

Assessing the sustained antimicrobial activity within a nitric oxide-generating dressing using antibiotic-resistant wound pathogens in a repeated inoculation model

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Introduction

- Hard-to-heal wounds are at high risk of developing local infection, which is associated with further complications, such as increased risk of systemic infection, and lower limb amputation in diabetic foot ulcers (DFUs)¹
- The reactive and short-lived free radical, nitric oxide (NO), is used by the innate immune system to combat pathogens^{2,3}
- Owing to its broad reactivity with microbial targets (including proteins, DNA, and membrane lipids),⁴ NO exerts fast antimicrobial action⁵
- A NO-generating dressing (NOGD[†]) generates controlled, sustained NO within the dressing, supporting prolonged antimicrobial activity

Objective

To evaluate the longevity of the antimicrobial activity of NOGD[†] against the wound pathogens, multidrug-resistant *Pseudomonas aeruginosa* (RPA) and methicillin-resistant *Staphylococcus aureus* (MRSA), using an *in vitro* repeated inoculation model

Methods

- Challenge microorganisms were antibiotic-resistant RPA (NCTC 8506) and MRSA (NCTC 14245)
- An adaptation of a global antimicrobial textile efficacy standard, AATCC TM100,⁶ was employed
- NOGD[†] or non-antimicrobial gelling fiber control dressing^{††} were directly inoculated, then re-inoculated, with $\sim 1 \times 10^6$ colony-forming units (CFU) of either RPA or MRSA at 0, 24, 48, 72, or 144 hours
- Viable counts within the dressings, after neutralization of NO activity, were conducted at 1, 4, or 24 hours after each inoculation or re-inoculation

Results

- NOGD consistently reduced both RPA (Fig 1) and MRSA counts (Fig 2) to near or below the limit of detection (<30 CFU/dressing) within 24 hours of each inoculation/re-inoculation
- Notable reductions were observed within 1–4 hours, demonstrating rapid and sustained antimicrobial action within the dressing
- After the final re-inoculation at 144 hours, both RPA (Fig 1) and MRSA (Fig 2) were still reduced by at least 4 log₁₀ within 24 hours
- The non-antimicrobial control dressing increased and then maintained high bacterial viability throughout the test period (Figs 1-2)

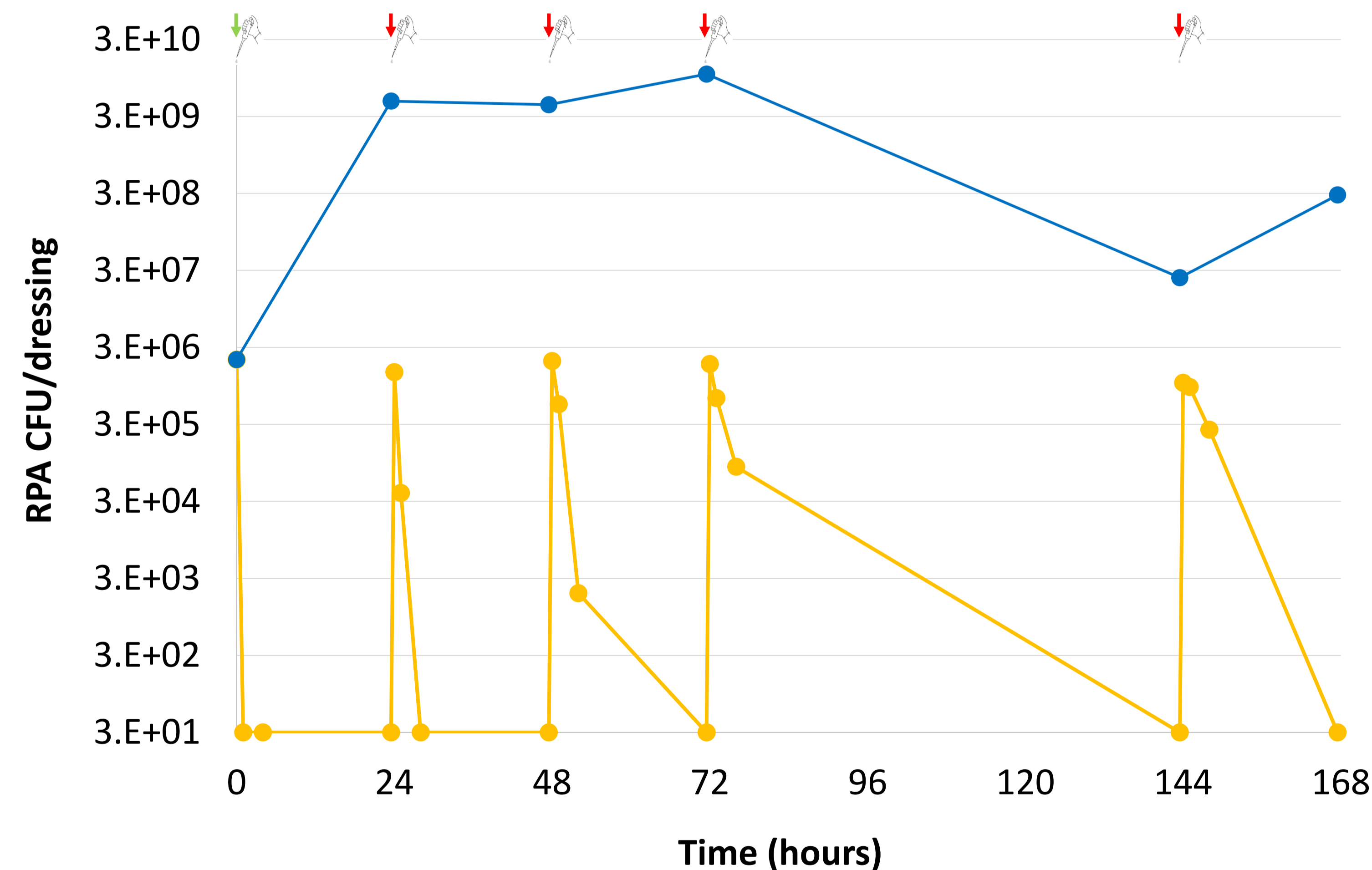


Figure 1. Sustained antimicrobial activity of NOGD against RPA. (■) NOGD (N=3); (●) control (N=1). ⚡ = inoculation ($\sim 1 \times 10^6$ CFU RPA); ↓ = initial inoculation; ↓ = reinoculation

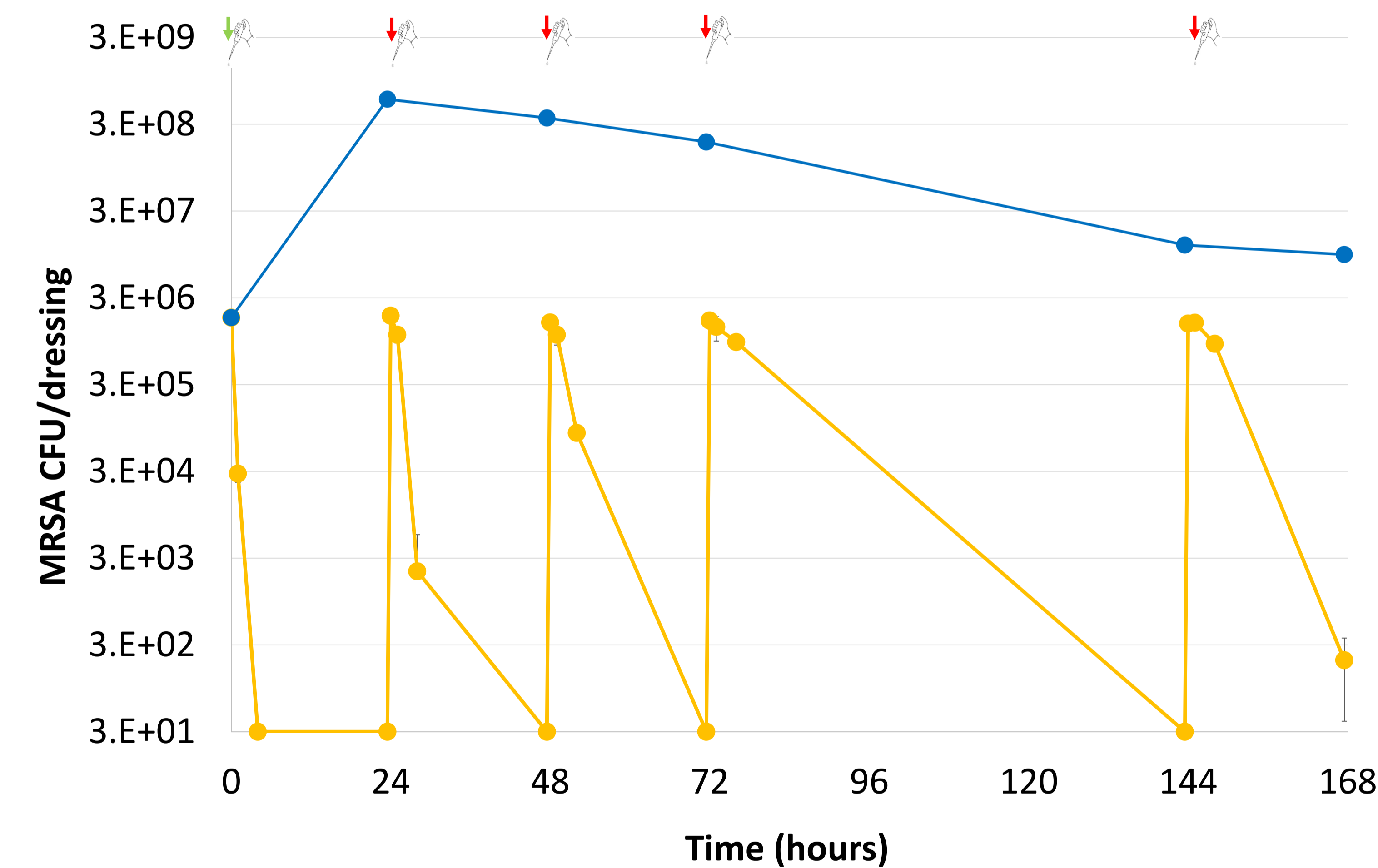


Figure 2. Sustained antimicrobial activity of NOGD against MRSA. (■) NOGD (N=3); (●) control (N=1). ⚡ = inoculation ($\sim 1 \times 10^6$ CFU MRSA); ↓ = initial inoculation; ↓ = reinoculation

References

1. Armstrong et al. *N Engl J Med* 2017;376:2367-237.
2. Bogdan C. *Nature Immunol* 2001;2:907-916.
3. Roberts et al. *Microorganisms* 2024;12:2543.
4. Waite et al. *Int J Antimicrob Agents* 2018;52:338-343.
5. Coleborn et al. Poster presented at SAWC Spring 2026, Charlotte, NC.
6. AATCC 100 Antimicrobial Fabric Test

Conclusion

NOGD demonstrated rapid and sustained antimicrobial protection against antibiotic-resistant pathogens over extended periods *in vitro*, highlighting its potential in managing hard-to-heal wounds with ever-present infection risk

Discussion

- These results demonstrate the sustained antimicrobial activity within NOGD under prolonged and repeated bacterial challenge
- Rapid and sustained source control in colonized, locally infected wounds, or those at risk of infection, is an appealing prospect for clinicians, especially in wounds at high risk of infection-related complications, such as DFUs
- This data suggests that sufficient antimicrobial NO is generated within the NOGD device for sustained periods

[†] ConvaNiox™ (Convatec) – available in the EU and UK. ConvaNiox™ is not available in the US. ^{††} Aquacel® Extra™ (Convatec).