



MgO/TCPP-Loaded PLGA Photodynamic Microspheres Enhance Fibroblast Activity to Treat Periodontitis

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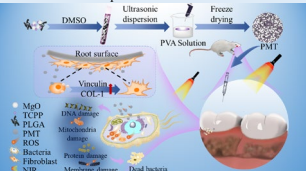
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Introduction

In the present work, poly (lactic-co-glycolic acid) (PLGA) microspheres were employed to load photosensitizer Tetrakis (4-carboxy-phenyl) porphyrin (TCPP) and magnesium oxide (MgO) microspheres, named as PMT, to exert antibacterial photodynamic therapy (aPDT) effect and promote tissue-regeneration for the treatment of periodontitis.



Scheme 1. Illustrations for Preparation and periodontitis treatment of PMT microspheres.

Methods

The single emulsion solution volatilization method was used to compose the PMT, the physicochemical properties were evaluated by surface morphology, chemical analysis and drug release, the antibacterial and soft tissue reconstruction effects were evaluated *in vitro*, and the therapeutic effect of periodontitis was evaluated by rat periodontitis model.

Results

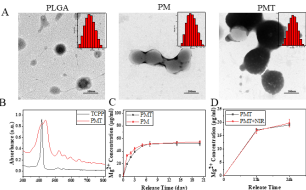


Fig. 1 TEM (A) for PLGA, PM and PMT. UV-Vis (B) of TCPP and PMT. ICP-ES (C) of PM and PMT. ICP-ES (D) of PMT with and without NIR.

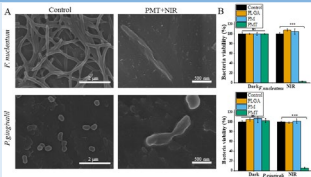


Fig. 2 SEM images (A) and MTS (B) assay. Fig.2 After irradiating with near infrared light (NIR), the membrane structure of bacteria with PMT was damaged, leading to the death of bacteria.

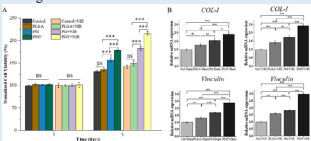


Fig. 3 CCK-8(A) And qRT-PCR analysis. Fig.3 PMT showed good biocompatibility and facilitated fibroblast adhesion by up regulating gene expression of COL-1 and vinculin.

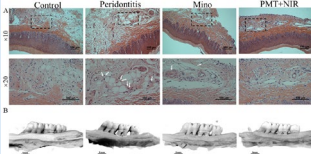


Fig. 4 In vivo animal experiment. Fig.4 The excellent therapeutic effect of PMT with NIR in the periodontitis rats.

Conclusion

In summary, the *in vivo* and *in vitro* results revealed the satisfied antibacterial and tissue-regeneration effect of PMT. Our work provide a promising strategy to fight periodontal diseases.