

## Progress Report 1: November 2 – November 8

*Title: Device to monitor/control differentiation of stem cells to pancreas*  
*Client: Victoria Browning Ph.D.*  
*Advisor: Naomi Chesler Ph.D.*  
*Team Members: Dhaval Desai (Communications)*  
*Kyle Herzog (Team Leader)*  
*Tim Pearce (BSAC)*  
*Jon Baran (BWIG)*

### Problem Statement

Embryonic stem cells (ESCs) have the capacity to differentiate into every cell type in the body, and therefore can theoretically be used to generate cells and tissues to cure a variety of diseases. Our client in the Odorico Lab (Department of Surgery) has derived foregut-committed cell lines from ESCs (which correspond to progenitor cells of the gut region that develops primarily into pancreas) and would like to differentiate these ESCs into insulin-producing pancreatic beta-like cells. These cells could replace or supplement transplanted donor beta cells. The mechanisms required to differentiate ESCs into these pancreatic cells is currently unknown, and this device would aid in researching such mechanisms. Our client would like to test a large number of growth factors for their ability to affect conversion of these precursor cells to mature insulin-secreting cells. In addition, a recapitulation of the 3-dimensional embryonic environment to prompt cells to adopt a pancreatic cell fate, perhaps using a Matrigel substrate, is desirable. A small scale cell culture using microfluidics to set up growth factor gradients is one approach that could be successful.

### Restatement of Team's Goals

- Meet with Dr. Chesler on Monday (Kyle, Tim, Jon)
- Attend Distinguished lecture on Friday (Kyle, Tim)
- Research MatLab equations (Jon)
- Research Comsol disc (Kyle)
- Complete progress report (Kyle)

### Summary of Team Accomplishments

- We met with Dr. Chesler and Monday to discuss the project. She told us about Fick's method and dimensionless relations which could be useful for us in determining what tests to perform and what parameters to alter.
- We attended the distinguished lecture on Platypus technologies on Friday.
- Jon is continuing to work on MatLab as a tool to help us figure out the differential equations.
- Kyle attempted to install the Comsol software on his computer, but with complications so another source may have to be found.
- Kyle completed the progress report.

### Statement of Team's Goals

- Begin testing our first prototypes because Erwin said they have arrived.
- Meet with Dr. Chesler on Friday.
- Begin work on Final report

### Project Schedule

September 7	Form team, select project, contact client, email team roles to advisor
September 14	Background and research on project, create problem statement, begin PDS
September 21	Brainstorming, begin developing designs
September 28	Brainstorming
October 5	Finalize three alternative designs
October 12	Work on mid-semester presentation (oral and power point)
October 19	Mid-semester presentations
October 25	Submit design notebooks for advisor review
October 26	Design on final design
November 2	Work on design
November 9	Work on design
November 16	Work on design
November 23	Thanksgiving break

November 30                    Work on poster presentation  
December 7                    Final poster presentation, put poster presentation on team web site by 10:00am  
December 12                   Hand in written report and notebook to advisor  
December 14                   Final meeting with advisors

### **Project Difficulties**

- Setting up a maintainable gradient on such a small scale could be very challenging, and all of the possible methods are considerably complicated and will require significant research
- If we decide to go with a non-flow system there has been relatively little research performed on such a system so much of the work would have to be trial and error

### **Activities**

- **Dhaval (Communications)**
  - Total: 0.0 hrs
- **Kyle (Team Leader)**
  - Advisor meeting (0.5 hr)
  - Lecture (1.0 hr)
  - Progress report (0.5 hrs)
  - Comsol (1 hr)
  - Total: 3.0 hrs
- **Tim (BSAC)**
  - Advisor meeting (0.5 hr)
  - Lecture(1 hr)
  - Research (1.5 hr)
  - Total: 3.0 hrs
- **Jon (BWIG)**
  - Advisor meeting (0.5 hr)
  - Matlab (2.0 hr)
  - Research (1.0 hr)
  - Total: 3.5 hrs
- **Total Team Hours for this Week: 9.5 hrs**
- **Running Total for Each Member:**
  - Dhaval – 32 hrs
  - Kyle – 37.5 hrs
  - Tim – 35.5 hrs
  - Jon – 34.5 hrs

**Project Timeline (next page)**

Task	September				October			November				December			
	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14
<b>Preliminary Steps</b>															
Assign team roles	█														
<b>Meetings</b>															
Meeting with client	█		█												
Friday team meetings	█	█	█	█	█	█		█							
Meetings outside of class	█	█	█												
Semester wrap up with advisor and final client meeting															
<b>Design (pre-mid-semester)</b>															
Brainstorming design ideas	█				█			█	█						
Researching articles / products	█							█	█						
<b>Design (post-mid-semester)</b>															
Researching materials and cost		█	█						█						
Prototype building								█	▣						
Prototype testing								▣							
<b>Deliverables</b>															
Progress Reports	▣	▣	▣	▣	▣	▣	▣	▣	▣						
Project Design Specification	█	█	█					█							
Mid-semester presentation								█							
Final presentation															
Final paper															
<b>Other duties</b>															
BSAC meetings		▣		▣		▣		▣		▣					
Updating website						▣	▣	▣	▣						
Contacting client/suppliers	▣		▣	▣		▣		▣							

<b>Key:</b>	▣	Dhaval	▣	Kyle	▣	Tim	▣	Jon	█	All
	█	Holiday(s)								

Only individual tasks are indicated with special gradients

### Expenses

There are no expenses to be reported.