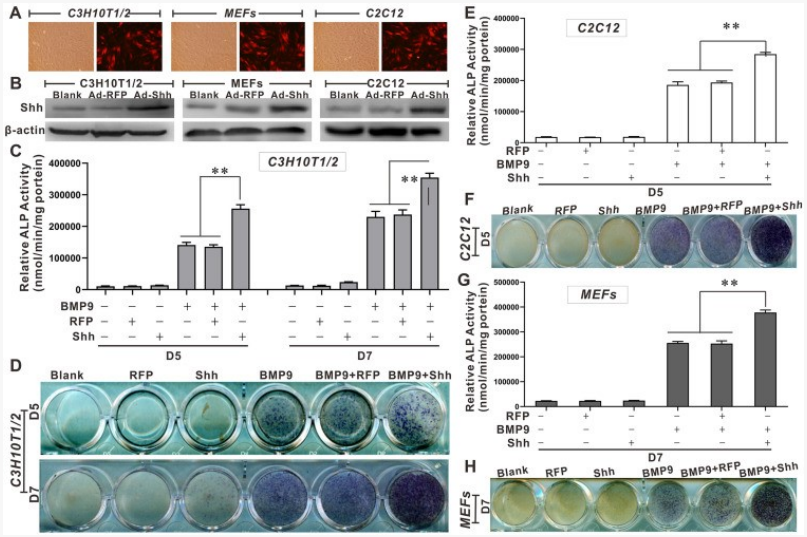
Innovative Study Highlights BMP9 and SHH as Key Drivers of Bone Repair

New Research Highlights Synergistic Role of BMP9 and Shh in Bone Regeneration



(A) The infection of Ad-Shh in MSCs (fluorescence microscope, × 100). (B) Validation of the expression of Shh by Ad-Shh in MSCs (Western blot). (C, D) The effects of Shh on BMP9-induced ALP activity in C3H10T1/2 cells (C: chemiluminescence; D: cytochemic

CHINA, March 13, 2025 /EINPresswire.com/ -- Bone morphogenetic proteins (BMPs) directly affect the osteogenic differentiation of stem cells and are integral to bone tissue development. BMP9, a less-studied member of the BMP family, exhibits strong osteogenic effects on mesenchymal stem cells (MSCs) when combined with growth factors. Sonic Hedgehog (Shh), on the other hand, plays an indispensable role in the regulation of skeletal development.

This research, published in the Genes & Diseases journal by a team from the Chongqing Medical University and People's Hospital of Deyang City, assesses the potential influence of Shh on BMP9-induced osteogenic differentiation of MSCs.

In this study, the researchers found that Shh significantly promoted BMP9-induced osteogenic differentiation of MSCs, although Shh alone showed no substantial osteo-inductive effects. In vivo experiments confirmed that Shh significantly promoted BMP9-induced ectopic bone formation in nude mice. Additionally, Shh has been shown to activate osteogenic markers such as Runx2 and ALP in MSCs, further reinforcing its role in bone formation.

The researchers suggest that Shh has the potential to augment BMP9-induced osteogenic differentiation of MSCs by directly affecting the expression/activation of essential osteogenesis-related transcription factors. Furthermore, the findings revealed that Shh increased the transcriptional activity of Smad1/5/8 induced by BMP9, indicating that Shh may further augment the BMP9-induced activation of the Smad1/5/8 signaling pathway.

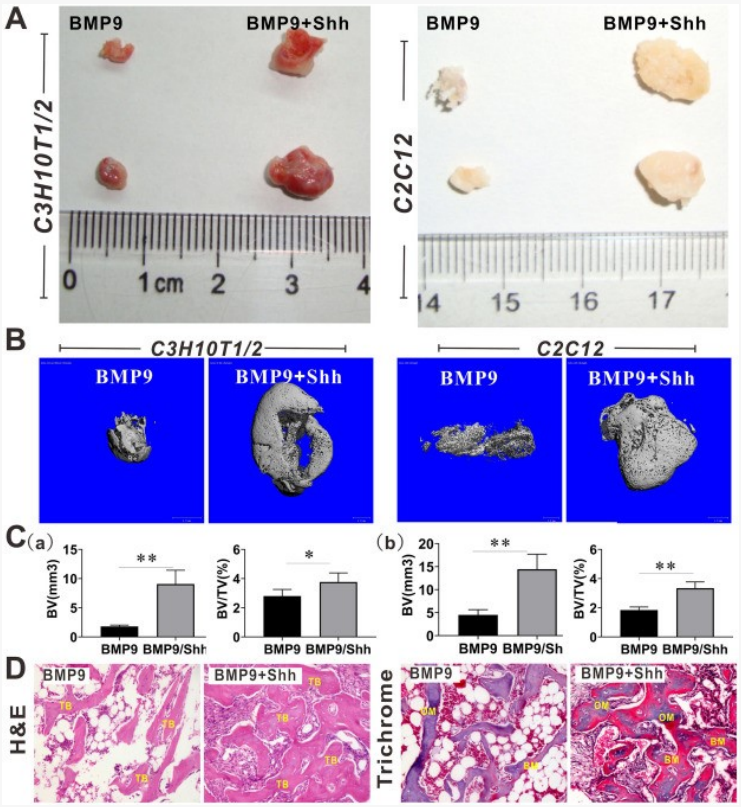
Interestingly, the study confirmed that GANT-61, an inhibitor of Gli1 and Gli2, reversed the enhancing effect of Shh on BMP9-induced osteogenic differentiation of MSCs, thus identifying Gli1 and Gli2 as key mediators in this process. These findings suggest that the combination of BMP9 and Shh holds great promise in addressing complex bone regeneration challenges.

Since BMP9 is already a recognized potent osteo-inductive factor, its enhanced activity through Shh co-treatment presents a promising therapeutic approach. In conclusion, this research has significant implications for MSC-based regenerative medicine, particularly in treating fracture nonunion, delayed healing, and critical bone defects.

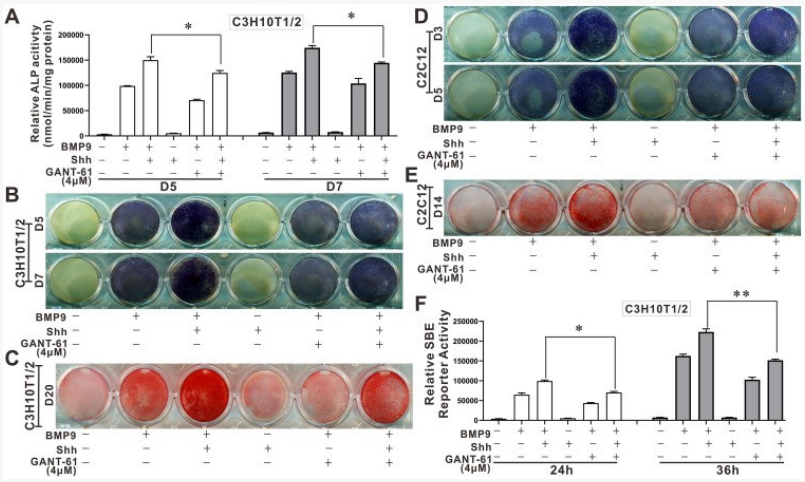
Reference

Title of the original paper - Sonic Hedgehog potentiates BMP9-induced osteogenic differentiation of mesenchymal stem cells

Journal - Genes & Diseases
Genes & Diseases is a journal for molecular and translational medicine. The journal primarily focuses on publishing investigations on the molecular bases and experimental therapeutics of human diseases. Publication formats include full length research article, review article, short communication, correspondence, perspectives, commentary, views on news, and research watch.



Representative bone masses from the ectopic bone formation induced by BMP9 alone or BMP9/Shh of C3H10T1/2 cells and C2C12 cells. (B) 3D reconstruction of bone masses by micro-CT analysis. (C) BV and BV/TV results of bone masses. (a) The results of bone ma



(A) The effects of GANT-61 on the enhancing effects of Shh on BMP9-induced ALP activity in C3H10T1/2 cells (chemiluminescence). (B) The effects of GANT-61 on the enhancing effects of Shh on BMP9-induced ALP activity in C3H10T1/2 cells (cytochemical staini

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