

Extracellular Vesicles Meet Biomaterials: Cell-Free Therapy for Periodontitis

Dr Pingping Han

(Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3), School of Dentistry, The University of Queensland, Australia)



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Abstract: Periodontitis is a chronic inflammatory disease driven by a complex polymicrobial community and dysregulated host-microbiome interactions, resulting in progressive destruction of periodontal tissues. This project investigates salivary extracellular vesicles (EVs), including host- and microbial-derived microvesicles (MVs), as non-invasive biomarkers for periodontitis diagnosis and treatment monitoring. In parallel, we investigated the therapeutic potential of dental cell-derived EVs for periodontal and peri-implant tissue regeneration. EVs derived from periodontal ligament cells, osteoblasts, and gingival cells were incorporated into 3D-bioprinted GelMA constructs and applied to nano-engineered titanium implant surfaces. EV-functionalised constructs and implants enhanced cellular proliferation, osteogenic differentiation, bone formation, soft-tissue attachment, Sharpey's fibre regeneration, and functional periodontal tissue regeneration in vitro and in vivo. Collectively, this research establishes the potential of dental-derived EVs as both non-invasive diagnostic biomarkers and therapeutic agents, providing a foundation for precision diagnosis, treatment monitoring, periodontal regeneration, and improved implant outcomes.

Biography: Dr Pingping Han is an NHMRC Investigator Fellow and currently leads the Epigenetic Nanodiagnostics and Therapeutics Group within the Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3) at the UQ School of Dentistry. She received her PhD in Biomedical Engineering from the Queensland University of Technology (QUT) in 2014. Dr Han's current research focuses on two main areas: (a) salivary diagnostics for periodontal disease and (b) "cell-free" regenerative therapies for periodontal tissue engineering.

問合せ先: 中野 環

共催: 触媒科学計測共同研究拠点, 学際統合物質科学研究機構