Progress Report 8

Week of 11/12/18

**Alex Goodman**

**Work/Research Accomplished:**

- Began to plan BME outreach activity to complete during the spring
    a. Plan to explain CRISPR to 3rd graders
        - Genes determine how everyone looks
        - It's the cookbook of life
        - Previously, cookbook has been given to us my mother nature
        - But now, we have the ability and go in to the cookbook and change the recipe to our liking
            - Maybe it's too salty or sweet?
            - Maybe you have a nut allergy? What's the best replacement ingredient
        - This is what the future of gene editing looks like.
        - By the time you're grown-ups, you may be able to do this
    b. Break off into groups and choose one person to Edit
    c. This person will be the recipient of their teams decorations
        - Team's will be limited to only ⅜ decorations. There are trade offs in engineering
        - We have to be careful when choosing it
    d. At the end, BME team will be the judge of which team is the best
    e. At the end, we will explain that the "decorations" are analogous to gene editins
    f. Must be careful to specify the importance of first curing illness before designing our own humans
- Advisor out of town and materials on way from Doro's order

**Problems:**

- Nothing related to design. Group will meet after Tong lecture to consider BME Outreach project

**Will Bacon**

**Work/Research Accomplished:**

- We received some of our testing materials from Dr. Doro
- Finished going over testing protocol
- Began work on outreach project, and will meet up later this week to finalize our idea for it. The following factors will be discussed:
    - Timeline for outreach project
    - Potential locations
    - Interactiveness of design
    - Potential rewards for good designs/winning teams -- candy?
    - Assigning roles
        - Maybe have each us be assigned to a group to serve as an advisor
            - Could potentially be a mini-competition among us group mates

**Problems:**

- We will need to find a company or method to miniaturize the ISFET technology

**Mark Austin**

**Work/Research Accomplished:**

- Acquired thermometer and tea bags from Dr. Doro
    - To be used for temperature control of the pH sensitive solution and to hold the meat together for eventual simulatory pH measurement
- Began thinking about outreach project
    - Leaning towards doing something along the lines of:
        - Present problem
        - Offer supplies for varying prices
        - Give each team a budget
        - Test each design at the end
        - Reward winning team with candy
- Plan to try to meet with Dr. Rogers sometime early in the week before Thanksgiving if possible

**Problems/Concerns:**

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**Kelsey Murphy**

**Work/Research Accomplished**

- Began looking into outreach project (see Alex and Will's sections above for more info)
- Received thermometer and 'tea bags' from our orders, still waiting on sensor
- Attended/presented at show-and-tell meeting, received feedback from other students
    - Most questions were about sterilizability, durability, effects of miniaturization (focuses for our research)
- Researched challenges to using ISFET in biological environments
    - Appears that size of sensor shouldn't be an issue: reaction at surface is thermodynamic rather than kinetic, so *theoretically* should be able to downsize as much as we want
    - Found information on the Debye layer → the layer in which actual sensing occurs. It's more of a problem for electrical sensing than proton sensing, but it might be a contributing factor at physiological ion levels.
- Contacted Dr. Aviad Hai to learn more about physiological use of ISFETs. He uses tiny ISFET sensors to monitor neurological activity. He agreed to help, but haven't received a response to our questions yet.
    - What variables do we need to account for when miniaturizing oru sensor?
    - Does the Debye layer affect pH sensing?
    - Are there any modeling systems he knows of?

- Reviewed the site-binding model (how ISFET sensors pick up signals) to make sure I could talk about it intelligently in a meeting w/ Dr. Hai
- Found physiological ion concentrations for muscles in case ions interfere with proton sensing
    - Found them for healthy tissue, couldn't find values for injured tissue. It's likely it varies a lot.

**Problems/ To Do**

- Miniaturizing should be fine, but I want to get a confirmation from Dr. Hai first. I hope he's able to get back to us soon.
- Also haven't heard back from the DeltaTrak people yet on their sensing materials, although they said they were working on it.