

**Bioactive materials-mediated regulation of bone marrow microenvironment:
mechanistic insights and therapeutic potentials**

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The bone marrow microenvironment(BME) maintains bone homeostasis through multi-cellular cooperation and signal crosstalk, its dysregulation drives pathological bone loss. In recent years, Materiobiology, a scientific discipline studying how biomaterial properties affect biological functions, has opened new avenues for the precise regulation of this complex microenvironment. Biomaterials enable sophisticated regulation of the BME through biomimetic design and functionalization strategies. They not only activate osteoblast signaling pathways to promote bone formation, but also inhibit osteoclast differentiation and bone resorption functions. Additionally,