

Accepted Manuscript

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PII: S0960-894X(16)31351-8
DOI: <http://dx.doi.org/10.1016/j.bmcl.2016.12.072>
Reference: BMCL 24561

To appear in: *Bioorganic & Medicinal Chemistry Letters*

Received Date: 12 October 2016
Revised Date: 6 December 2016
Accepted Date: 28 December 2016

Please cite this article as: Jing, Z-W., Ma, Z-W., Li, C., Jia, Y-Y., Luo, M., Ma, X-X., Zhou, S-Y., Zhang, B-L., Chitosan cross-linked with poly(ethylene glycol)dialdehyde via reductive amination as effective controlled release carriers for oral protein drug delivery, *Bioorganic & Medicinal Chemistry Letters* (2016), doi: <http://dx.doi.org/10.1016/j.bmcl.2016.12.072>

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Chitosan cross-linked with poly(ethylene glycol)dialdehyde via reductive amination as effective controlled release carriers for oral protein drug delivery

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ABSTRACT

The covalently cross-linked chitosan-poly(ethylene glycol)₁₅₄₀ derivatives have been developed as a controlled release system with potential for the delivery of protein drug. The swelling characteristics of the hydrogels based on these derivatives as the function of different PEG content and the release profiles of a model protein (bovine serum albumin, BSA) from the hydrogels were evaluated in simulated gastric fluid with or without enzyme in order to simulate the gastrointestinal tract conditions. The derivatives cross-linked with difunctional PEG₁₅₄₀-dialdehyde via reductive amination can swell in alkaline pH and remain insoluble in acidic medium. The cumulative release amount of BSA was relatively low in the initial 2 h and increased significantly at pH 7.4 with intestinal lysozyme for additional 12 h. The results proved that the release-and-hold behavior of the cross-linked CS-PEG₁₅₄₀H-CS hydrogel provided a swell and intestinal enzyme controlled release carrier system, which is suitable for oral protein drug delivery.

Keywords: chitosan; poly(ethylene glycol); crosslinking; hydrogel; controlled delivery system

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