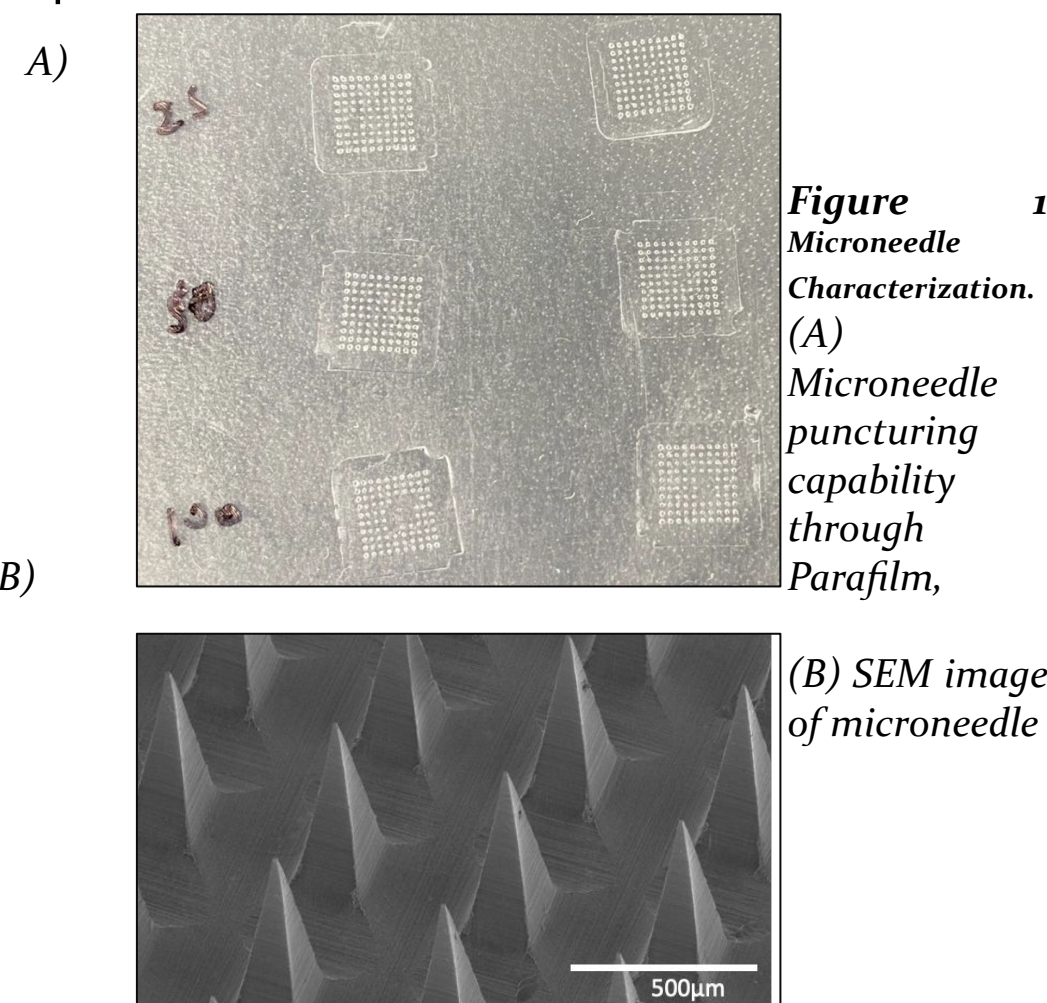


Introduction

- **Microneedles (MN)** have already been proven effective at delivering various biomolecules to patients
 - This includes being able to deliver EVs despite their extreme conditions that make them difficult to maintain their longevity outside the body
 - They also portray some benefits including being easier to self administer and being minimally invasive.
- **Extracellular Vesicles (EVs)** are vesicles that are released by cells that usually deliver proteins, metabolites, and nucleic acids to cells, but they also have therapeutic potential.



Objective & Impact of Professor's Research

Dr. Chung's lab focuses on developing targeted nanoparticles for therapeutic delivery. The lab specifically works with NK-EVs, which are endogenous therapeutic nanoparticles that have inherent honing properties. The lab strives to further improve NK-EV delivery through microneedles. The outcome will allow for a more efficient way to deliver treatment of diseased tumors.

Methods & Results

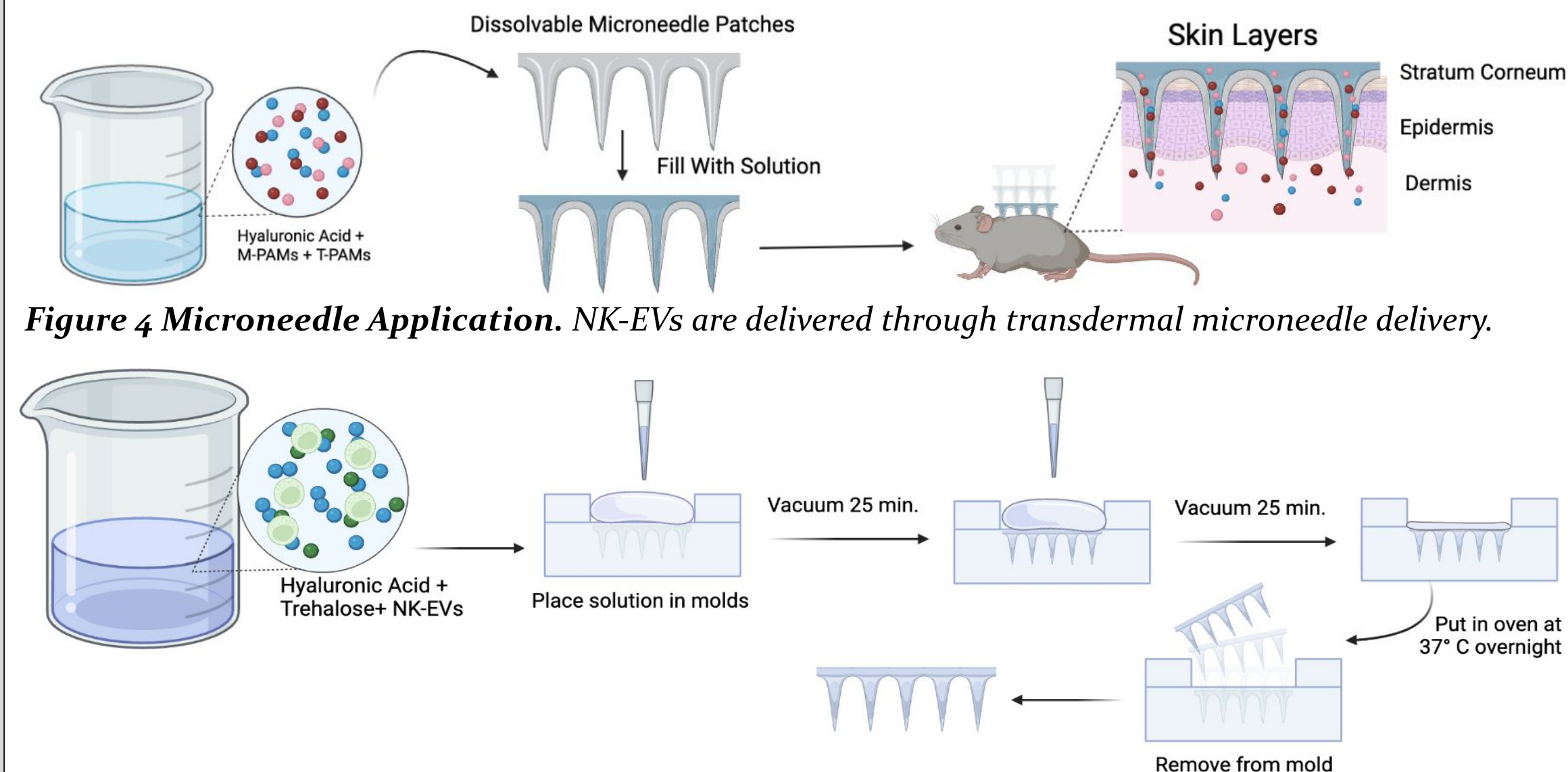


Figure 4 Microneedle Application. NK-EVs are delivered through transdermal microneedle delivery.

Figure 3 Microneedle Synthesis. HA and Tre solution are added to the MN mold.

- **Hyaluronic Acid (HA)** is a polyanionic gel-like polymer that can be found in the skin: it is shown to maintain protein stability, has low immunogenicity, and is FDA approved for dermal fillers
- **Trehalose (Tre)** is a disaccharide sugar found in mushrooms and shrimp: it has bioprotective effects, low immunogenicity, and is used as a stabilizer in the food industry

Results:

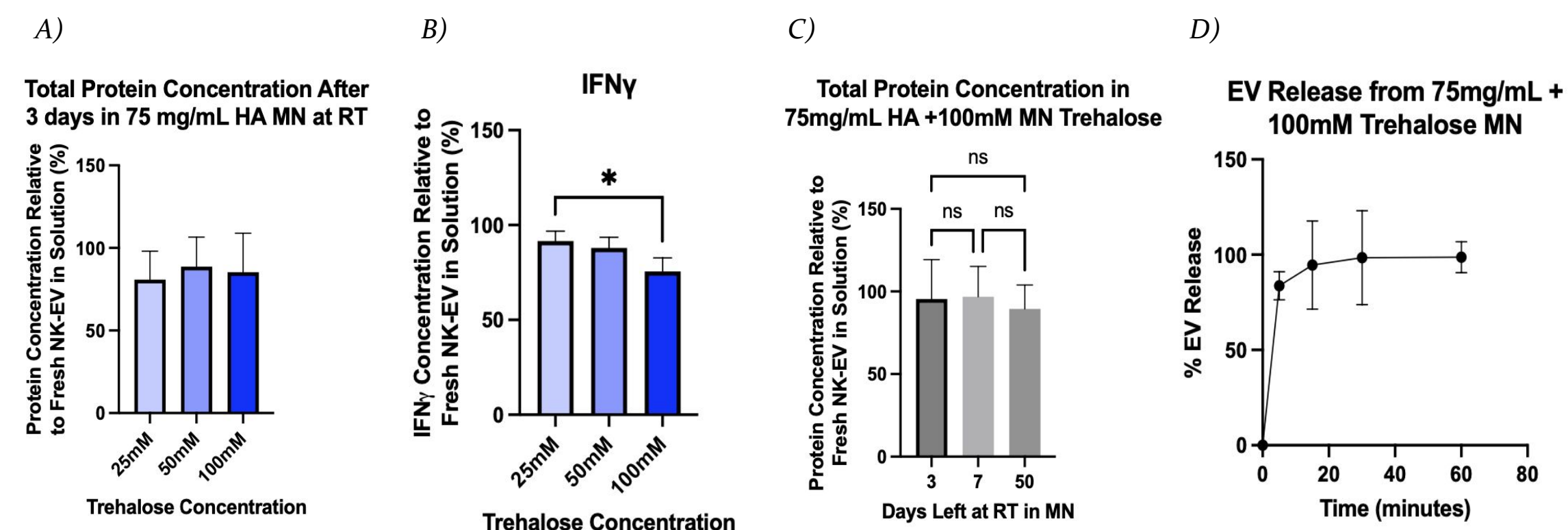


Figure 4 Microneedle Protein Stability. Microneedles are able to maintain EV protein stability even after being left at room temperature for multiple days.

Next Steps for You and Advice for Future SHINE Students

Throughout this program, I have learned how collaborative research labs are and how to do different procedures in the lab, including cell culture and microneedle synthesis. Additionally, I got to learn so much regarding research, career paths, and college in general, and I hope to apply my understanding of these things in the future.

For future SHINE students, I would tell them to not being afraid to ask lots of questions and to take advantage of the many opportunities SHINE offers to its students.

Citations

Yerneni,S.,et al, Acta Biomaterialia. 2022.

Mönkäre, J., et al. Journal of Controlled Release. 2015.

Bosch, S., et al. Scientific Report. 2016.

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