Investigating the antibacterial and antibiofilm potential of Bald's eyesalve-derived cocktail against chronic wound pathogens

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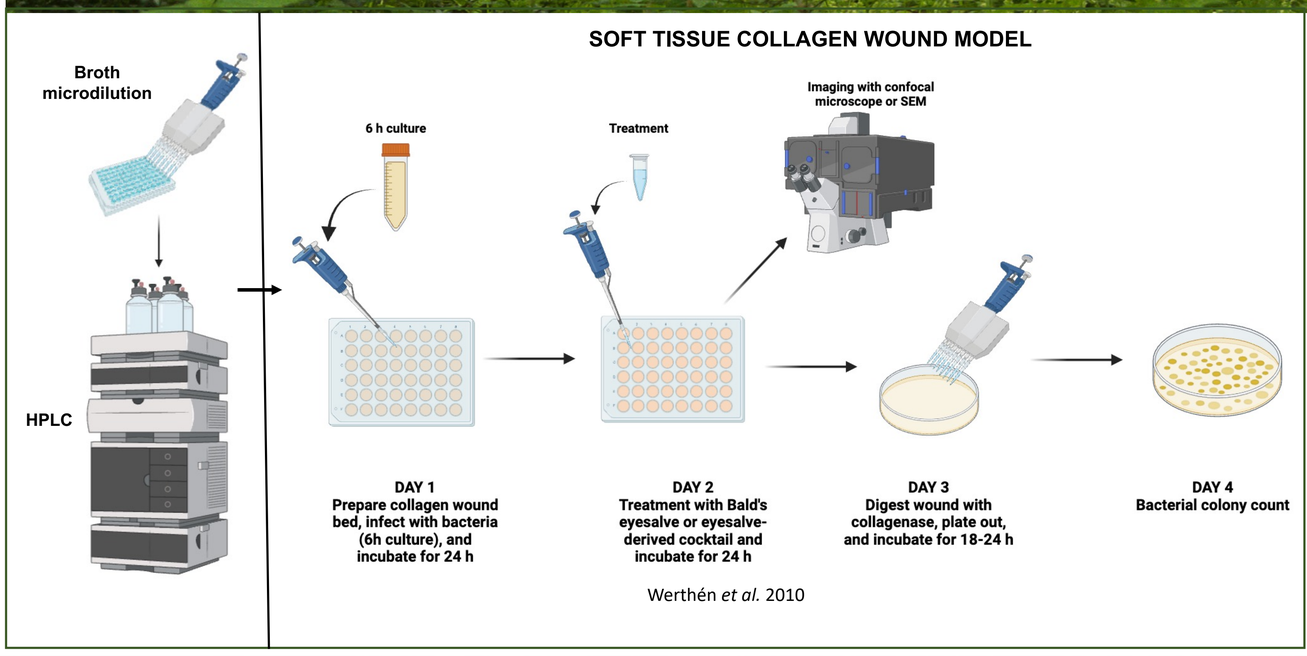
INTRODUCTION

- **Biofilm-associated infections (like chronic wound infections), which are naturally antibiotic-resistant, account for about 80% of all chronic bacterial infections[1].**
- **Natural products, especially plant-derived ones, are well-known sources of bioactive compounds including antimicrobials. It is not surprising that they were used in medieval Europe to treat microbial infections[3].**
- **Our lab identified a medieval remedy called Bald's eyesalve which was used to treat styes during the pre-antibiotic era. This remedy has broad-spectrum antibacterial and antibiofilm activity[4]. However, just like many natural product remedies, this remedy is complex and poses a challenge of activity variation.**
- **The main aim of my PhD research is to develop a defined and simple cocktail formulation of natural products with potent biofilm eradication activity, based on Bald's eyesalve's original formulation.**

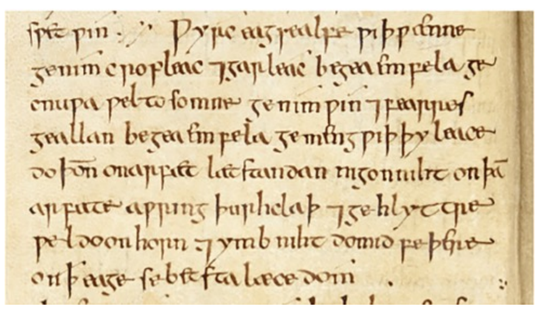
METHODS



Werthén *et al.* 2010

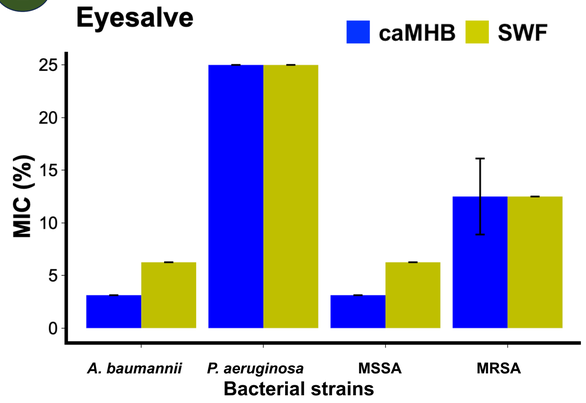
RESULT

1 BALD'S EYESALVE PREPARATION



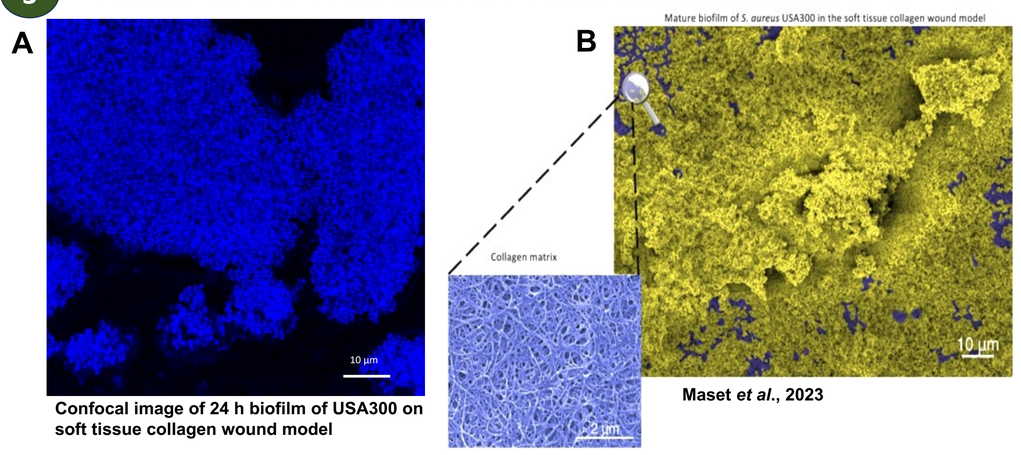
This is an excerpt of the Bald's Leech book (an ancient medical text) describing the preparation of Bald's eyesalve. In summary, Bald's eyesalve is prepared by combining 4 natural ingredients including bovine bile, garlic, another *Allium* species, and wine. This mixture is then left to stay for 9 days before antibacterial and antibiofilm testing.

2 ANTIBACTERIAL ACTIVITY OF BALD'S EYESALVE



Bald's eyesalve has potent broad-spectrum antibacterial activity against planktonic forms of wound bacterial pathogens including *S. aureus* – methicillin-resistant and susceptible strains, *A. baumannii,* and *P. aeruginosa* in both standard and host-mimicking media – synthetic wound fluid (SWF).

3 FORMATION OF BIOFILM ON A SOFT TISSUE WOUND MODEL

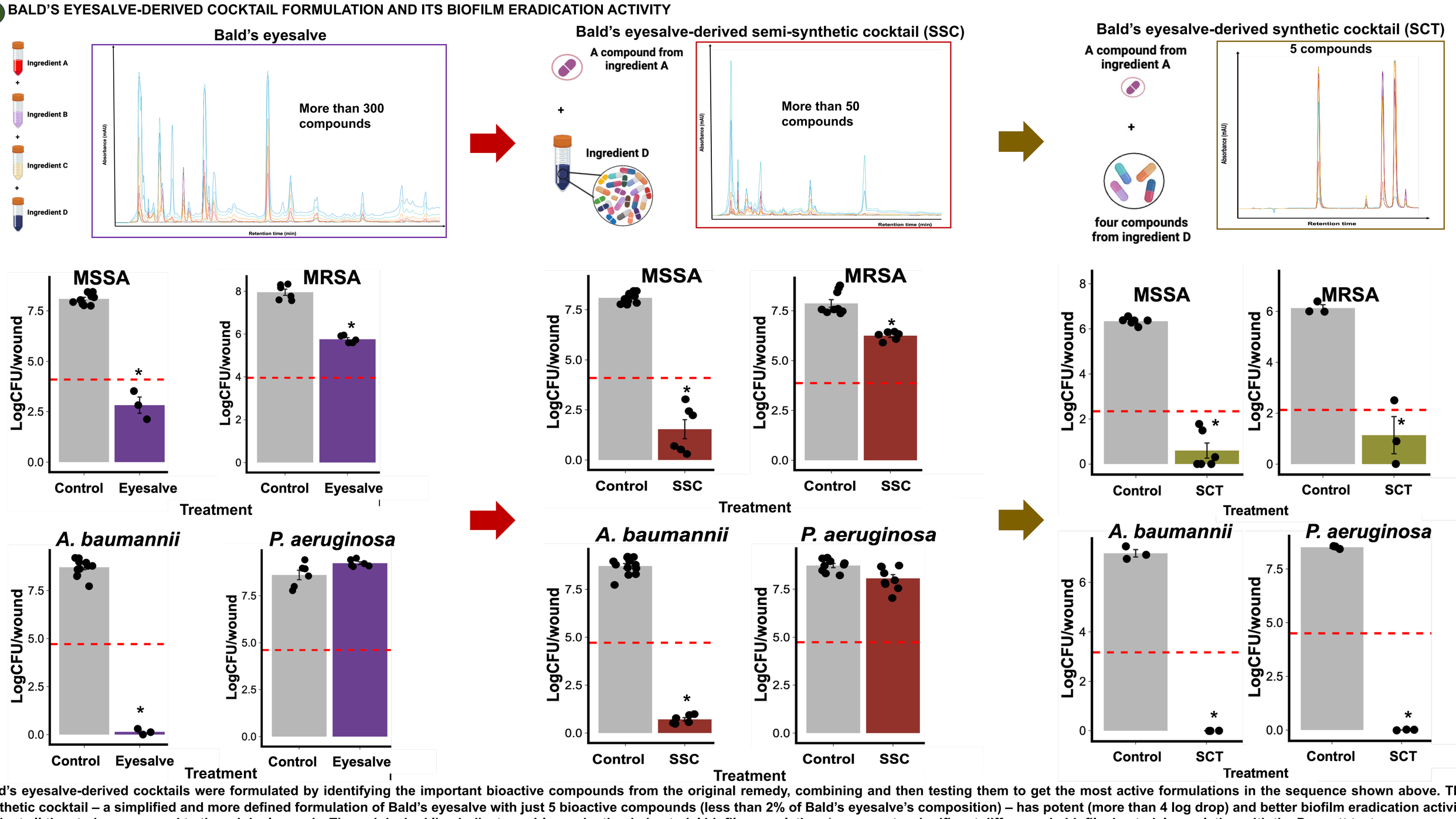


Confocal image of 24 h biofilm of USA300 on soft tissue collagen wound model

Maset *et al.*, 2023

Figures A and B are confocal (stained with calcofluor white) and scanning electron micrographs (with false colouring) respectively showing the formation of bacterial biofilm (*S. aureus* USA300 – methicillin-resistant strain) on the surface of the collagen matrix in the soft tissue wound model.

4 BALD'S EYESALVE-DERIVED COCKTAIL FORMULATION AND ITS BIOFILM ERADICATION ACTIVITY



Bald's eyesalve-derived cocktails were formulated by identifying the important bioactive compounds from the original remedy, combining and then testing them to get the most active formulations in the sequence shown above. The synthetic cocktail – a simplified and more defined formulation of Bald's eyesalve with just 5 bioactive compounds (less than 2% of Bald's eyesalve's composition) – has potent (more than 4 log drop) and better biofilm eradication activity against all the strains compared to the original remedy. The red dashed line indicates a 4-log reduction in bacterial biofilm population. * represent a significant difference in biofilm bacterial population with the Dunnett test.

CONCLUSION

Bald's eyesalve and its derived cocktail have broad-spectrum antibacterial activity.

Synthetic cocktail also has potent biofilm eradication activity against a broad spectrum of wound pathogens.

NEXT STEPS

MECHANISM, MODE OF ACTION

HOW SAFE IS IT?

Can these pathogens evolve resistance easily to Bald's eyesalve? Check poster number B234

REFERENCES

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