

# Nano/Microlayer Hemostatic Agents in Diabetic Injury Wound Model in Rat

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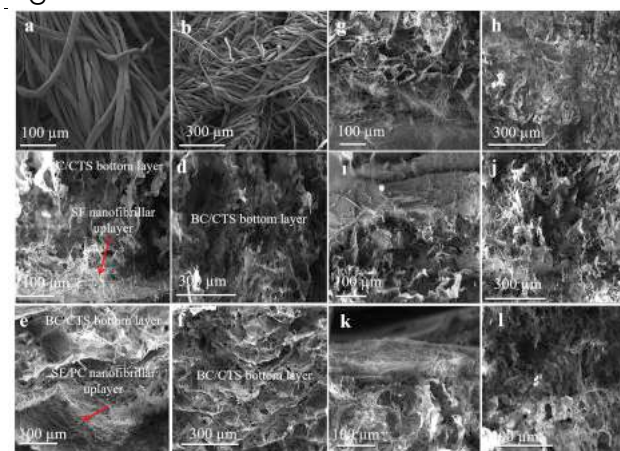
Diabetes mellitus (DM) is a chronic, life-long metabolic disease, which is associated with nephropathy, retinopathy, and neuropathy for microvascular systems and coronary artery disease and strokes and peripheral arterial disease for macrovascular.<sup>1-3</sup> In besides hypercoagulability and hypofibrinolysis, the wound complication problems in surgical patients with diabetes mellitus is a serious problem in clinical practice. Therefore, effective bleeding control for a person with diabetes is more essential compared to a healthy person in military and civilian life. For this purpose, we prepared a nano/microlayer hemostatic dressing that has a porous sublayer, including chitosan (CTS), bacterial cellulose (BC) as basement and active agents in coagulation cascade, such as vitamin K (Vit K), protamine sulfate (PS), and kaolin (Kao) as a filler and an upper layer consisting of silk fibroin (SF) or SF/phosphatidylcholine (PC) blend to achieve complete hemostasis in diabetic rats. Coagulative performances of the prepared hemostatic dressings were examined by the determination of bleeding time, blood loss, and mortality

rate through diabetic rat femoral artery injury model. According to the obtained results, Vit K-reinforced within 138 s and SF-coated BC/CTS hemostatic dressings within 144 s showed a rapid coagulation time.

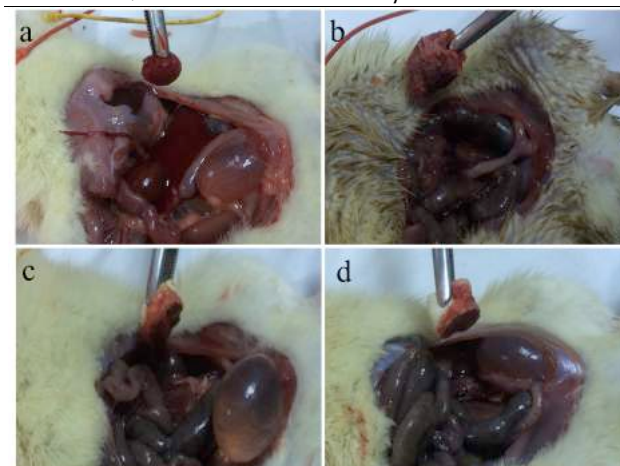
## References

- [1] Brownlee M. *Nature* 2001;414(6865):813–820.  
[2] Fuller JH, Stevens LK, Wang SL. *Diabetologia* 2001;44:S54–S64.  
[3] Bennett PH, Lee ET, Lu M, Keen H, Fuller JH. *Diabetologia* 2001;44:S37–S45.

## Figures



**Figure 1:** (a, b) SEM micrograph of standard gauze and cross-sectional SEM micrographs of (c, d) SF-coated BC/CTS, (e, f) SF/PC-coated BC/CTS, (g, h) SF-coated Kao/BC/CTS, (i, j) Vit K/BC/CTS, and (k, l) PS/BC/CTS hemostatic dressings (left images: bilayer structures, scale bars:100 μm; right images: sub-porous structures, scale bars: 300 μm).



**Figure 2:** Bleeding site after application in a diabetic rat femoral artery model: (a) standard gauze, (b) SF-coated BC/CTS, (c) SF-coated Vit K/BC/CTS, and (d) SF-coated PS/BC/CTS.