Decision Letter (mt-2025-013053.R2)

From: r.wang-office@abm.acs.org

To: mdlang@ecust.edu.cn

CC:

Subject: Decision on Manuscript ID mt-2025-013053.R2

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Title: "Liquid-Activated Self-Expanding Chitosan Shape Memory Cryogel for Rapid Hemostasis in Penetrating Wounds with Coagulation Disorders"
Author(s): zhang, Yuhui; Lang, Yuanru; Zhang, Jiakang; Fu, Tao; Zhao, Lin; Liu, Qian; Chen, Long; Zhang, Peng; Zhang, Yuntong; Fang, Shuo; Lang, Meidong
Manuscript Status: Accept

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Sincerely,

Prof. Ruibing Wang
Associate Editor
ACS Applied Bio Materials
Email: r.wang-office@abm.acs.org

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Date Sent: 17-Sep-2025

Liquid-Activated Self-Expanding Chitosan Shape Memory Cryogel for Rapid Hemostasis in Penetrating Wounds with Coagulation Disorders

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Abstract

Due to the complexity of anatomical structure, non-compressible hemorrhage in coagulation disorders often misses "golden window" of emergency treatment and becomes the key problem in trauma management. In this work, CS/ODX-G shape-memory cryogel with three-dimensional interoperable porous structure based on chitosan/oxidized dextran system was constructed by strategy of synergistic crosslinking of dynamic Schiff base bonding and covalent bonding. The cryogel can be implanted minimally invasively with pre-compression technology. It swells rapidly in-situ with blood triggering and utilizes elastic recoil properties to precisely conform to irregular wounds and create dynamic mechanical compression effect. Additionally, synergistic effects of the capillary effect of multistage channels and surface amine protonation promote fibrin deposition, ultimately forming a multi-mode coordinated hemostatic mechanism of "morphology adaptation-mechanical compression-coagulation regulation". Meanwhile, cryogel exhibits broad-spectrum antimicrobial resistance and outstanding biocompatibility. In rat tail amputation, rat liver perforation and normal/coagulopathic rabbit liver hemorrhage models, CS/ODX-G cryogel demonstrated excellent hemostatic efficacy and significant clinical advantages. Through multi-level structural design and coagulation pathway regulation, this work innovatively exploits cryogel that can adapt to morphology of deep cavities and expedite coagulation cascade, providing a hemostatic solution with rapid response and intelligent regulation for battlefield injuries (especially for patients with deep wounds and coagulopathies).

Keywords

Chitosan; Cryogel; Liquid-activated self-expanding property; Shape-memory materials; Penetrating hemorrhage; Coagulation disorders;

1. Introduction

Non-compressible hemorrhage is responsible for significant proportion of traumatic deaths and has become the critical global public health challenge.[1] According to statistics reported by the World Health Organization (WHO), this particular type of trauma directly causes more than 1.9 million deaths per year, and its pre-hospital mortality rate can be up to 80%, while 35% of patients who survive hospitalization still die due to irreversible blood loss, which is the technical bottleneck of the trauma care system.[2] In the "golden window" of prehospital emergency care (typically less than 10 minutes), the utilization of effective hemostatic materials is not only pivotal to successful rescue but also constitutes the fundamental element in mitigating secondary