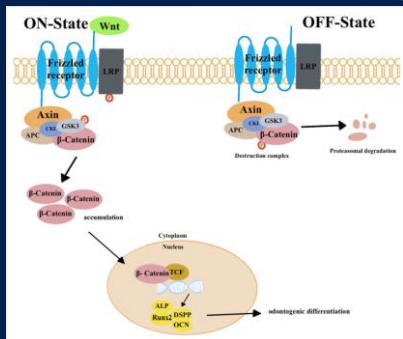


## “The Healing Nexus: The Medical Marvels of Dental Pulp Stem Cells”

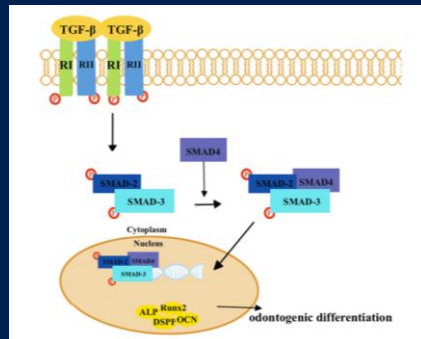
Dental Pulp Stem Cells (DPSCs) are a type of mesenchymal stem cells that express markers due to their ability to self-renew, high proliferation rate, immunomodulatory properties and versatile potential to differentiate into different cell types

### Chemical Signalling Pathways



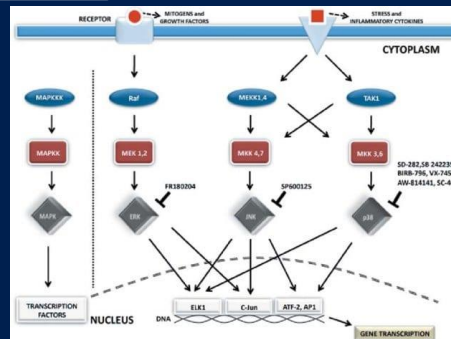
#### Wnt/β-catenin Pathway

Increase in the expression of core pluripotency factors such as SOX2, SSEA1, LIN28, NANOG, and REX1



#### BMP/Smad Pathway

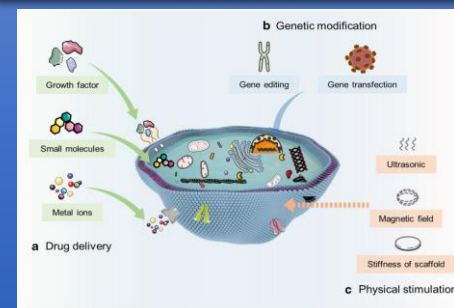
BMP2 & 7 increase the expression of DSPP, DMP1, ALP, OCN and Smad 5, pSmad5 proteins



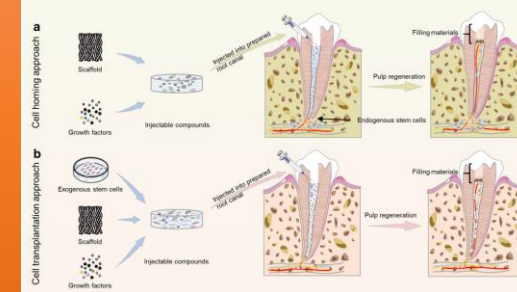
#### MAPK Pathway

Leptin activating the pathway led to an increase in ALP expression, mineralisation & phosphorylation levels to ERK, P38MAPK & JNK

### Methods in Regulating Signaling Transduction



### Modulation of Signalling in Pulp Regeneration Strategies



### Challenges of signalling modulation

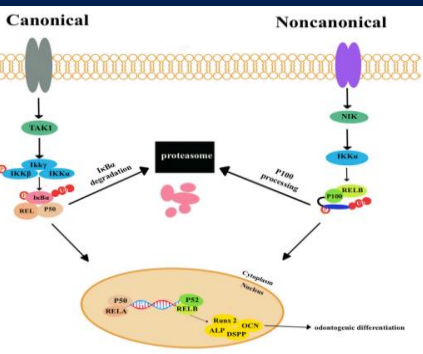
- Controlled release of growth factors
- Single or combined deliveries of growth factors
- Safety of Modulating Signaling Transduction
- The Barriers of Complex Clinical Conditions
- Control the abnormal calcification in Regenerated Pulp Tissue

### Conclusion

- Reactivating specific signaling pathways is essential for the regenerative potential of dental stem cells.
- Most studies have focused on basic mechanisms in vitro, given the complexity of these pathways.
- Understanding the signaling processes in DPSCs will help identify effective materials for regenerating the pulp-dentin complex.

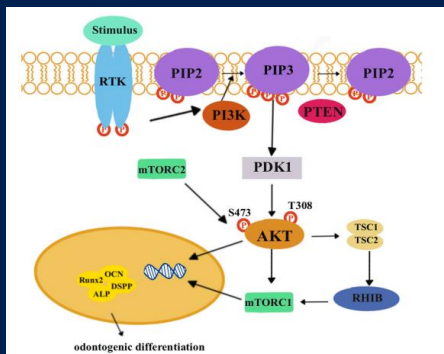
### References:

- Liang C, Liao L, Tian W. Stem Cell-based Dental Pulp Regeneration: Insights From Signaling Pathways. Stem Cell Rev Rep. 2021
- Zhou L, Zhao S, Xing X. Effects of different signaling pathways on odontogenic differentiation of dental pulp stem cells: a review. Front Physiol. 2023



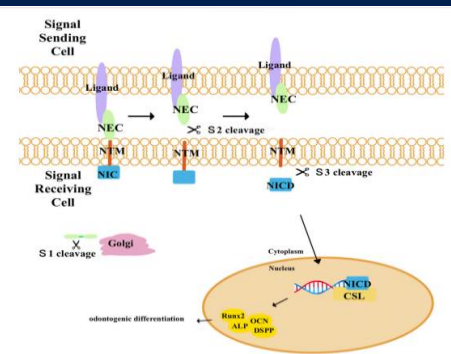
#### Nuclear factor-kappa B Pathways

Canonical pathway: Activate TAK1 – IKKβ  
Non-canonical pathway: Activate TNFR - NIK



#### Phosphoinositide-3-kinase/protein kinase B Pathways

Inhibition of Proteins & upregulate the expression of DSPP, DMP1 & mineralization



#### Notch signalling Pathways

Jagged-1 inhibited the odontogenic differentiation  
Immobilized Jagged1, Delta1 enhanced the proliferation & odontogenic differentiation of DPSC