Evaluation of Antimicrobial Compounds on Diabetic Wound Pathogens and their Impact on Fibroblast Function

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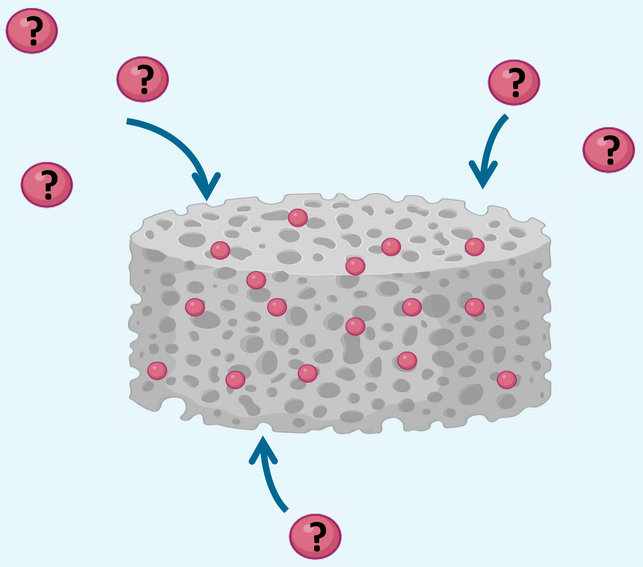
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Introduction

Diabetic wounds are difficult to heal

Dermal substitutes, like type I collagen scaffolds, can be used to address tissue regeneration and microbial burden, but they require functionalization with bioactive molecules to enhance therapeutic potential.

Aim: To evaluate antimicrobial properties while maintaining fibroblast function of different compounds

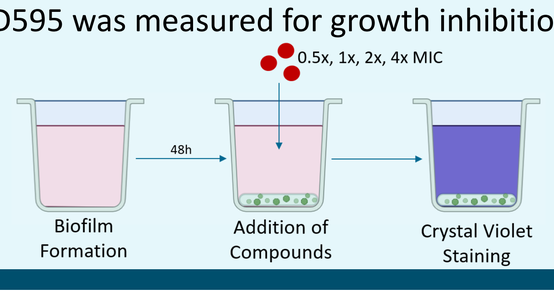


Methodology

Activity against *P. aeruginosa* and *S. aureus* was tested

1. Growth inhibition was measured by Minimum Inhibitory Concentration (MIC) through broth microdilution method.

2. Biofilm eradication assays were used to evaluate anti-biofilm properties. Biofilms were stained with crystal violet, and OD595 was measured for growth inhibition.

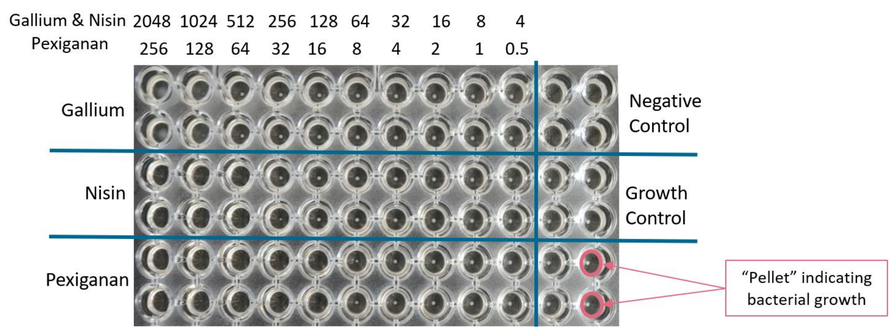


Results & Discussion

Gallium, nisin and pexiganan inhibit microbial growth

Gallium, nisin and pexiganan are more effective against *S. aureus* or *P. aeruginosa* compared to other compounds.
Nisin notably reduced *S. aureus* biofilms.

A



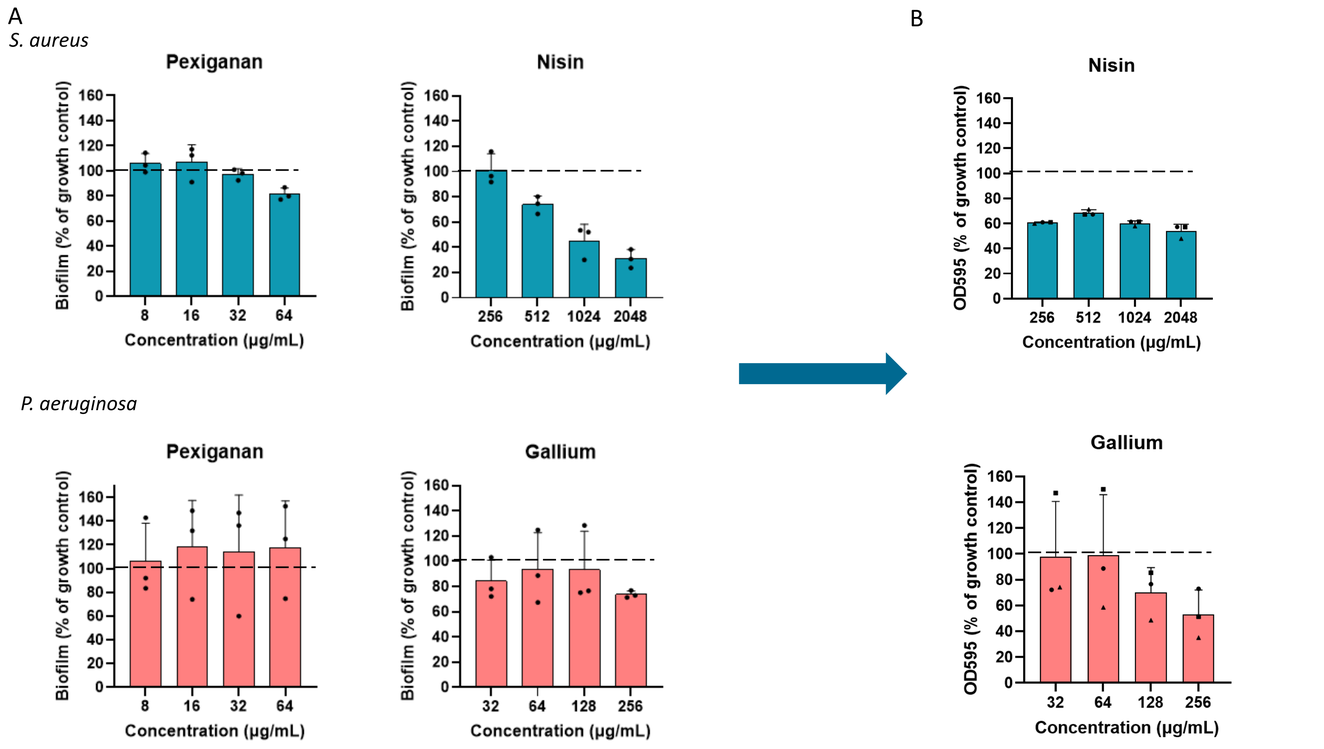
B

Compound	MIC concentration (ug/mL)	
	S. aureus	*P. aeruginosa*
Dill extract	>50%	>50%
Allicin	>2048	>2048
Gallium	>2048	64
Nisin	512	>2048
Pexiganan	8	16
Thymol	1024	2048

MIC assay : (A) Images of MIC plates depicting growth inhibition after incubation with different compounds (B)) MIC values (ug/mL) of each compound for *S. aureus* or *P. aeruginosa*

Nisin and Gallium have anti-biofilm properties

Nisin notably reduced *S. aureus* biofilms.
Pexiganan had no effect on biofilm eradication. While gallium did not significantly eradicate biofilms, gallium inhibited growth from biofilm at higher concentrations.

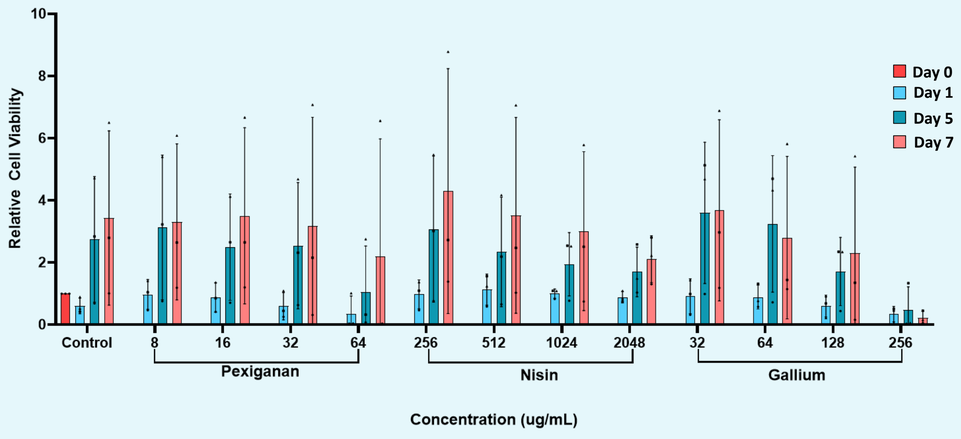


Biofilm assay: (A)Total biofilm biomass or (B) OD595 as a percentage of the growth control (%) after 24h treatment of pexiganan, nisin, gallium (0.5x, 1x, 2x, 4x MIC) or ciprofloxacin (100ug/mL) on either S. aureus (blue) or P. aeruginosa (pink) 48h-old biofilms ± SD, N=3.

Future Directions

Future work will focus on detailed analysis of fibroblast function

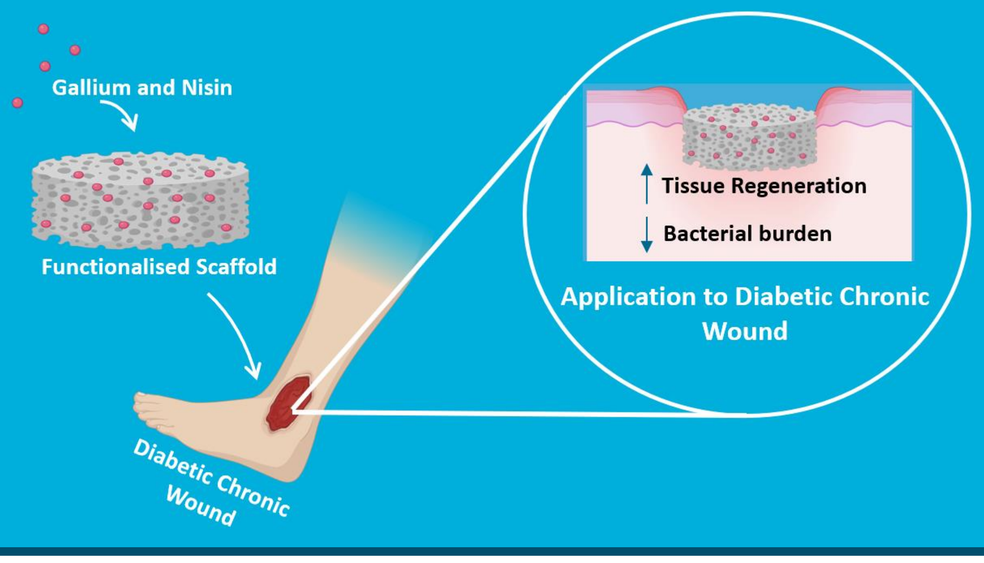
We want to make sure that while these compounds do have a positive effect against bacteria, they should not negatively effect skin cells. Therefore, fibroblast (HFF-1) function will be evaluated through cellular viability and migration assays. Promising compounds will then be incorporated into scaffolds for more testing.



Preliminary results of HFF-1 viability after compound treatment at different concentrations on day 0, 1, 5 and 7. Viability measured using alamarBlue™ ± SD, N=3.

Conclusion

Nisin and Gallium can be used as a component of skin substitutes for diabetic wound healing



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This study is funded by Dutch Research Council NWO, Advanced Healthcare Materials call, project 14725-6