant biological mechanisms. Curr Top Med Chem. 2017;17(15):1670-1691.
5. Chen YY, Chou PY, Chien YC, Wu CH, Wu TS, Sheu MJ. Ethanol extracts of fruiting bodies of *Antrodia cinnamomea* exhibit anti-migration action in human adenocarcinoma CL1-0 cells through the MAPK and PI3K/AKT signaling pathways. Phytomedicine. 2012;19(8-9):778.
6. Boyle WJ, Simonet WS, Lacey DL. Osteoclast differentiation and activation. Nature. 2003;423(6937):337-342.
7. Liu YW, Lu KH, Ho CT, Sheen LY. Protective effects of *Antrodia cinnamomea* against liver injury. J Tradit Complement Med. 2012;2(4):294.
8. Lu MC, El-Shazly M, Wu TY, Du YC, Chang TT, Chen CF, et al. Recent research and development of *Antrodia cinnamomea*. Pharmacol Ther. 2013;139(2):124-156.
9. Liu YM, Lin IJ, Huang CW, Chien RC, Mau CZ, Mau JL. Effect of ethanolic extracts from *Taiwanofungus camphoratus* and *T. salmoneus* (Agaricomycetes) mycelia on osteoporosis recovery. Int J Med Mushrooms. 2020;22(3):277-287.
10. Almeida M, Saragiotto B, Richards B, Maher CG. Primary care management of non-specific low back pain: Key messages from recent clinical guidelines. Med J Aust. 2018; 208: 272–275.