Title: Evaluation of hemostatic behavior of Gelatin- silica nanohybrid by changing the pH of injury in severe bleeding

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Abstract:

After trauma, fast hemostasis is an essential strategy in extensive bleeding, in this decade, much effort has been made to develop the hemostatic agents, but the existent options have ample restrictions, including failure to maintain the structure of the styptic in the face severe bleeding and rapid changes in pH. Since the changes in pH of injury site is an important factor in the failure of styptic and their structural damage, in this study gelatin-silica nanohybrid behavior in severe bleeding was evaluated under different pH. Experiments including blood absorption, zeta potential measurements, and poly disparity index by GPC tests were studied. By changing the pH of environment, structural integrity and thereupon nanohybrid hemostatic behavior changed dramatically. So that nanohybrid showed the most blood absorption (440%) and acceded to a coherent structure with tendentious to al pH a helix and beta-sheets (the secondary structure of protein), that also provide ability to maintain integrity of structure in severe bleeding. these results obtained, in alkaline or acidic environment nanohybrid hemostatic behavior was limited, so that in the acidic pH the blood absorption was reduced to 110% and 1.6 times the normal clotting time delayed. Based on the results of this study, it was found that changes in nanohybrid behavior in acidic pH were much more than in alkaline pH and nanohybrid can also maintain the structural integrity with rapid hemostasis. According to the desire of injury site to change the pH to alkaline side, the resulting nanohybrid has an ideal ability to control excessive bleeding and can be proposed for further studies in vivo as a novel styptic.

Keywords: nanohybrid, pH, hemostasis, severe bleeding.

Image

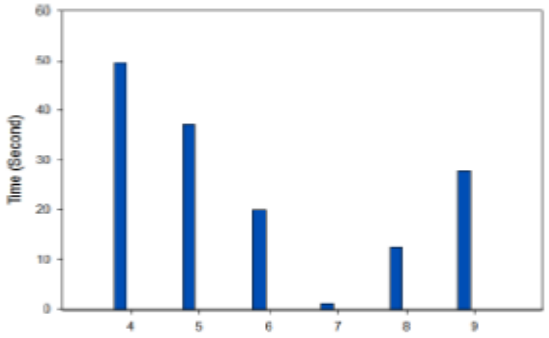


Figure 1. APTT chart, plasma and nanohybrid interaction in different pH

pH	4	5	6	7	8	9
M_n(g/mol)	8.88×10^7	6.32×10^5	3.36×10^4	9.51×10^3	1.68×10^4	7.34×10^4
M_w(g/mol)	9.86×10^7	7.48×10^5	4.48×10^4	1.46×10^4	2.27×10^4	8.15×10^4
PDI	1.11	1.18	1.33	1.54	1.35	1.11

Figure 2. M_n, M_w and PDI changes for nanohybrid samples

Recent Publications

1. Chenani M., Ahmadinejad M. 2016. Preparation and characterization of novel gelatin/silica nano-hybrid as a styptic for massive bleeding. J. Nano. Bio., 4, 1277-1288.
2. Chenani M., Behnamghader A. July 21, 2015. "The Evaluation Alginate-Enriched Nano-Silica Static Blood Performance in Extreme Bleeding", International Conference on Research in Engineering, Istanbul, Turkey.
3. Chenani M., Khorasani M. July 21, 2015. "Zeolite Hybrid Homeostasis Behavior Characterized by Thrombin", International Conference on Research in Engineering, Istanbul, Turkey.

4. Chenani M., Ahmadinejad M. April 14 & 15, 2015. "Comparison of Nano-Powder Treated by Thrombin with Quick clot, Hem con, Wound State and Standard Dressing", International Conference on Engineering Sciences (ICOAC) University of Barcelona, Spain.
5. Chenani M., Moradi S. December 11 & 12, 2014. "Evaluation and Characterization of Kaolin-Treated by Thrombin on Hemostatic Improvement for Massive Bleeding", International Conference on Engineering, University of Szczecin, Poland.
6. Chenani M., Kamyar N. In winter 2016 “nano-materials in medical engineering” book completed due to be published in a print queue.
7. Chenani M., Ahmaditabatabaei S.A. In autumn 2015 “introduction to nano-biomaterials and design” book published.

Biography

Maryam Chenani has been studying and researching in new biomaterials and drug release for more than 7 year, she spend 5 years of her professional studies on blood coagulation in severe bleeding. She collaborates in coagulation part of the Iranian Blood Transfusion Organization to design the gelatin-base nano-hybrid which are recently tested on animals. These tests recorded the extraordinary effect of this material on reduce the coagulation time. There are two published books in design and creation of nano-materials by Maryam Chenani. In addition, she has been attended to several international conferences and published some papers in these fields

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