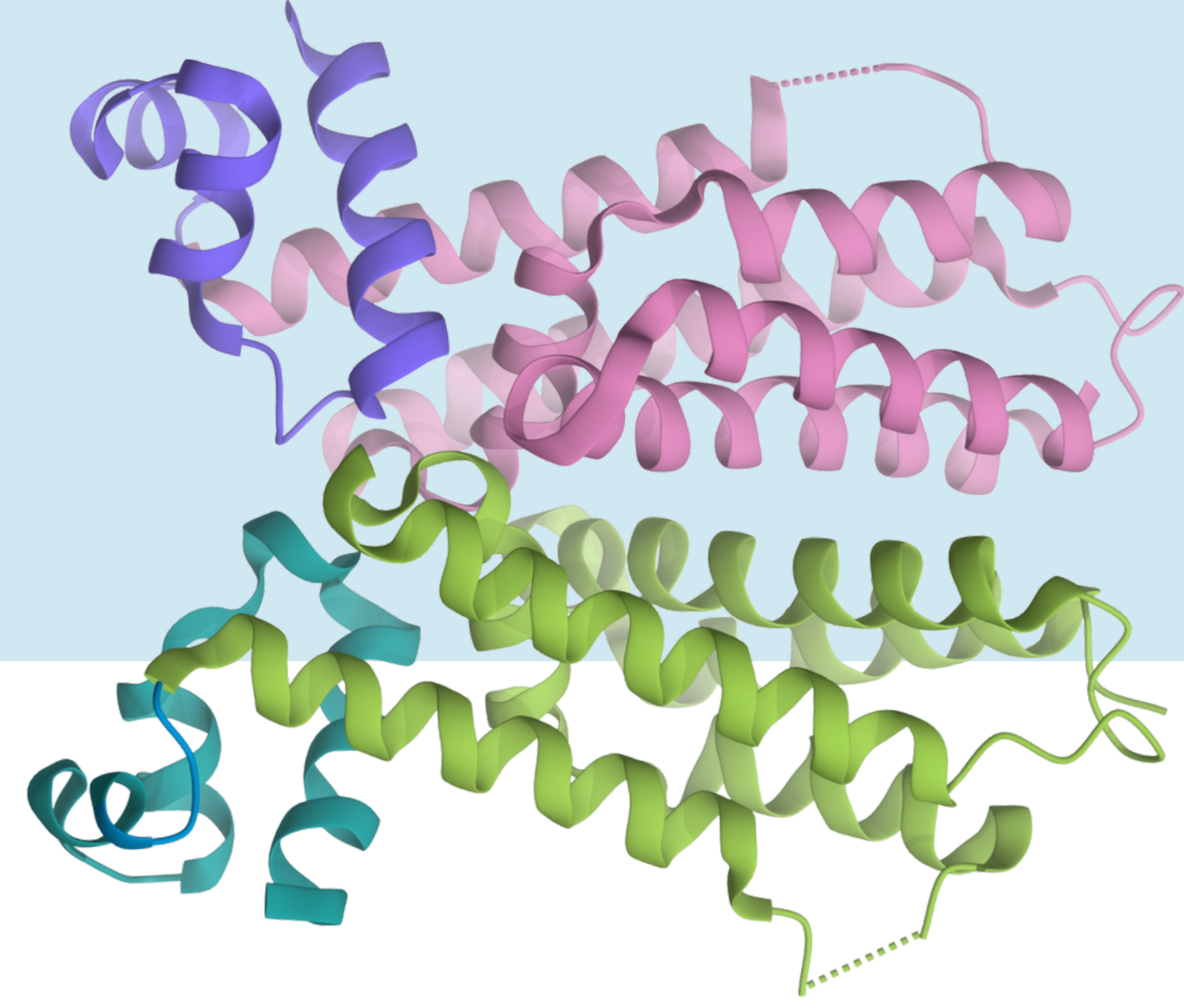




Unveiling the Silent Threat: IcaR in Staphylococci Biofilm Regulation

BACKGROUND

Staphylococci are the leading cause of Device-related infections in hospitals

Despite the significant threat posed by biofilms in inpatient care, there is a notable lack of research on the IcaR protein, responsible for regulating the intercellular adhesion locus and contributing to biofilm formation through PIA synthesis.

Our Approach to Solving This Problem

Our Objective

Since only IcaR proteins of *S. aureus* and *S. epidermidis* have been experimentally determined, the study aimed to produce theoretical yet realistic models of other *Staphylococcus* species to further understand their functional capabilities in biofilm formation.

RECOMMENDATION IN THE FUTURE...

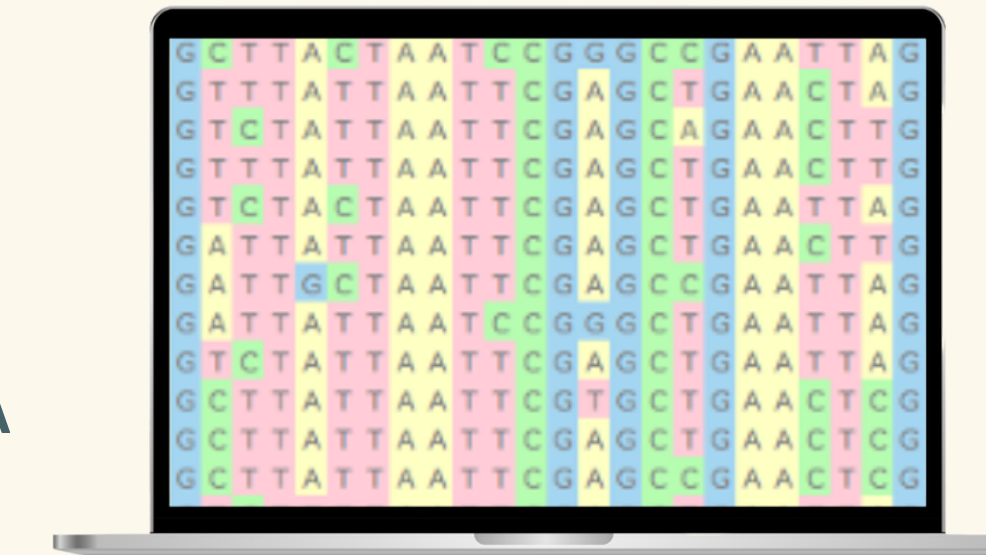
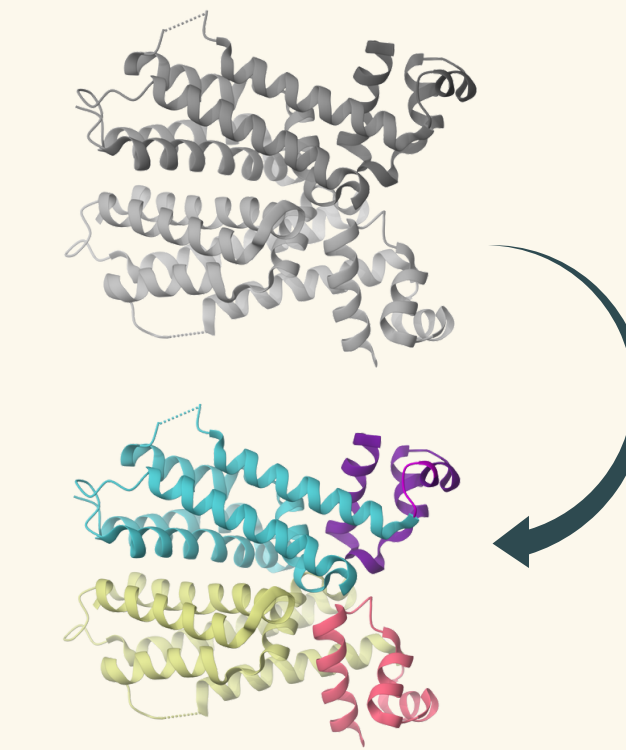
We hope that these findings have elucidated the mechanism behind lesser-known biofilm-producing Staphylococci. The next step is then to explore interactions between other biofilm regulatory proteins and establish therapeutic strategies that target their terminal regions for pharmacologic studies.

METHODS

In silico homology modeling allowed us to create new IcaR protein models

1 Molecular Characterization

Unknown IcaR protein sequences were subjected to physicochemical profiling via ProtParam and SOPMA



2 Homology Modeling

Homology Modeling via SWISS-Model, i-TASSER, and Phyre2 allowed for the creation of protein models

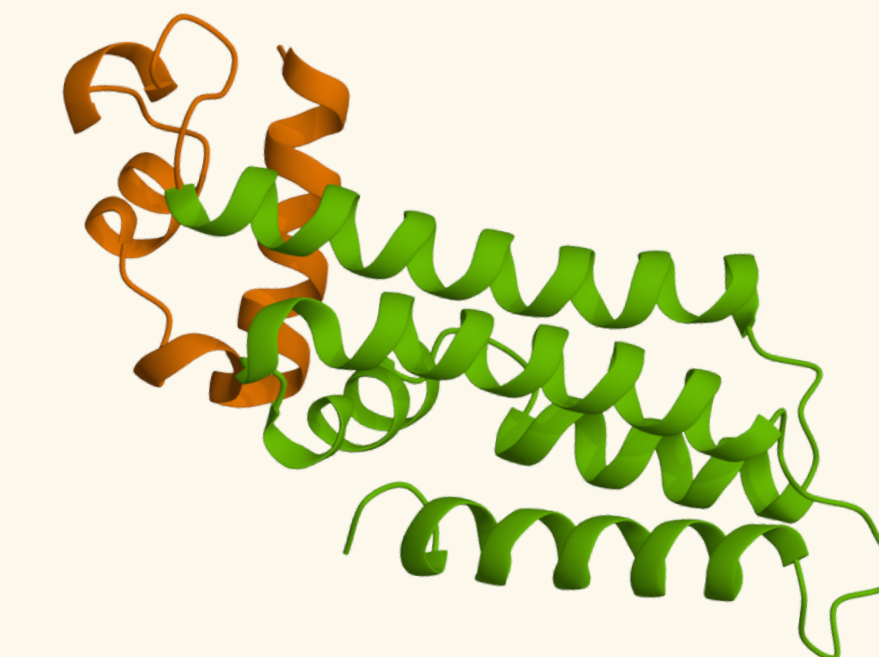
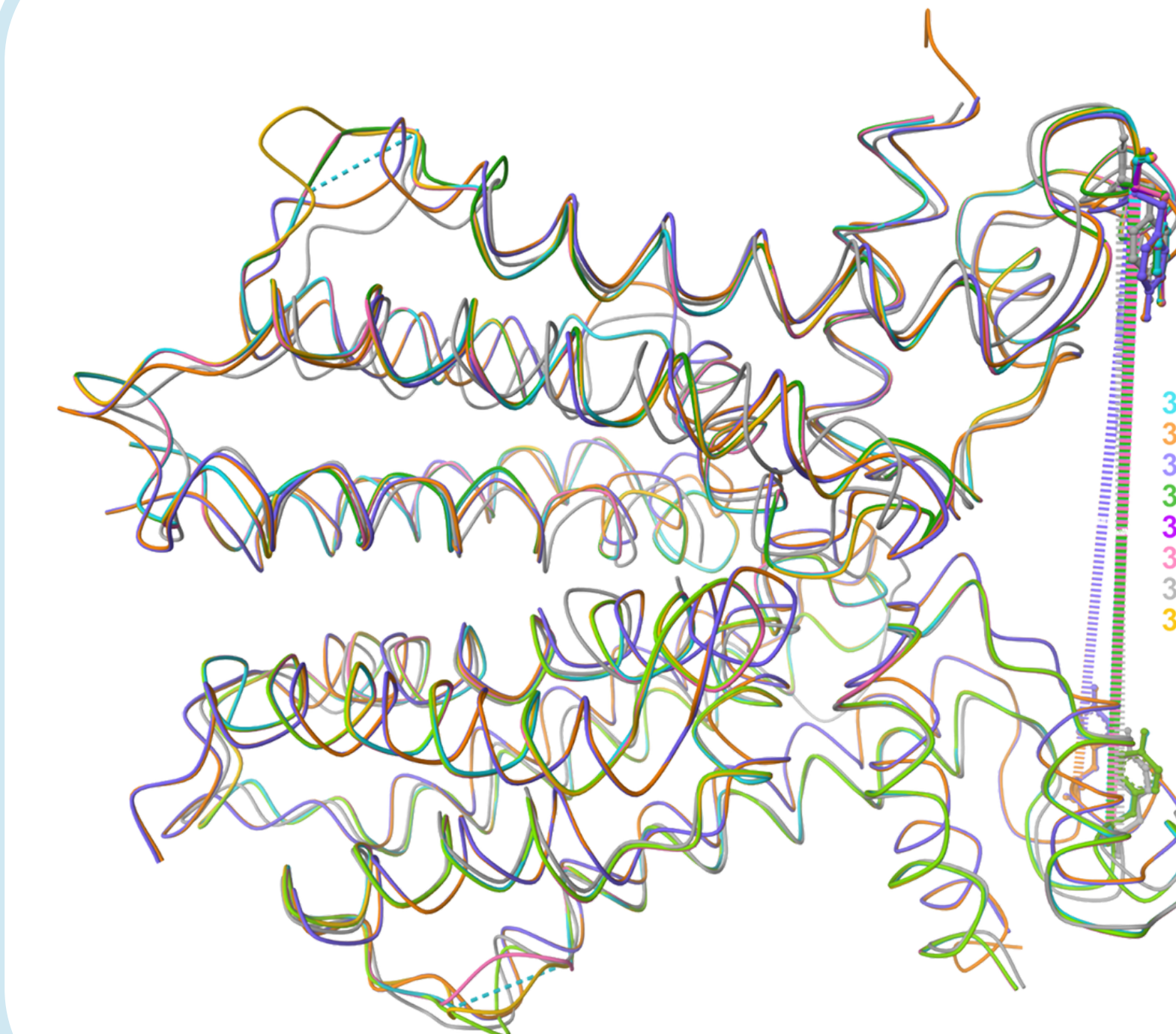
3 Refinement

The best models as determined via Ramachandron Plot analysis were further refined through GalaxyWEB



4 Protein Model Analysis

Structures were visualized through the RCSB MolStar to determine variations in structure



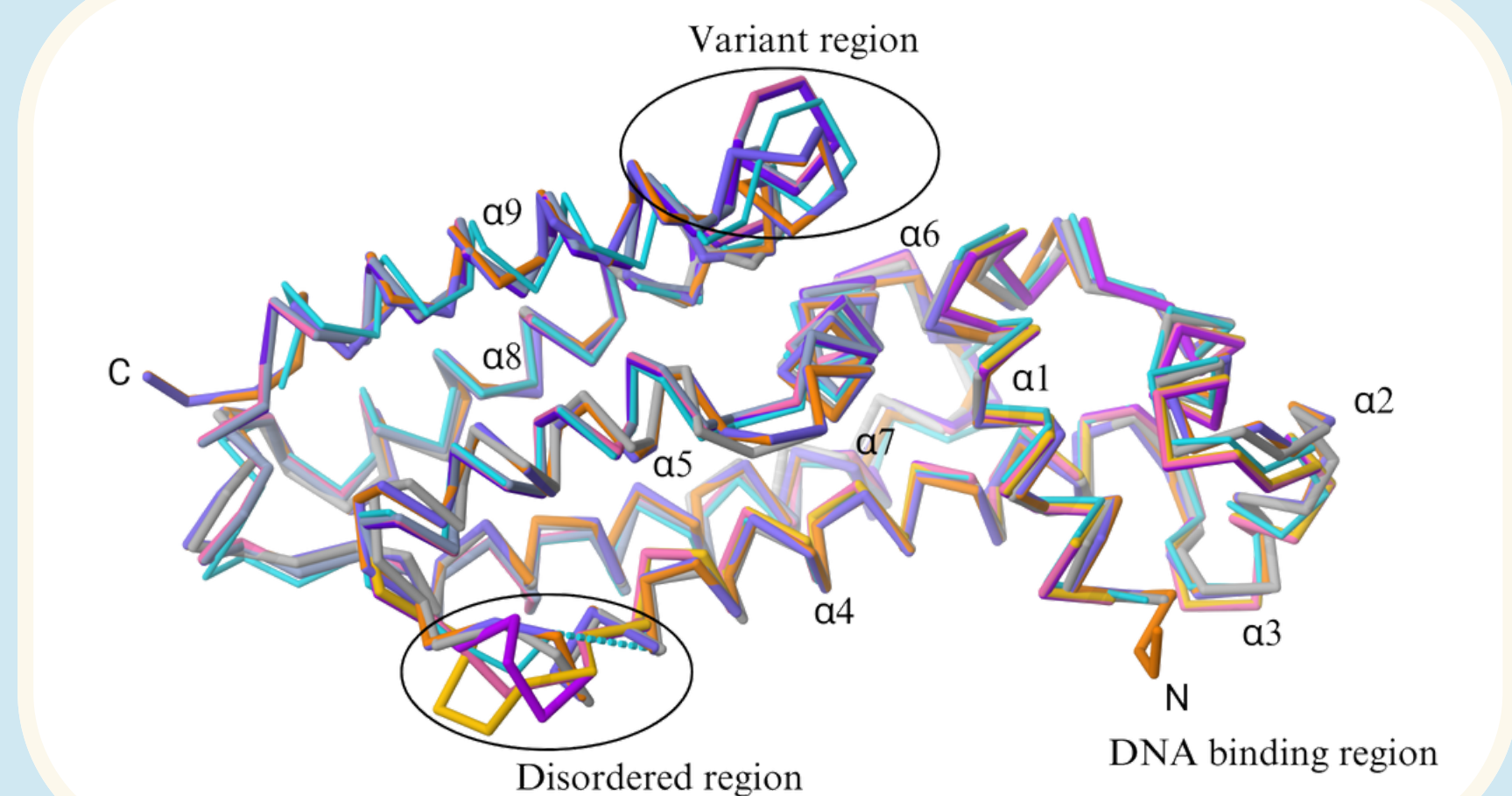
RESULTS

Superimposed IcaR proteins prove their homology but...

There were distinct variations labeled as variant and disordered regions where the greatest inconsistencies can be found. These sites suggest potential variation in dimer stability and ligand susceptibility among species.

IcaR proteins regulate biofilms by binding with the DNA; hence, less distance between dimers mean more efficient binding.

The numbers show that there is little variation between the dimers, indicating that DNA binding function are preserved among species.



CONCLUSION

New IcaR models could be the key in eliminating Staphylococcal biofilms!

We found that the IcaR proteins of *S. aureus*, *S. saprophyticus*, and *S. argenteus* are similar.

In contrast, *S. epidermidis*, *S. caprae*, *S. haemolyticus*, *S. xylosus*, and *S. capitis* are also exceptionally homologous!

...But what does this mean for biofilm regulation?

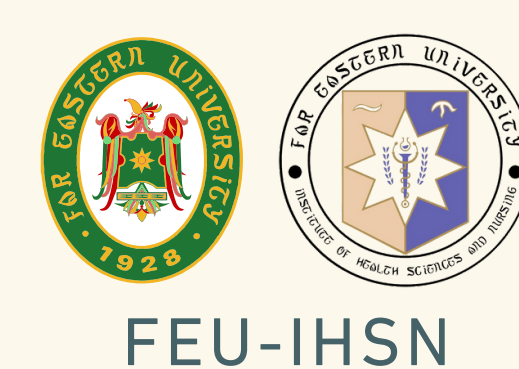
Homologous proteins suggest similar biofilm regulation. This means a closer step in developing **therapeutic interventions** effective against several Staphylococci at a time, leading to potentially more efficient means in **eliminating biofilms!**

RESEARCH PAPER



Molecular Characterization and Homology Modeling of Intercellular Adhesion Regulatory (IcaR) Proteins in Biofilm-Producing *Staphylococcus* Species

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