

Accepted Manuscript

Full length article

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PII: S1742-7061(17)30761-4
DOI: <https://doi.org/10.1016/j.actbio.2017.12.005>
Reference: ACTBIO 5217

To appear in: *Acta Biomaterialia*

Received Date: 18 August 2017
Revised Date: 22 November 2017
Accepted Date: 4 December 2017

Please cite this article as: Thi, T.T.H., Lee, Y., Le Thi, P., Park, K.D., Nitric oxide-releasing injectable hydrogels with high antibacterial activity through in situ formation of peroxyxynitrite, *Acta Biomaterialia* (2017), doi: <https://doi.org/10.1016/j.actbio.2017.12.005>

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Nitric oxide-releasing injectable hydrogels with high antibacterial activity through in situ formation of peroxynitrite

Thai Thanh Hoang Thi^{a,†}, Yunki Lee^{b,†}, Phuong Le Thi^b, Ki Dong Park^{b,*}

^a Faculty of Applied Sciences, Ton Duc Thang University, Ho Chi Minh City, Vietnam.

Email: hoangthithaithanh@tdt.edu.vn

^b Department of Molecular Science and Technology, Ajou University, Suwon 16499, Republic of Korea

* Corresponding author: kdp@ajou.ac.kr

[†] These authors contributed equally in this study.

Abstract

Nitric oxide (NO) is an endogenous molecule with many critical biological functions that depend on its concentration. At high levels, NO provides broad-spectrum antibacterial effects through both its pathogen inhibition and killing abilities. However, its short half-life has been a great challenge to its clinical application in pharmaceutical forms. In this study, we incorporated the NO donor S-nitrosothiolated gelatin (GelSNO) into injectable gelatin-based hydrogels (GHs) to controllably release NO. Under catalysis by horseradish peroxidase, H₂O₂ oxidizes phenol moieties functionalized on gelatin to quickly form phenol-phenol crosslinks that encapsulate GelSNO. Through thermal, visible light, and oxidizing agent-driven mechanisms, NO is released from the GH/GelSNO hydrogels. By varying the GelSNO concentration, the release of

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