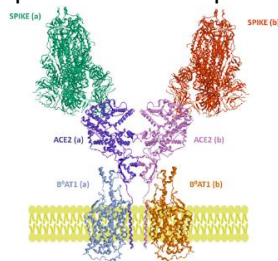
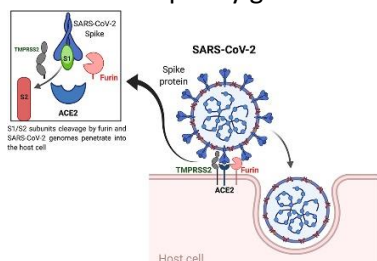


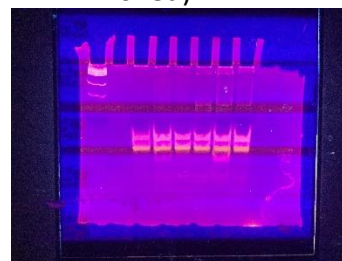
Q1: Research Question/Engineering Goal

- SARS-CoV-2 (the virus that causes COVID-19) attaches to the human 2nd angiotensin-converting enzyme (ACE2).
- This protein is found in almost all organ and blood vessel tissues, which is suspect for a cause of organ and brain damage associated with COVID-19.
- Gathering demographic data on single nucleotide polymorphisms found in ACE2 will be beneficial for treating and understanding COVID-19.
- Processes to quickly gather this demographic data were optimized.

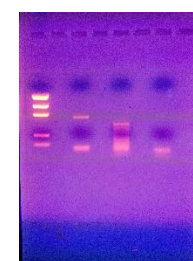


Q3: Data Analysis & Results

- Data from PCR and LCR is analyzed with gel electrophoresis.
 - PCR analyzed with agarose gels. Search for DNA at proper lengths.
 - LCR analyzed with polyacrylamide gels. See if primer lengths by gel location doubled from annealing.
- Data from qPCR can be analyzed with graphs (procedure not yet finished).



Polyacrylamide gel



Agarose gel

Q2: Methodology/Project Design

- Select polymorphisms.
 - Look for polymorphisms already discussed in scientific literature.
 - Use a webserver for predicting polymorphisms' effects on proteins.
- Design primers.
 - For both PCR and LCR.
- Extract DNA
 - Swab cheek cells, combine with buffer, incubate.
- Optimize PCR.
 - Change $MgCl_2$ concentrations and annealing temperature.
- Optimize LCR.
 - Change annealing temperature and test adjuvants.
- Redesign procedure for quantitative PCR machines.
 - LCR primers dropped, one primer moved over polymorphism location on genome.

Q4: Interpretation & Conclusions

- Human samples have yet to be collected, so the significance of studied polymorphisms is only known from data found in literature.
- All primers showed signs of annealing to their DNA at some point, suggesting success.
- DNA extraction procedure used amplified cells for PCR with equal efficiency of normal DNA extraction procedures with much less difficulty.
- PCR had success with 48°C on all primers and 1 μ L, 3 μ L and 4 μ L of $MgCl_2$ depending on the primer.
- LCR showed no success. Adjuvants will be tested in the near future.
- Quantitative PCR machines were not used but will be tested in the near future as access to one is gained.