Research in Professor Richard Robert’s lab uses the process called mRNA display to select peptides that bind to target proteins. The goal is for these peptides to be used as disease diagnostics and therapeutics.

Throughout the seven weeks of SHINE, my mentor, Dr. Kaori Noridomi, my lab partner, Lillian Bailey, and I discussed the mechanisms of the complex mRNA display and performed mRNA display experiments. We also researched Covid-19 and explored mRNA display’s application to COVID-19.

**Objectives & Impact**

Through mRNA display, selected peptides could be used in diagnostic and therapeutic applications for diseases including autoimmune diseases, cancer, and COVID-19.

**Autoimmune Disease**

In an autoimmune disease, antibodies, whose job is to protect one’s body from viruses and foreign substances, malfunction. They instead attack one’s own body and tissue. Using mRNA display, peptides are developed that bind to the malfunctioning antibodies, called autoantibodies.

**Diagnostic Application**

The selected peptides could:
- Recognize the autoantibodies’ presence → diagnosing the disease
- Measure the amount of expressed autoantibodies → identifying the disease’s severity or progression

**Therapeutic Application**

Selected peptides could:
- Inhibit autoantibodies from binding to proteins → slowing disease progression

We researched mRNA display’s application to COVID-19. In a body, a spike protein on a SARS-CoV-2 virus binds to a ACE 2 human receptor. This binding allows the virus to enter human cells.

Using mRNA display, selected peptides could bind to the spike protein on the SARS-CoV-2 virus. These peptides could block the spike protein from binding to the ACE 2 human receptor, inhibiting the SARS-CoV-2 virus from entering human cells and slowing the viral progression.

**Next Steps**

I have been incredibly inspired throughout my seven weeks at SHINE. Wherever I go, I will carry a new level of knowledge, expertise, and confidence. I am especially eager to begin my Honors Research in Science II class next month. From SHINE, I have a whole new perspective on the challenges of research; I now feel confident in deepening the complexity and impact of my own research project. I am also very excited to start Honors Computational Chemistry. From this program, I have observed real-world applications of chemistry, and I have developed a love for it. I can definitely see chemical engineering and research being a part of my future.

The most important next step for me is staying in contact with and hopefully involved with Dr. Noridomi and Professor Roberts. I hope that I can continue to observe and be a part of their lab in the near future.

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