

## Progress Report 13: December 7 – December 18

*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

- Present poster (Kyle, Tim, Jon, Dhaval)
- Update notebooks (Kyle, Tim, John, Dhaval)
- Finish final report (Kyle, Tim, John, Dhaval)
- Complete progress report (Kyle)
- Meet with Dr. Chesler on Friday (Kyle, Tim, Jon, Dhaval)
- Meet with Dr. Browning next week (Kyle, Tim, Jon, Dhaval)
- Jon updated the website (Jon)

### Summary of Team Accomplishments

- We presented our poster at the BME poster presentation on Friday in ECB.
- We all put in time on our making sure that our notebooks were up to date and ready for hand in on Wednesday.
- We all wrote sections of the paper and we met on Tuesday to make sure that it was edited and ready for turn in.
- Kyle completed the progress report.
- We will meet with Dr. Chesler for the semester wrap up on Friday
- We will also meet with Dr. Browning next week Tuesday to present the poster to her and Dr. Kahan.
- Jon updated the website

### Statement of Team's Goals

- Continue work over break so that we are ready to go come next semester.

### 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
- Getting the Matrigel into the channel using passive pumping is difficult, but doable.

### Activities

- **Dhaval (Communications)**
  - Poster presentations (2 hr)
  - Advisor meeting (0.5 hrs)
  - Notebook/paper work (5.0 hrs)
  - Client meeting (1 hr)
  - Total: 8.5 hrs
- **Kyle (Team Leader)**
  - Poster presentations (2 hr)
  - Advisor meeting (0.5 hrs)
  - Notebook/paper work (5.0 hrs)
  - Client meeting (1 hr)
  - Progress report (0.5 hrs)
  - Total: 9.0 hrs
- **Tim (BSAC)**
  - Poster presentations (2 hr)
  - Advisor meeting (0.5 hrs)
  - Notebook/paper work (5.0 hrs)
  - Client meeting (1 hr)
  - Total: 8.5 hrs
- **Jon (BWIG)**
  - Poster presentations (2 hr)
  - Advisor meeting (0.5 hrs)
  - Notebook/paper work (5.0 hrs)
  - Client meeting (1 hr)
  - Website (0.5 hr)
  - Total: 9.0 hrs
- **Total Team Hours for this Week: 35 hrs**
- **Running Total for Each Member:**
  - Dhaval – 60.5 hrs
  - Kyle –65.5 hrs
  - Tim – 67.0 hrs
  - Jon –64.5 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**

Poster Printing: \$20

All other material donated from Browning, Berthier, Williams, Beebe.