

# Development of Novel Biotherapeutics to Treat and Prevent Common Dermatological Skin Infections

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## Introduction

- *Staphylococcus aureus* (Sa) is the leading cause of skin and soft tissue infections (SSTI).
- Sa is an opportunistic pathogen that colonizes the nasal cavity in approximately 1/3 of the population without causing harm.<sup>1</sup>
- Individuals with breached skin and mucus membrane barriers may suffer from life threatening infections
- Sa has a diverse spectrum of skin manifestations due to the numerous virulence factors it produces
- Sa is linked to many primary infections that dermatologist commonly see in practice such as: cellulitis, boils, and impetigo.<sup>1</sup>
- Liked secondary infections in those with atopic dermatitis and intertrigo due to disrupted skin barrier and frequent scratching

## Importance

- Current treatment approaches for SSTIs include antibiotics; however, overuse can lead to antimicrobial resistance raising the concern for MRSA
- 21-50% of people with SSTI caused by Sa will get recurrent infections prolonging their use of antibiotics<sup>2</sup>

## Methods

- Samples were obtained from two medicinal house plants to identify novel biotherapeutic agents to treat Sa infections
- Christmas tree plant is known for its antiseptic and emollient properties
- Aloe plant is known for its wound healing properties
- Isolates obtained from these plants were assessed for growth and antagonism to Sa on both trypticase soy agar (TSA) and brain heart infusion (BHI)
- Isolates that were found to be antagonistic underwent DNA extraction and 16s rRNA PCR.
- PCR was sent for sequencing and BLASTN was used to analyze results

## Results

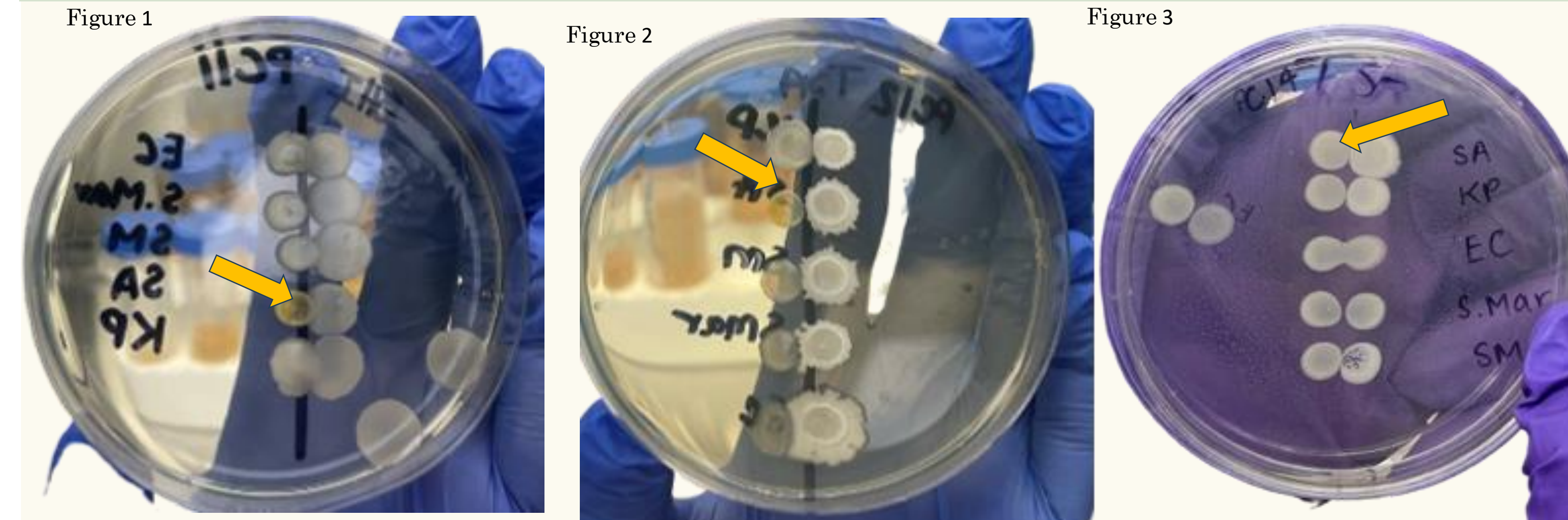


Figure 1: BHI. PC11 antagonistic properties against Sa. Isolate PC11 on right, Sa on left. Evidence shown by translucence of Sa.  
Figure 2: TSA. PC12 antagonistic properties against Sa. Isolate PC12 on right, Sa on left. Evidence of inhibitory effect is apparent with translucency of Sa.  
Figure 3: TSA. PC14 antagonistic properties against Sa. Isolate PC14 on left, Sa on right. Evidence of inhibitory effects shown by reduced growth of Sa.

Isolate	Bacteria	Antagonism Towards Sa	Query Cover (QC) E value Percent Identified (PI)	Characteristics
PC11	Bacillus sp.	BHI	QC: 99% E Value: 0.0 PI: 95.8%	Gram Positive Rod, aerobic, endospore forming. Commonly used in probiotics. Found in the soil, fermented foods, human gut <sup>4</sup>
PC12	Agrobacterium larrymoorei	TSA	QC: 96% E Value: 0.0 PI: 98.2%	Gram Negative Rod, Motile Plant pathogen that can be used to genetically modify plants by integrating their DNA segments into plant genome <sup>3</sup>
PC14	Serratia marcescens	TSA	QC: 96% E Value: 0.0 PI: 98.9%	Gram Negative Rod. Found in water, soil. Opportunistic pathogen <sup>5</sup>

## Clinical Significance

- Use of topical or oral biotherapeutics to prevent or treat Sa infections of the skin
- Promote a bloom of healthy microorganisms
- Replacing recurrent topical antibiotic use may help reduce antimicrobial resistance and MRSA infections in patients

## Conclusion

- Results of this highlight the potential of plant derived biotherapeutics
- Ability to utilize micro-organisms to control and outcompete harmful pathogens
- Introduce a healthy microbiome in those who frequently suffer from recurrent SSTIs

## References

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