Optimizing Conditions to Maximize Loading, Protection and Release of Nucleic Acids Using the Protocell

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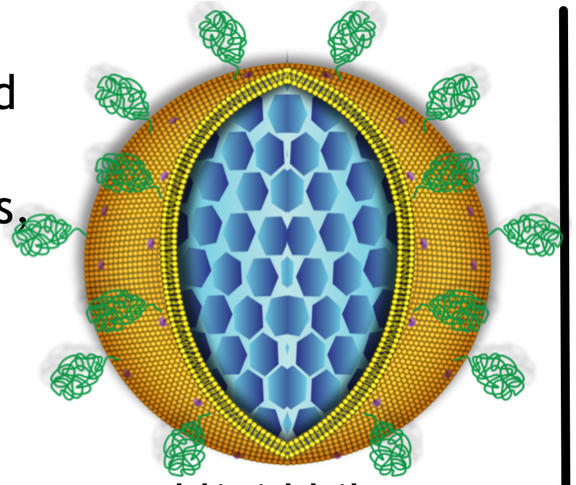
PROBLEM

Gene therapy is currently limited by the lack of a reliable nanocarrier that efficiently loads, protects, and delivers nucleic acids (such as DNA or RNA) to target cells.



GOAL

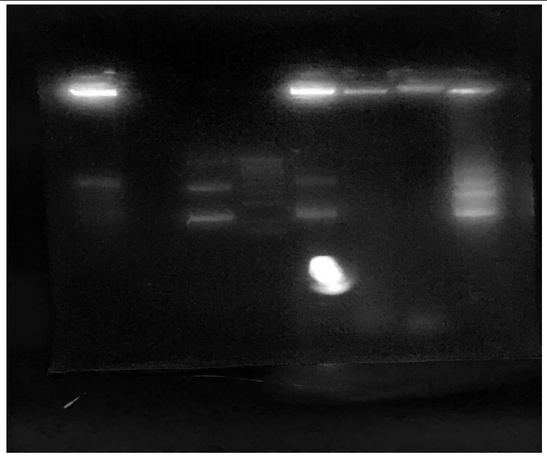
Develop the mesoporous silica supported lipid bilayer nanoparticle (protocell) for DNA delivery by exploring various pH and ionic strength conditions for loading DNA, and silica cores modified with cationic groups that may facilitate DNA loading, protection, and release

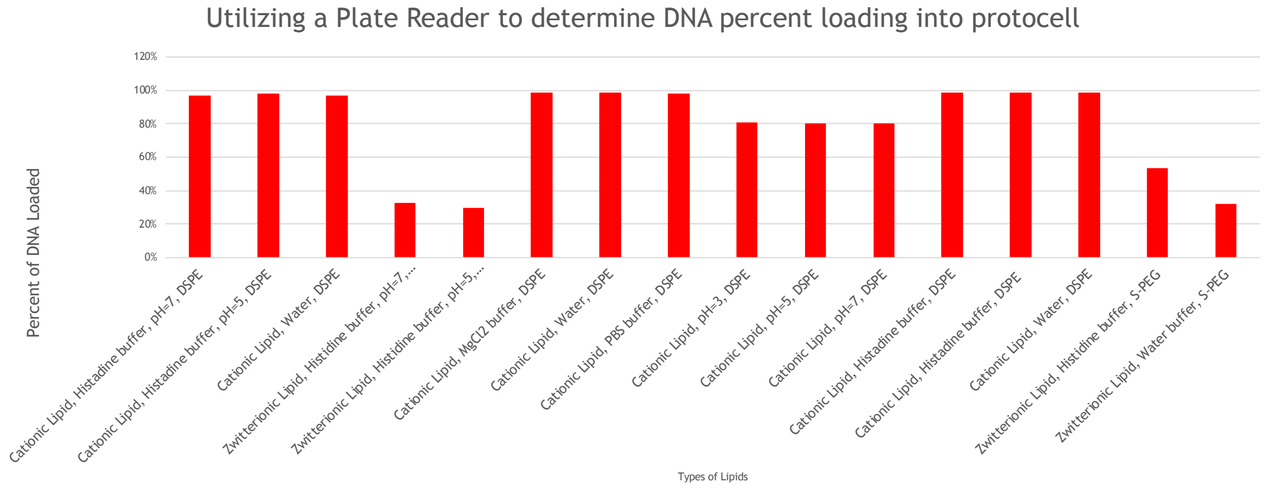
METHODOLOGY

- Associate cationic cores with negatively charged DNA. Use a cell plate reader to see if DNA was successfully loaded into protocell.
- Use different buffers (water, PBS, Histidine, etc.) to see if loading increases.
- Incubate DNA with destructive enzyme to see if degradation occurs using gel electrophoresis.
- Test transfection of protocell to cell by utilizing Green Fluorescent Protein (GFP) and Flow Cytometry.

RESULTS

- Cationic liposomes assist in loading and protection of DNA,
  but toxic and non-specific.
- Zwitterionic Lipids





FUTURE WORK

- Try different buffers that would help in loading and prevent degradation.
- Test buffer that will help in transfection
- Look into EGFR as an antibody for targeting
- Test DNA Loading and Release using cationic cores and zwitterionic lipids