



WHS P-14

# Peptide-based biomimetic matrix offers antibacterial protection and rapid wound closure of stalled diabetic foot ulcers

Ana Tellechea<sup>1</sup>, Rebecca Salamone<sup>1</sup>, Brunno Caetano<sup>1</sup>, Trudy-Ann Grant<sup>1</sup>, Bishnu Joshi<sup>1</sup>, Nivedha Suresh<sup>1</sup>, Daljit Kaur<sup>1</sup>, Tarak Bakhda<sup>1</sup>, Manav Mehta<sup>1</sup>, Sara Rose-Sauld<sup>2</sup>, Jennifer Skolnik<sup>2</sup>, Adam Landsman<sup>2</sup>

Affiliations: <sup>1</sup>Gel4Med, Inc., Lowell, MA, United States; <sup>2</sup>Massachusetts General Hospital, Harvard Medical School, Boston, MA, United States



## BACKGROUND

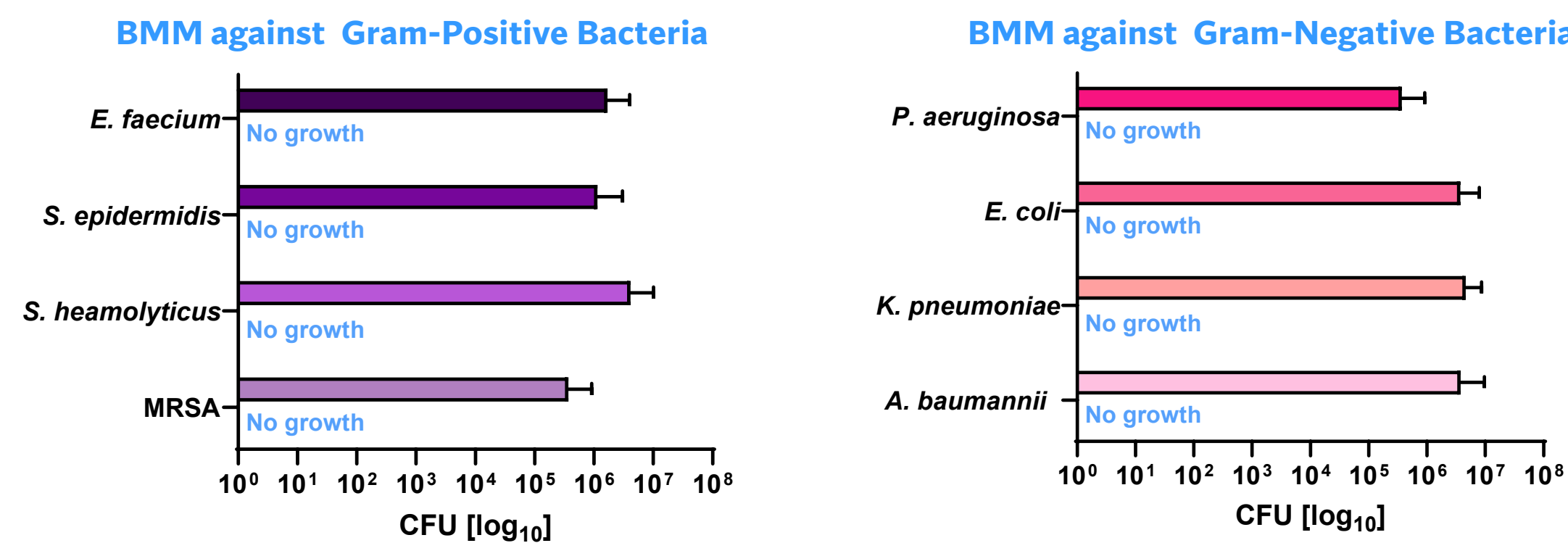
Approximately 60% of diabetic foot ulcers (DFUs) become infected, substantially increasing morbidity and raising the rate of lower extremity amputations up to 90%. Current approaches have serious limitations, and the rise of multidrug-resistant organisms (MDROs) and biofilms further complicates treatment. To address this issue, we designed and developed a peptide-based **Biomimetic Matrix (BMM - G4Derm Plus, Gel4Med Inc.)** to simultaneously prevent infection and promote wound healing.

**BMM is a self-assembling nanofiber technology, free of antibiotics and biologics, that uniquely combines:**

- ✓ broad-spectrum antibacterial mechanism that evades resistance to prevent colonization
- ✓ 3D scaffold microarchitecture that mimics the native ECM to encourage tissue regrowth
- ✓ wound-conforming properties for intimate contact and dead space elimination

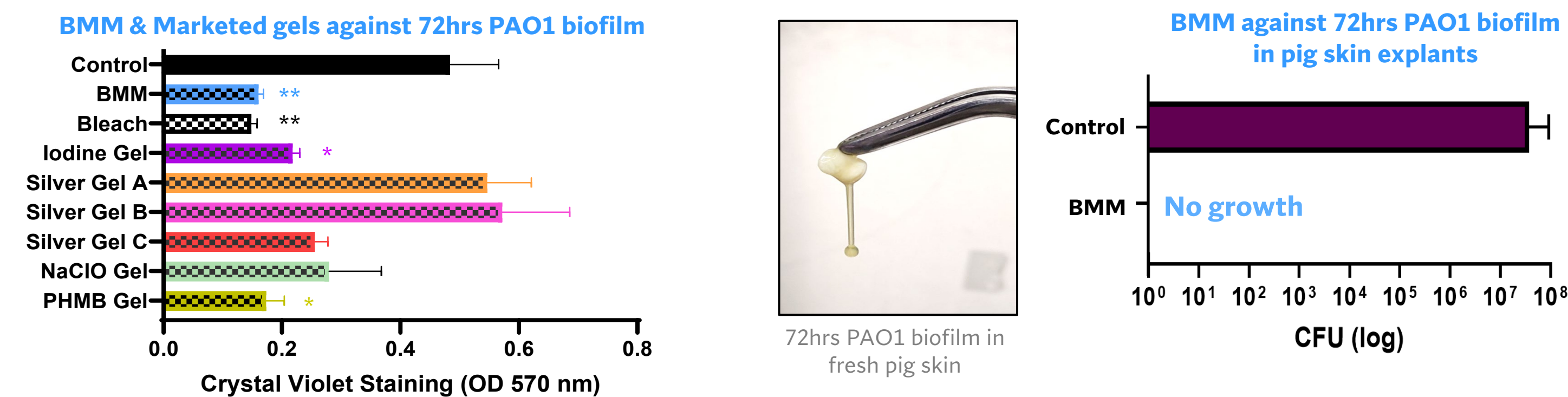
## RESULTS

### 1. BMM shows broad-spectrum activity against clinical isolates



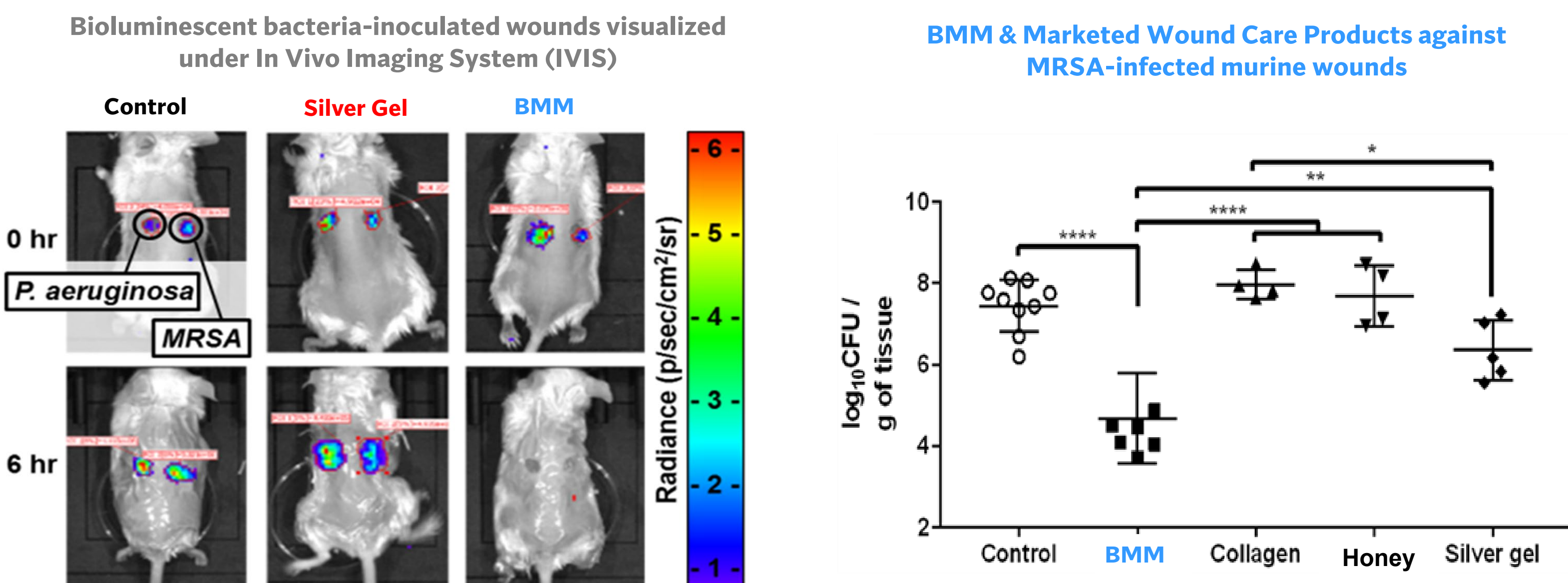
- Complete cidal activity against 10<sup>6</sup> CFU of Gram-positive & Gram-negative clinical isolates, including multidrug-resistant organisms (MDROs)

### 2. BMM eradicates established biofilms in skin explants



- Efficacy against mature PAO1 biofilms comparable to undiluted bleach
- 72h-aged PAO1 biofilm eradication confirmed in pig skin explants

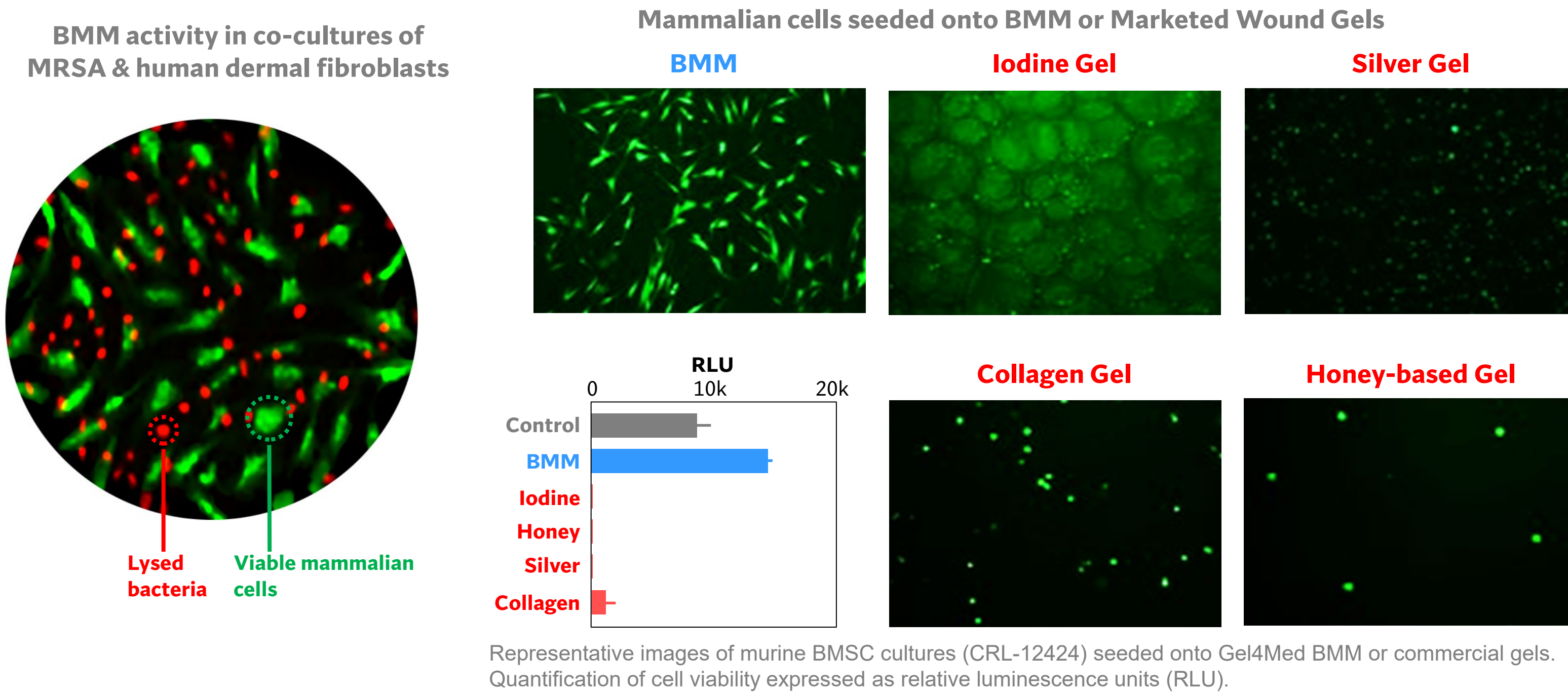
### 3. BMM substantially reduces *in vivo* wound bioburden



- Elimination of *P. aeruginosa* & MRSA from murine wounds within 6 hours of application
- Superior wound bioburden reduction compared to tested commercially available wound care products

## RESULTS

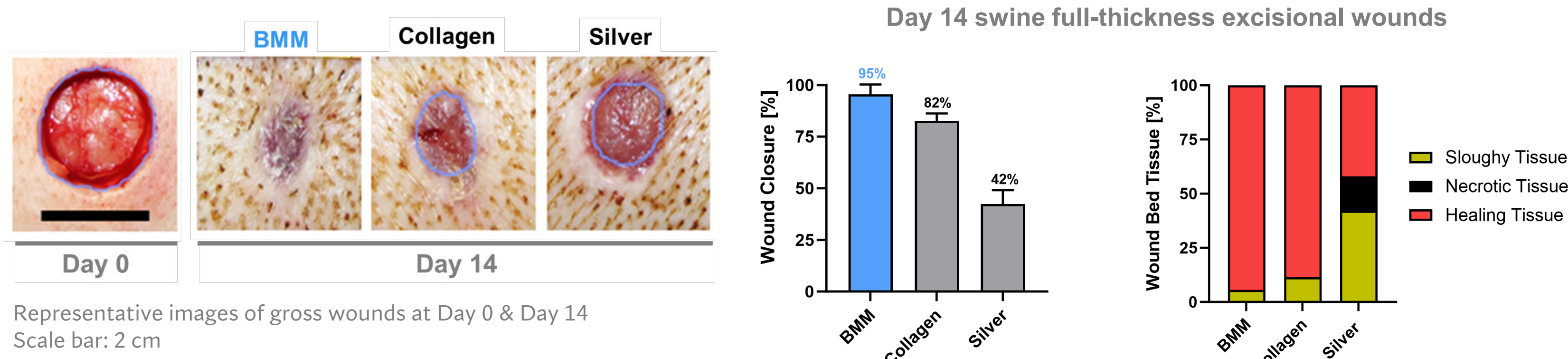
### 4. BMM demonstrates superior compatibility with mammalian cells



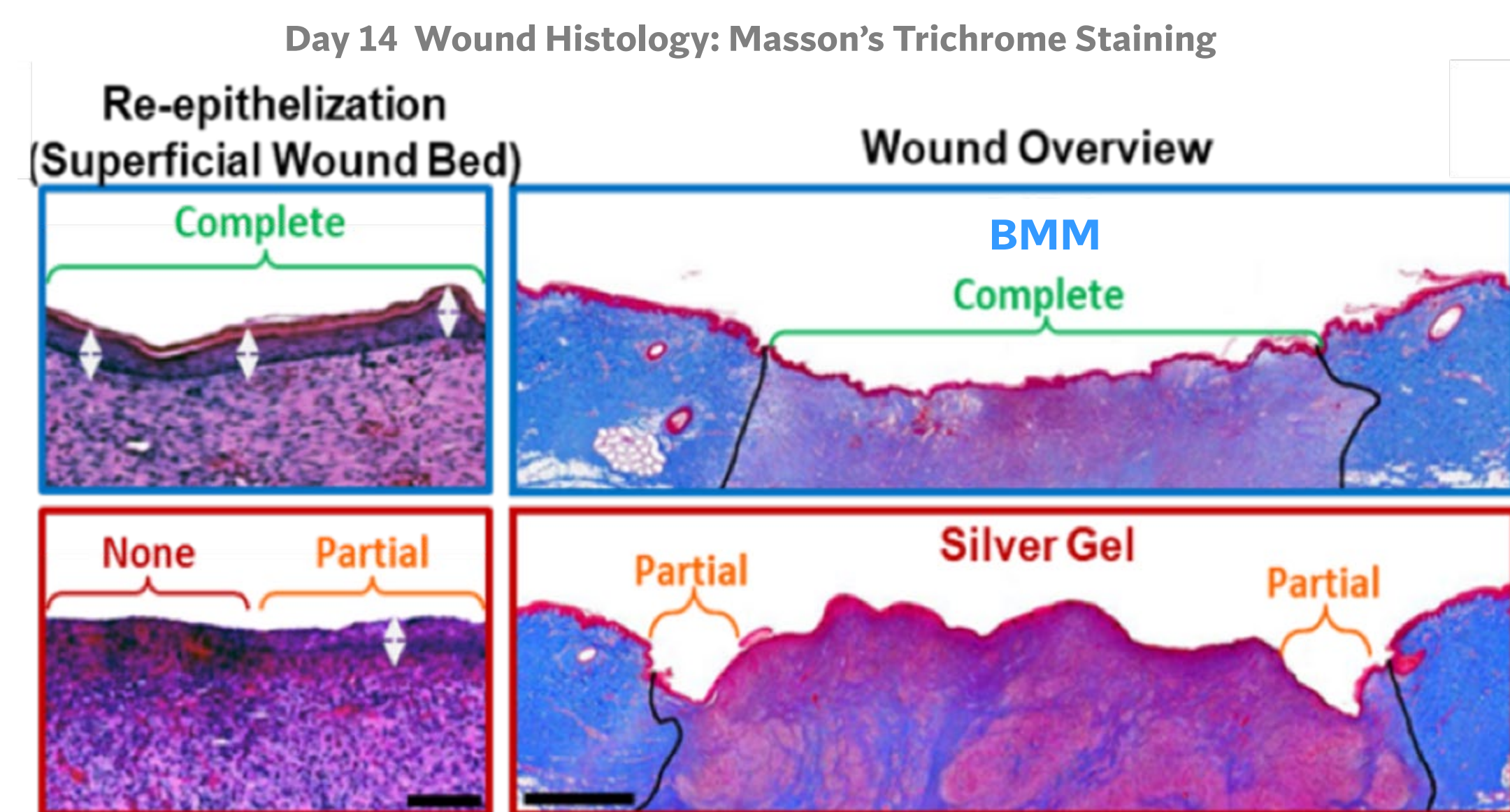
Representative images of murine BMSC cultures (CRL-12424) seeded onto Gel4Med BMM or commercial gels. Quantification of cell viability expressed as relative luminescence units (RLU).

- Selective cidal activity against microbes and rescue of mammalian cells
- Better cytocompatibility compared to tested commercially available antimicrobial wound gels: higher cell viability, cell spreading, and cell attachment

### 5. BMM improves healing in a swine full-thickness wound model



Representative images of gross wounds at Day 0 & Day 14. Scale bar: 2 cm



Representative images of Masson's Trichrome stained wound sections at Day 14. Scale bar: 2 mm

- Superior healing profile compared to collagen and silver gels with greater wound closure (95% ± 5%), increased granulation tissue, increased neovascularization, and reduced inflammation
- Only treatment achieving complete re-epithelialization by Day 14 post-wounding

## RESULTS

### 6. BMM achieves positive healing outcomes in refractory DFUs

Clinical Characteristics of Study Participants				
#	Comorbidities (besides Diabetes)	Wound Location	Wound duration (months)	Wagner Grade
1	Neuropathy, Osteomyelitis	Heel	39	2
2	Osteomyelitis, PVD	Forefoot	30	1
3	Neuropathy	Heel	8	2
4	Neuropathy, Obesity, Osteomyelitis, Partial Amputation	Forefoot	56	1
5	Neuropathy, Osteomyelitis, PVD	Ankle	3	3
6	Charcot deformity, Neuropathy, PVD	Lateral Foot	15	1
7	Neuropathy, Obesity	Heel	8	3
8	Charcot deformity, Neuropathy	Mid-arch	13	2

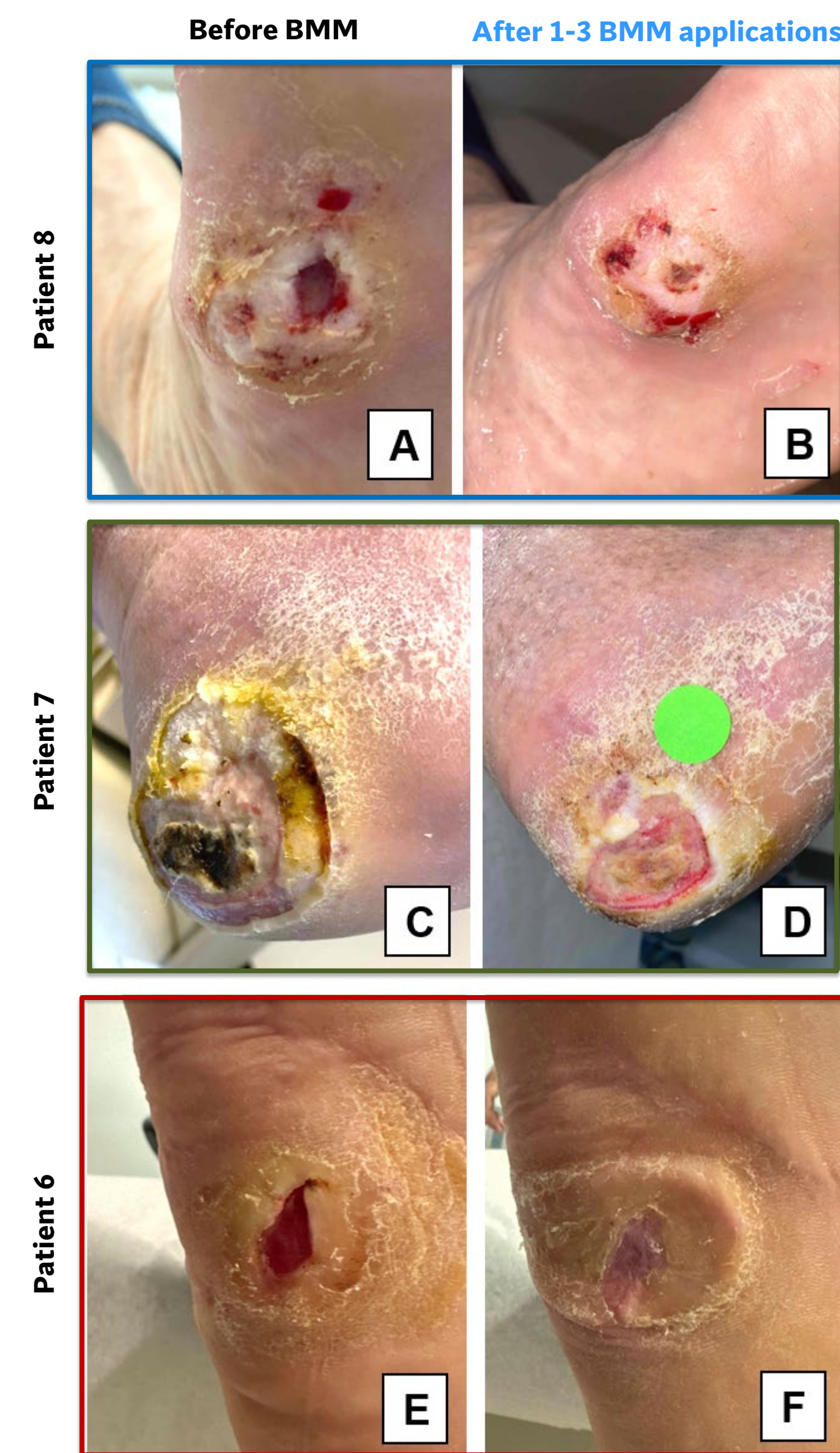
- ✓ Despite prior failed treatments with advanced biologics, all wounds responded to BMM with **rapid granulation tissue formation** and progress towards healing.

- ✓ A mean **percent area reduction of 63.6%** was achieved **after 1-3 BMM applications** in DFUs originally measuring 7.5 cm<sup>2</sup> and present for 21.5 months on average.

- ✓ One patient achieved complete wound closure after 6 weeks following 1 BMM application.

- ✓ Odor, drainage, inflammation, and wound depth were noticeably reduced.

- ✓ No adverse events were observed.



Representative images of chronic DFUs before (left) and after (right) BMM treatment.

## SUMMARY & CONCLUSIONS

BMM demonstrates broad-spectrum activity against MDROs and biofilms. In the clinically relevant swine model, BMM shows better healing profile with superior re-epithelialization, granulation tissue formation, and inflammation resolution when compared to silver- and collagen-based wound care products. Clinical outcomes confirm rapid healing progression of challenging DFUs, suggesting benefits in hard-to-heal wound management. Further studies are needed to validate and expand our findings.

#### References:

McDermott K, Fang M, Boulton AJM, Selvin E, Hicks CW. Etiology, Epidemiology, and Disparities in the Burden of Diabetic Foot Ulcers. Diabetes Care. 2023 Jan 1;46(1):209-221. doi: 10.2337/dci22-0043. PMID: 36548709.



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