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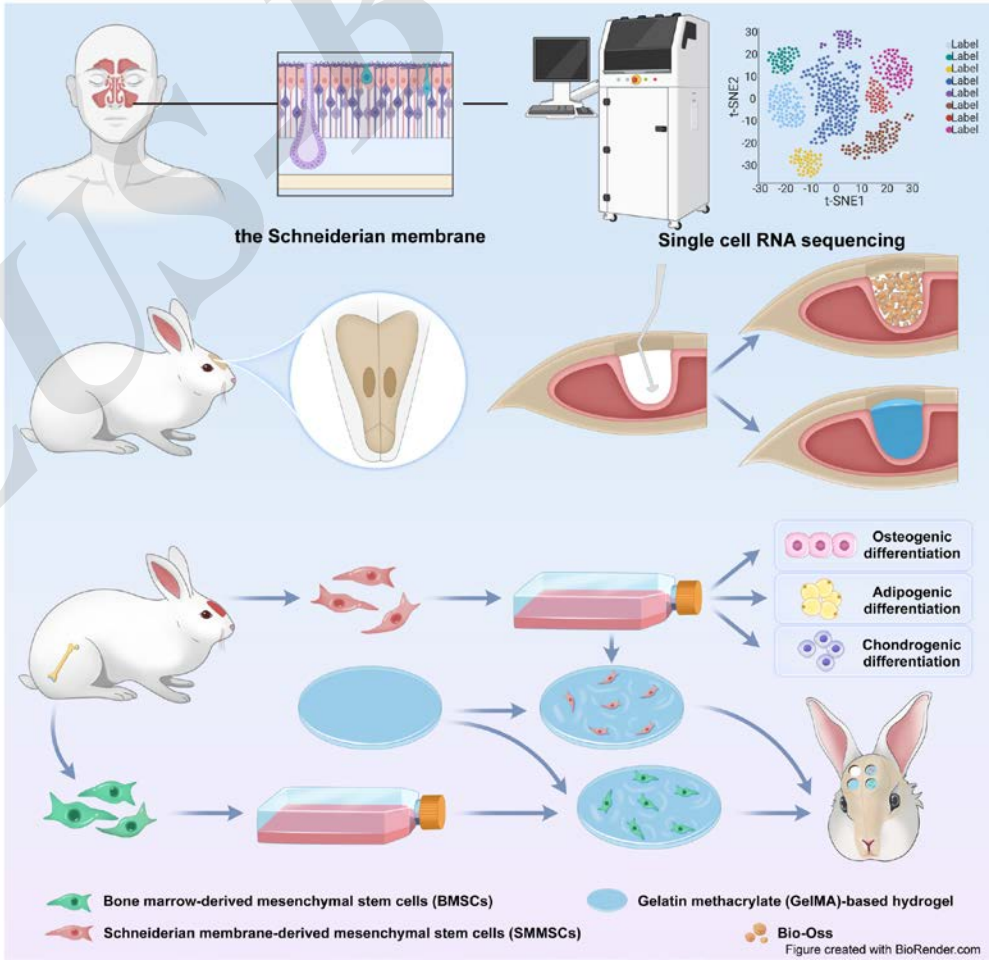
Regenerative potential of Schneiderian membrane-derived mesenchymal stem cells in sinus floor elevation model and calvarial defect model

Key words: Schneiderian membrane-derived mesenchymal stem cells (SMMSCs); Single-cell RNA sequencing; Osteogenesis; Maxillary sinus floor elevation (MSFE); Calvarial defect

Research Summary

This article mainly focused on the Schneiderian membrane osteogenic contribution and the bone regeneration of SMMSCs.

- **Evaluation of Schneiderian membrane osteogenic contribution**
- **Identification of PRRX1+ progenitor clusters**
- **Demonstration of superior early-phase bone regeneration by SMMSCs over BMSCs**



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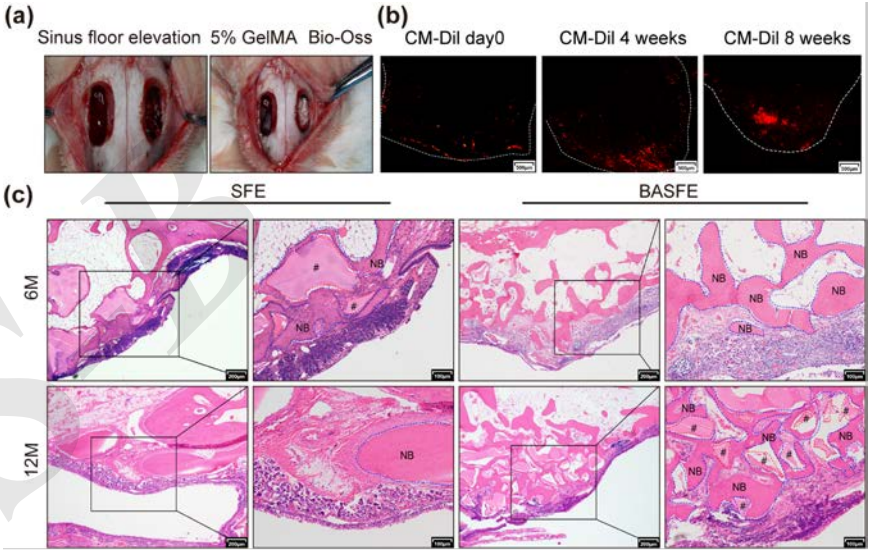
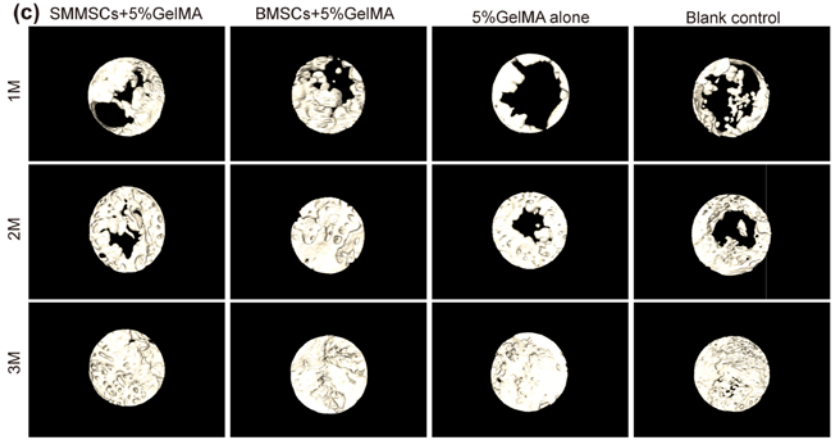
Innovation points

- **First in vivo validation of SMMSCs' osteogenic potential, resolving longstanding controversy regarding the intrinsic bone-forming capacity of Schneiderian membrane.**

- **Single-cell resolution mapping of Schneiderian membrane cellular heterogeneity, uncovering PRRX1+ lineage as a novel progenitor subset governing sinus osteogenesis.**

- **Direct functional comparison between SMMSCs and BMSCs in cranial repair, highlighting SMMSCs' accelerated early-stage regenerative advantage.**





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Innovation points

Regenerative potential of Schneiderian membrane-derived mesenchymal stem cells in sinus floor elevation model and calvarial defect model

Fig 1| Schneiderian membrane participated in endo-sinus bone formation in the rabbit sinus floor elevation model.

Fig 2| Features of *PRRX1*$^{+}$ cells in the Schneiderian membrane.

Fig 3| Characterization of rabbit SMMSCs.

Fig 4| Micro-CT suggested earlier bone formation by SMMSCs relative to BMSCs in calvarial defects.

Fig 5| Histomorphological detection indicated accelerated osteogenesis of SMMSCs versus BMSCs during early-stage calvarial healing.

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