4) In-vivo Colony Wound Biofilm Model

The evaluation on prototype dressing performance, a model wound biofilm was developed by growing biofilms on a nano-porous polycarbonate membrane (200 mm in diameter) on top of aseptically inoculated, inoculated at 37°C (figure 5a,b). Growth of biofilm was characterized by Scanning Electron Microscope (figure 5c).

5) Dressing Response to In-vivo Model Wound Biofilms

In-vivo colony wound biofilms, produced from burn pathogens, S. aureus and P. aeruginosa, and control E. coli were grown for 48, 42 and 72 hours and tested with prototype dressings (figure 6a). Within 5 hours of incubation with biofilms, the fluorescent response was clearly observed in dressings (figure 6b).

6) Ex-vivo Porcine Burn Wound Model and Dressing Response

Using organic porcine skins, ex-vivo burn wound, as a more realistic model, was further developed for the evaluation of the dressing performance. Scaled burns were created with a hot metal block on disinsected pig skins (figure 7a) and infected with selected strains of SPE pathogens to establish biofilms allowing only burned tissues as a sole carbon source for infected bacteria (figure 7b). After 24 hours of growth at 37°C, each dressing was placed on the burn wounds and incubated up to 24 hours to test the dressing response (figure 7c). Fluorescent response was observed in all of the dressings except for the control dressings of E. coli.

Conclusion

A prototype intelligent dressing developed is the dressing performance is accessed by testing with in-vivo and ex-vivo porcine wound biofilm models of clinically important S. aureus, P. aeruginosa and E. faecalis (SPE) pathogens. Patterned vesicles in hydrogel dressing are lysed by virulence factors of pathogenic bacteria in mixed biofilms only and triggered the release of fluorescent dyes which are visible to naked eyes. This study provides proof-of-concept for an advanced infection-detecting dressing for wound care, which could allow the targeted treatment of infections at the bedside and reduce the unnecessary use of antibiotics.

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