Progress Report

Week of 10/1/18

Alex Goodman
Work/Research Accomplished:

- Met With advisor to discuss optical fiber system.
- Will begin more intensive planning after preliminary presentations
- Worked on Preliminary presentations all week

Problems:

- **n/a**

Will Bacon
Work/Research Accomplished:

- Met with team on Sunday to divide up roles for presentation
    - I was tasked with presenting the three preliminary designs that we put in our design matrix
- Spent most of week preparing for preliminary presentation
- Also continued research on immobilization of BCECF pH indicator
    - Sol-gel has been used to immobilize other pH indicators such as methyl orange, but no literature on immobilizing BCECF on sol-gel

Problems:

- Need to find way to immobilize BCECF pH indicator or some other unknown indicator on a biocompatible surface.

Mark Austin
Work/Research Accomplished:

- Met with Dr. Rogers to gain a bit of understanding on optical fibers and what direction to take with the type(s) of light we plan to use
- Prior to meeting, I had thought monochromatic light would be the best bet, but it seems like in order to measure a ratio (which is necessary) rather than an absolute value, using two specific wavelengths of light will be the way to go.
    - Look into BCECF absorption spectrum to determine which wavelengths to use
- Plan to simulate the BCECF spectra with MATLAB if I get the raw data out of the research sheet Kelsey found
- Worked on prelim presentations

Problems/Concerns:

- None as of right now

Kelsey Murphy

Work/Research Accomplished

- Went to Dr. Rogers's lab to get some more background on optics. We discussed the dual-emission/ratiometric nature of BCECF, which was very helpful in understanding the research I'd done to that point.
    - A ratiometric approach will remove a lot of the noise from the fluorescent signal
    - Take the measurements on either side of the isosbestic point of the spectrum
- I did some more research on BCECF and other pH indicators. I called ThermoFisher to learn more about BCECF - the technician I spoke to said she didn't know of a way to immobilize or encapsulate it or any of their other markers, and that diffusion might be a problem. It appears possible to her, however.
- I looked into using green fluorescent protein (GFP), which was of interested because it's often used in the literature and has many modified forms. Unfortunately, it's usually genetically encoded into cells, and it's incredibly expensive to purchase a purified form (hundreds of dollars for a few micrograms). A further question would be if it elicited an immune response in the patient. I decided to forgo this route.
    - An optics paper I read about GFP will be helpful. It gave an in-depth method of performing ratiometric measurements of fluorescent spectra. We can refer to it when constructing our device.
- I talked to Megan Livingston, a member of the Beebe lab, about encapsulating indicators in hydrogels or PDMS. We have a meeting scheduled for next week.
- Worked on the preliminary presentation for Friday. I will talk about the design matrix and future work.

Problems

- BCECF still looks like the best way to go, but we can't find anything in the literature about immobilizing or encapsulating it. If we don't find a more suitable/more researched probe, we might have to come up with a method ourselves.