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Compositions and Methods for Re-activation of Dysfunctional Skeletal Stem Cells

Researchers at Stanford University have developed a novel therapeutic avenue for the treatment of osteoporosis and other musculoskeletal diseases.

Musculoskeletal disease incidence rates have increased in recent years in response to an aging population. Available therapies for osteoporosis-related bone loss are effective but come with significant side effects. As such, there is a need for novel therapeutic approaches with minimal side effects profiles. In a separate vein, stem cell technologies represent a new frontier in modern medicine. Indeed, human skeletal stem cell (hSSC) dysfunction has been implicated in musculoskeletal diseases, specifically in the context of aging. There remains a major unmet medical need for therapies targeting the re-activation of dysfunctional hSSCs in the context of musculoskeletal diseases.

Stage of Research
The inventors have pioneered a novel method for re-activating dysfunctional hSSCs in the context of disease or age related dysfuntion. These researchers found that aged SSCs have lower bone-forming potential due to their a lack of diversity via their skewed lineage trajectory towards fibrostromal tissues.

Using a Boolean mathematics approach, they identified two factors that can re-instate youthful SSC activity in dysfunctional diseased or aged SSCs. Specifically, this method involves contacting stem cells with a combination of an inhibitor of bone morphogenic protein (BMP)/transforming growth factor beta (TGF-B) and an activator of Hedgehog (Hh) signalling. Indeed, co-administration of such factors was shown to increase osteogenesis in mice.

Stage of Development
Research - in vivo

Applications

- Regeneration of bone due to aging and or disease

Advantages

- Has the potential to offer a more limited side effect profile than currently available therapies
- Can be delivered using biodegradable hydrogels

Patents

- Published Application: WO2026030181

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