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Iron accumulation and its impact on osteoporotic fractures in postmenopausal women

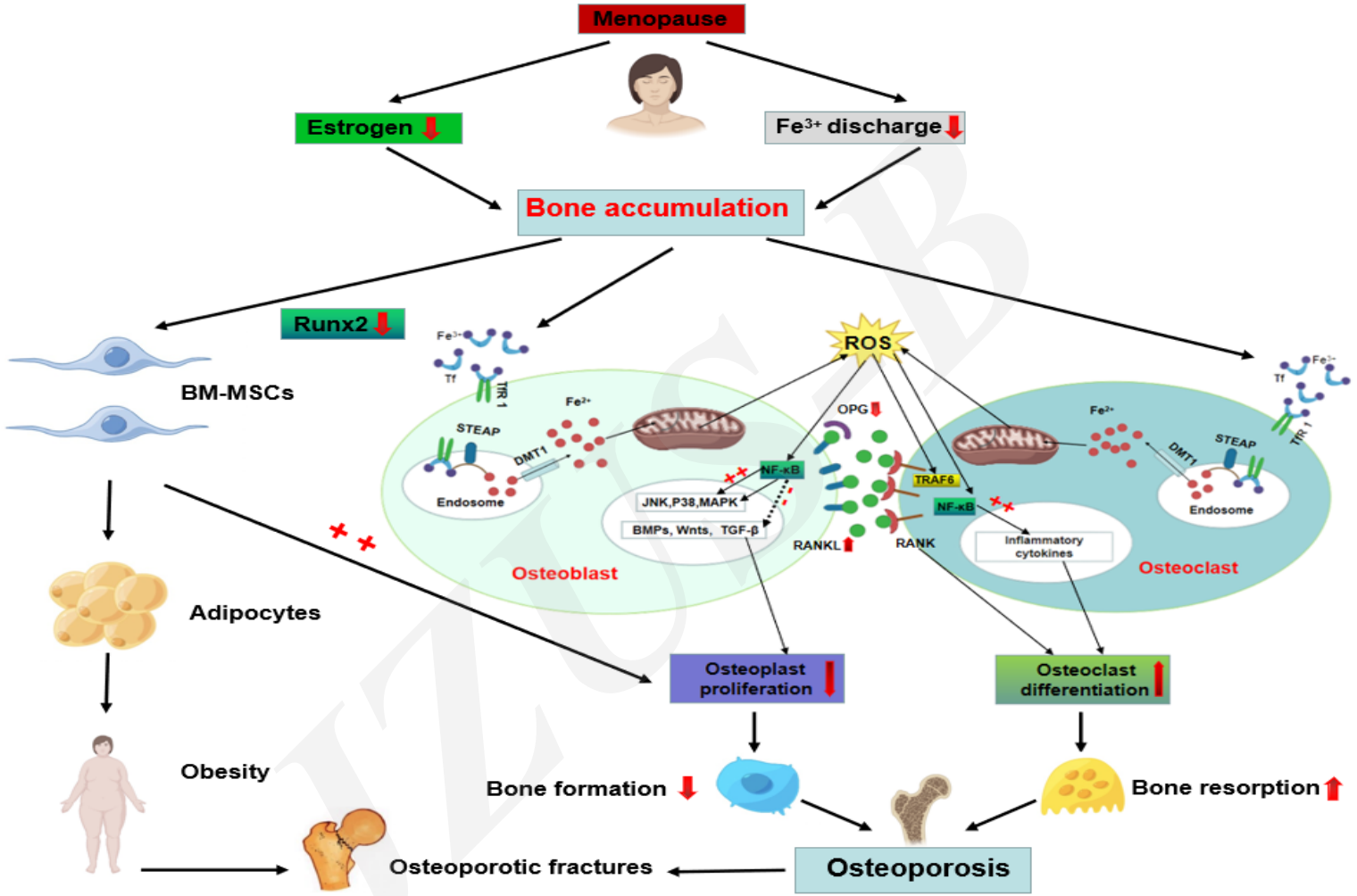
Key words: Iron accumulation, Postmenopausal osteoporosis, Bone metabolism, Osteoporotic fracture

Research Summary

In this review, we firstly describe **the impact of iron accumulation on bone metabolism and introduce its mechanism**. Next, t**he relationship between iron accumulation and postmenopausal fragility fracture** is discussed. Finally, we introduce **clinical treatment strategies for postmenopausal osteoporosis**.

We conclude that, to find effective therapeutic targets for postmenopausal osteoporosis, **it is crucial to study the phenomenon of iron accumulation in postmenopausal women with osteoporosis and explore the in-depth mechanism of abnormal bone metabolism caused by iron accumulation**.

Mechanism of iron accumulation and its impact on postmenopausal osteoporotic fractures



BM-MSCs: bone marrow mesenchymal stem cells; Runx2: runt-related transcription factor 2; STEAP: six-transmembrane epithelial antigen of the prostate; Tf: transferrin; TfR1: transferrin receptor 1; DMT1: divalent metal transporter 1; JNK: Jun-N-terminal kinase; MAPKs: mitogen-activated protein kinase; BMPs: Bone morphogenetic protein; TGF-β:transforming growth factor-β; NF- κB: nuclear factor-κB; RANKL: receptor activator of nuclear factor κB ligand; OPG:osteoprotegerind; TRAF6: tumor necrosis factor receptor-associated factor 6; ROS: reactive oxygen species.

Clinical treatment strategies of postmenopausal osteoporosis

Treatment methods	Therapies	Mechanism	Reference
Western medicine treatments	Recombinant Human Parathyroid Hormon 1-34 (rPTH1-34)(Teriparatide)	Binds to the PTH receptor of osteoblasts and stimulates osteoblast proliferation and bone formation	Leder (2017)
	Bisphosphonates(Zoledronic acid)	Inhibits the farnesyl diphosphate synthase pathway and promotes osteoclast apoptosis	Mei et al. (2020)
	Hormone Replacement Therapy (HRT)(Estradiol)	Promotes the Wnt/β-catenin signaling pathway to stimulate osteoblast proliferation and reduce bone resorption by inhibiting the NF-κB signaling pathway	
	Selective estrogen receptor modulator (SERM)(Raloxifene)	Binds tightly to estrogen receptor (ER) as an estrogen agonist	Ma et al. (2021)
	Denosumab	Blocks the receptor activator of nuclear factor-kappa B ligand (RANKL) binding to RANK, thus inhibiting the development and activity of osteoclasts	Kobayakawa et al. (2021)
	Odanacatib	Inhibits cathepsin K (CatK) and decreases bone resorption	Papapoulos et al. (2021)
	Hepcidin	Regulates iron homeostasis and plays a role in binding to membrane iron transporters on the cell membrane to reduce iron levels	Camaschella et al. (2020); Ginzburg (2019); Huang (2015); Zhang et al. (2018)
	Icariin	Regulates many signaling pathways, such as anti-osteoporosis, osteogenesis, anti-osteoclast, cartilage formation, angiogenesis, anti-inflammation	
	Astragalus polysaccharides	Exerts the same estrogen-like effect as icariin	Huo and Sun (2016); Ou et al. (2019); Yang et al. (2016)
Chinese traditional medicine treatments	Acupuncture	Upregulates the levels of serum growth hormone (GH) and insulin-like growth factor-1(IGF-1)	Chen et al. (2022)

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