

Introduction

Chronic wounds often contain high levels of wound exudates. Dressing wear times typically ranging from 24 hours to 1 week, making the ability of a dressing to sequester and retain bacteria within the dressing core key to the removal of bacteria from the wound and to preventing reseeding of the wound with previously removed bacteria. This study compared the ability of five SAP dressings to sequester and retain bacteria over a 7 day challenge period. A gauze dressing was used as a control.

Methodology

Inoculation volume was calculated following a free swell absorptive capacity assessment according to an adapted ISO13726-1 method. Based on data from the free swell study, dressings were inoculated daily for 7 days with 17.9 mL methicillin-resistant *Staphylococcus aureus* (MRSA) inoculum ($1.0 \times 10^6 \pm 5.0 \times 10^5$ CFU/mL⁻¹). Dressing were maintained at $37^\circ\text{C} \pm 2^\circ\text{C}$ throughout the study. On days 1, 3 and 7, dressing samples (n=3) were removed from the inoculum, held for 10 seconds, and then transferred to agar plates. Agar plates and dressings were incubated for 24 hours at $37^\circ\text{C} \pm 2^\circ\text{C}$. Following incubation, dressings were removed and agar plates were photographed. A sample of the dressing core was dissected for microbial quantification and a further sample of the dressing core was processed for scanning electron microscopy.

SAP Dressings

SAP 1 DryMax® Super
SAP 2 Kerramax Care,
SAP 3 Zetuvit Plus
SAP 4 Mextra Superabsorbent
SAP 5 Kliniderm Superabsorbent
Control – Gauze

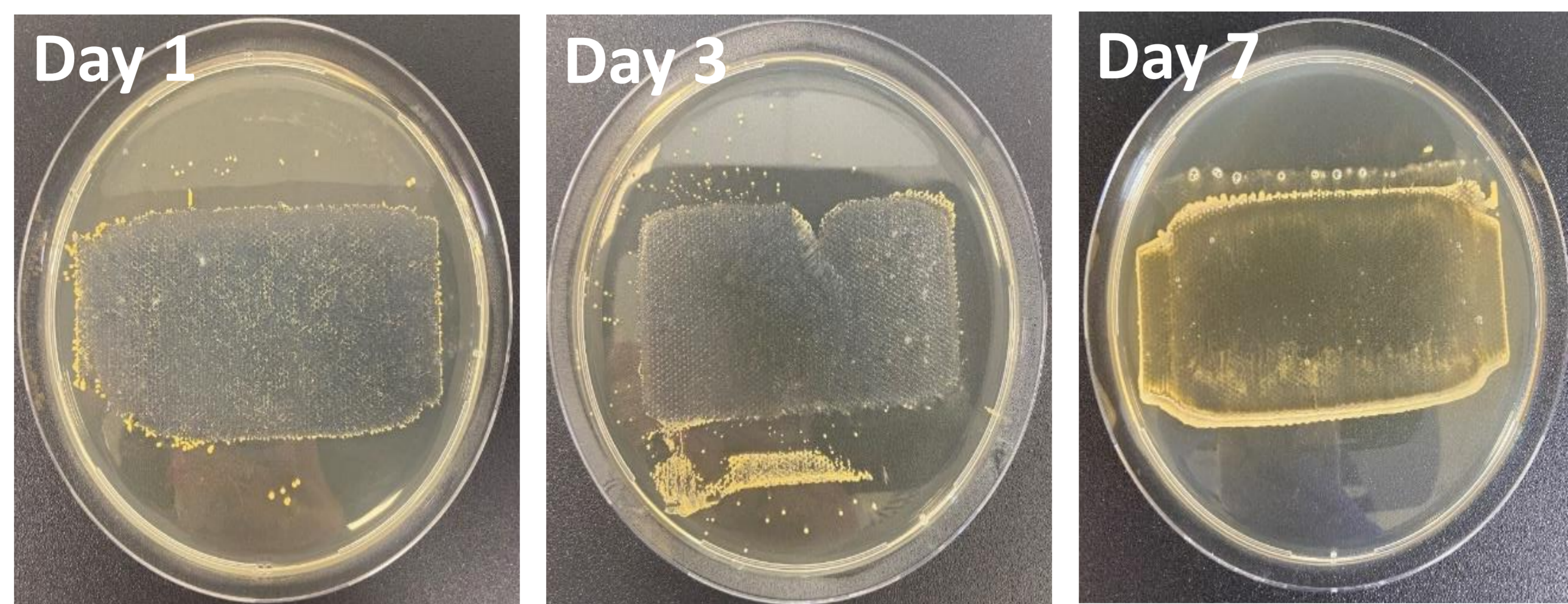


Figure 1. Photographs of agar following 24 hour incubation with SAP 1 dressing at Day 1, 3 and 7

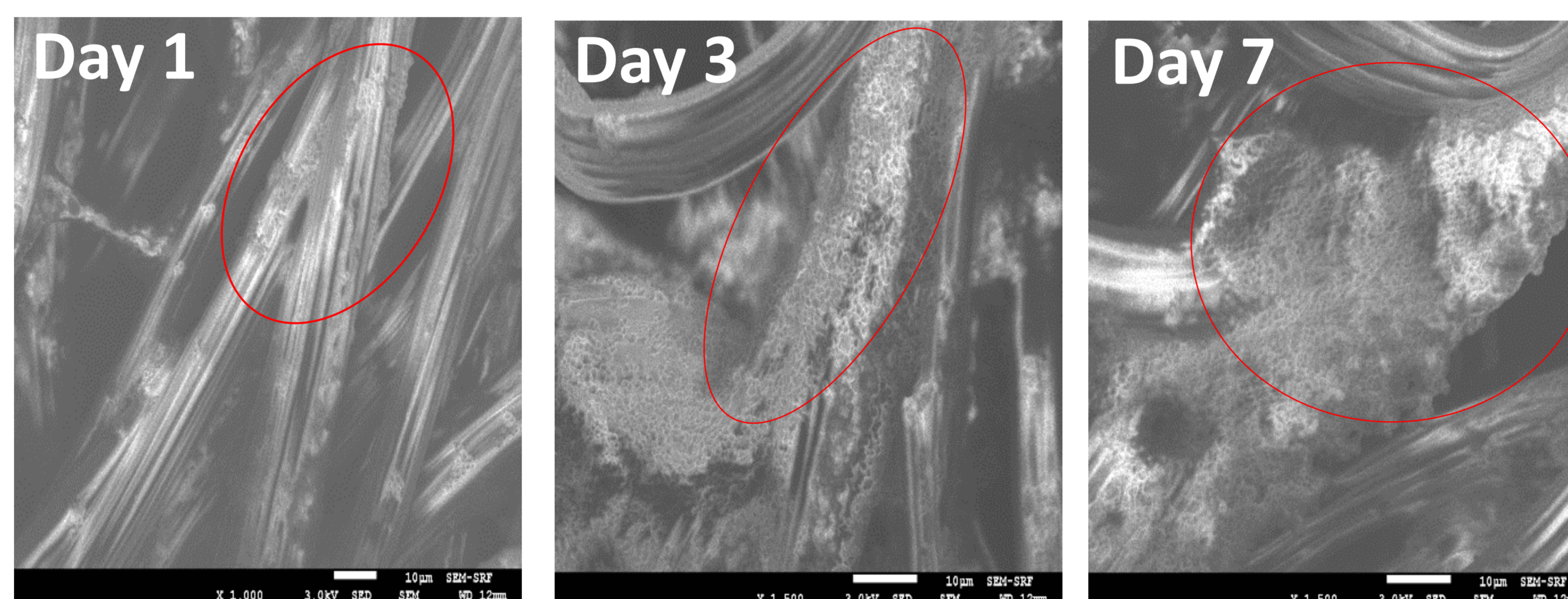


Figure 2. SEM images SAP 1 dressing at Day 1, 3 and 7. Red circle indicates the presence of attached organisms and biofilm material.

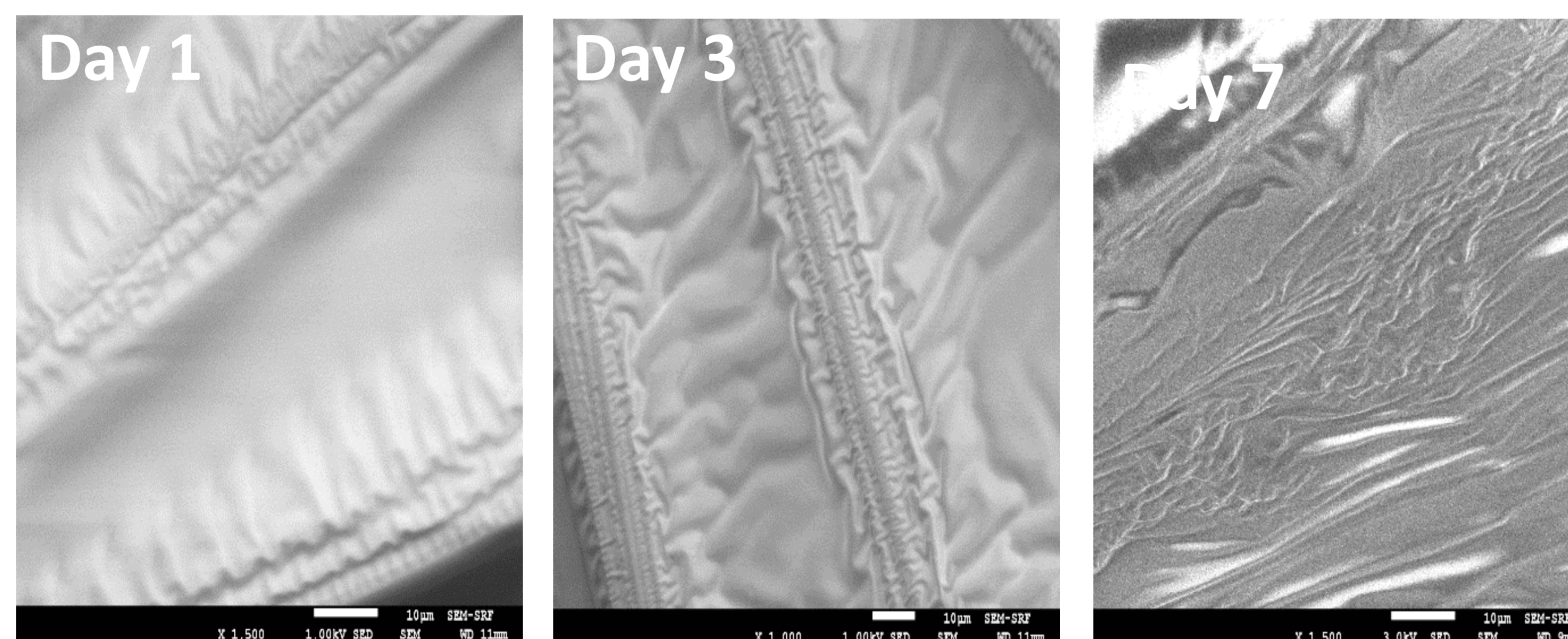


Figure 3. SEM images gauze control dressing at Day 1, 3 and 7.

Results

A minimum of 7.23 ± 0.20 Log₁₀CFU/mL⁻¹ MRSA was recovered from the dressing samples of each of the superabsorbent dressings, demonstrating that these dressings were all capable of holding significant levels of bacteria within the dressing core (Table 1).

SAP Test item	Average recovery \pm SD (Log ₁₀ CFU/mL ⁻¹)		
	Day 1	Day 3	Day 7
SAP 1	7.56 \pm 0.33	8.36 \pm 0.38	7.68 \pm 0.24
SAP 2	8.31 \pm 0.13	8.08 \pm 0.08	7.23 \pm 0.20
SAP 3	8.50 \pm 0.17	8.66 \pm 0.07	8.12 \pm 0.14
SAP 4	8.55 \pm 0.02	8.56 \pm 0.46	7.62 \pm 0.37
SAP 5	8.27 \pm 0.02	7.67 \pm 0.11	7.77 \pm 0.09

Table 1. Average recovery of viable methicillin-resistant *Staphylococcus aureus* from SAP dressings at Day 1, 3, and 7.

Qualitative assessment demonstrated that a bacterial lawn was observed under the negative control dressing contact area, at days 1, 3 and 7, demonstrating the transfer of bacteria from the dressing contact layer to the agar surface.

Three of the SAP dressings (SAP 1, SAP 2, and SAP 3) demonstrated visually reduced bacterial transfer from the dressings to the agar compared to the control product whereas the remaining 2 SAP dressings (SAP 4 and SAP 5) transferred levels of bacteria that were visually more similar to the gauze control. (Figure 1)

For the products that held bacteria within their core, bacteria could be seen via SEM microscopy (Figure 2). Bacteria appeared as individual and small clusters of cells that increased in size between days 1, 3 and 7, developing into large clusters of cells surrounding and joining the dressing fibres (red circles, Figure 2). Bacteria were not seen on the control samples after the rinsing and fixing process (Figure 3).

Discussion and Conclusions

Wound dressings typically remain on infected wounds for up to 7 days. When a dressing sequesters bacteria from the wound it helps to resolve the inflammatory response and to allow the wound to progress to the healing phase. If over time (up to 7 days) dressings cannot adequately manage the exudate volume and bacterial load, there is a risk of recontamination of the wound from the dressing. Dressings that can appropriately manage the contaminated exudate (as demonstrated by SAP, 1, SAP 2 and SAP 3) for the duration of wear time are a key element in the successful treatment of chronic non-healing infected wounds.