

The promotion of critically colonized wound healing by cleansing with SOFORO-FINE BUBBLES

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BACKGROUND

Ultra-fine bubbles, measuring $< \varnothing 1 \mu\text{m}$, are stable and effective for cleansing various materials. Ultra-fine bubbles are generally produced by mechanical methods. Recently, a chemical method using sophorose lipids, which is a kind of biosurfactants, has been developed to generate ultra-fine bubbles, called as Soforo-fine bubbles (SFB)¹.

Biofilms crucially inhibit healing in critically colonized wounds. Previous reports have highlighted the efficient removal of *in vitro* biofilms by SFB². However, the practical utility of SFB in cleansing critically colonized wounds had not been demonstrated in experimental animals.

AIM

1. To assess the safety of SFB in normal wound healing.
2. To demonstrate the promoting effect of SFB on healing of critically colonized wounds.

CONCLUSION

Our results indicate that cleansing with SFB has no negative effect on normal wound healing, and promotes healing in critically colonized wounds.

References

- 1) Minematsu et al. The Japanese Society for Wound Healing Abstracts, 53:01-6, 2023.
- 2) Biochemical Laboratory, Saraya Co., Ltd. Abstract presented at the 1st Biotechnology Industry Research Association Meeting, 2022.
- 3) Kunimitsu et al. Int Wound J 20: 648-658, 2023.

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Experiment 1

AIM 1: To assess the safety of SFB in normal wound healing

METHODS

- Subjects: 5 normal rats (SD, 6 months old, male)
- Wounding: 2 full-thickness wounds ($\varnothing 1.5 \text{ cm}$) on the shaved dorsal skin
- Treatment: 2 wounds were randomly assigned to the SFB and control (vehicle) groups. Wounds were daily cleansed with SFB or vehicle solution, then covered with polyurethane dressing (Foam Lite, Convatec) until the day before the wound closure.
- Measurements: Healing period and relative wound area
- Analysis: Paired t-test

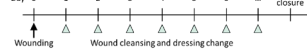


Fig 1. Schedule of Experiment 1.

RESULTS

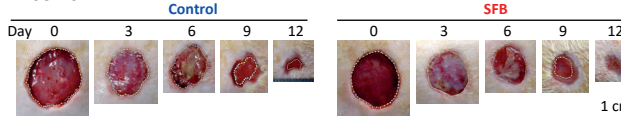


Fig 2. Macroscopic features of control (left) and SFB (right) groups.

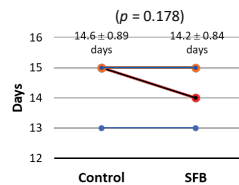


Fig 3. Healing period

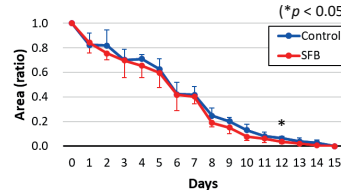


Fig 4. Relative wound area

No difference between groups

Ethical consideration: Both experiments were conducted with the approval of the Animal Experimentation Committee of the University of Tokyo.

Experiment 2

AIM 2: To demonstrate the promoting effect of SFB on healing of critically colonized wounds

METHODS

- Subjects: 5 normal rats (SD, 6 months old, male)
- Wounding: 2 full-thickness wounds ($\varnothing 1.5 \text{ cm}$) on the shaved dorsal skin
- Critical colonization: Wounds were covered with hydrocolloid dressing (Duo Active CGF, Convatec) for 3 days (Day 1 to 4) without wound cleansing and dressing change³.
- Treatment: 2 wounds were similarly managed to experiment 1 from day 4 to the day before the wound closure.
- Measurements: Healing period and relative wound area
- Analysis: Paired t-test



Fig 5. Schedule of Experiment 2.

RESULTS

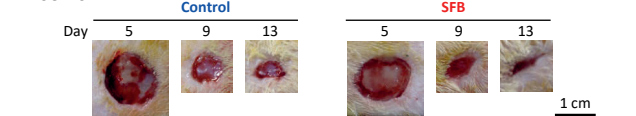


Fig 6. Macroscopic features of control (Left) and SFB (Right) groups.

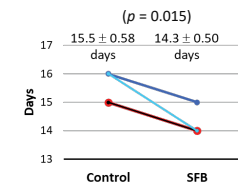


Fig 7. Healing period

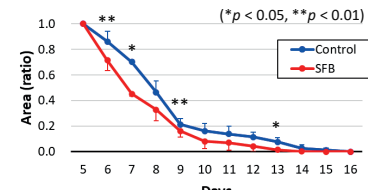


Fig 8. Relative wound area

SFB enhanced critically colonized wound healing