

Metronidazole and Ketoprofen Loaded Mesoporous Magnesium Carbonate for Rapid Treatment of Acute Periodontitis *in vitro*

Zhaohan Yu, Kunneng Liang, Jiyao Li
State Key Laboratory of Oral Diseases, West China Hospital of Stomatology, Sichuan University



Objective. When treating acute periodontitis with drugs, it is necessary to achieve rapid eradication of periodontal pathogens and inflammation to relieve the pain of patients. When encapsulating drug molecules into mesoporous magnesium carbonate (MMC) leads to amorphous drug confined within the nanoscale pores and rapid release of drug occurs. The objective of this study was to verify MMC as a rapid drug release carrier for periodontal treatment *in vitro* for the first time.

Methods. Metronidazole (MET) and ketoprofen (KET) were loaded in MMC by solvent evaporation method. The MET-KET@MMC were characterized by scanning electron microscopy (SEM) and X-ray diffraction (XRD). The rapid drug release properties were also investigated through the drug release curve. The antiseptic properties were evaluated by Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC), colony-forming unit (CFU), live/dead staining and time-kill assay. The anti-inflammatory capabilities on human gingival fibroblasts were probed by quantitative polymerase chain reaction (QPCR) and enzyme-linked immune sorbent assay (ELISA).

Results. Crystallization of MET and KET was completely suppressed in MMC. MMC induced higher apparent solubility and rapid drug release, produced up to 9.93- and 3.9-times higher release percentages of the drugs, compared to the crystalline drugs, respectively. 90% of the loaded drugs content could be released in the first 1 minutes, and the antibiosis and anti-inflammatory properties of the released drugs in the first 1 minute were also verified *in vitro*. This novel strategy utilizing mesoporous structure shows great promise in achieving treatment of acute periodontitis.