

Accepted Manuscript

Full length article

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PII: S1742-7061(18)30378-7

DOI: <https://doi.org/10.1016/j.actbio.2018.06.032>

Reference: ACTBIO 5542

To appear in: *Acta Biomaterialia*

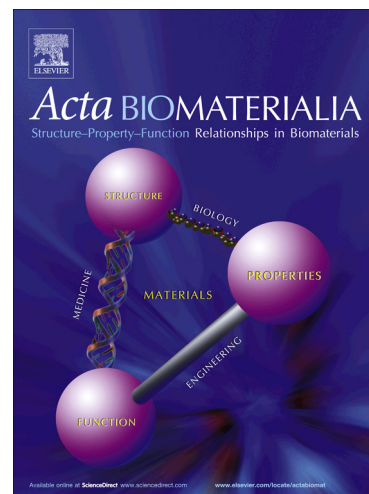
Received Date: 26 March 2018

Revised Date: 23 May 2018

Accepted Date: 21 June 2018

Please cite this article as: Stewart, C.A., Hong, J.H., Hatton, B.D., Finer, Y., Responsive Antimicrobial Dental Adhesive Based on Drug-templated Mesoporous Nanoparticles, *Acta Biomaterialia* (2018), doi: <https://doi.org/10.1016/j.actbio.2018.06.032>

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Responsive Antimicrobial Dental Adhesive Based on Drug-templated Mesoporous Nanoparticles

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Keywords: Dental Materials; Dental Caries; Antimicrobial Materials; Biodegradation; Salivary Esterase; Bacterial Esterase; Controlled Drug Release; Esterase-triggered Drug Release;

Abstract:

Most dental resin composite restorations are replacements for failing restorations. Degradation of the restoration-tooth margins by cariogenic bacteria results in recurrent caries, a leading cause for restoration failure. Incorporating antimicrobial agents in dental adhesives could reduce interfacial bacterial count and reduce recurrent caries rates, inhibit interfacial degradation, and prolong restoration service life, while minimizing systemic exposure. Direct addition of antimicrobial compounds into restorative materials have limited release periods and could affect the integrity of the material. Attempts to incorporate antimicrobial within mesoporous silica nanoparticles (MSNs) showed theoretical promise due to their physical robustness and large available internal volume, yet yielded short-term burst release and limited therapeutic payload.

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