

Progress Report 5: October 5 – October 11

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 to discuss the project (Dhaval, Kyle).
- Email Erwin to discuss meeting with him to discuss non-flow systems (Dhaval)
- Meet with Erwin to discuss non-flow systems and tour lab (Kyle, Tim, Dhaval)
- Update website (Jon)
- Complete progress report (Kyle)

Summary of Team Accomplishments

- We met with Dr. Chesler on Friday. We hadn't met in two weeks so we updated her on our meeting with Dr. Browning and our plans for the near future. She reminded us that midsemester presentations are rapidly approaching and we should begin work on them ASAP.
- Dhaval emailed Erwin and set up a meeting with him on Monday evening.
- We met with Erwin and it is evident that he will be a valuable resource. He went over the fabrication process with us and told us of things we need to consider when designing our device. He showed us the lab space and also assured us that Dr. Beebe would let us use his lab and supplies when we are ready to begin making devices.
- Kyle completed the PDS, and Jon updated the website.

Statement of Team's Goals

- Meet with Dr. Chesler on Friday
- Complete PowerPoint for Friday presentation
- Practice presentation as a group

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)**
 - Team meeting (1.5 hr)
 - Advisor meeting (0.5)
 - Email correspondence (0.5)
 - Total: 2.5 hrs
- **Kyle (Team Leader)**
 - Team meeting (1.5 hr)
 - Advisor meeting (0.5)
 - Progress report (0.5 hrs)
 - Total: 2.5 hrs
- **Tim (BSAC)**
 - Team meeting (1.5 hr)
 - Total: 1.5 hrs
- **Jon (BWIG)**
 - Website (2.0 hrs)
 - Total: 2.0 hrs
- **Total Team Hours for this Week: 8.5 hrs**
- **Running Total for Each Member:**
 - Dhaval – 16 hrs
 - Kyle – 19 hrs
 - Tim – 16.5 hrs
 - Jon – 14.5 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
Preliminary Steps															
Assign team roles	■														
Meetings															
Meeting with client	■		■												
Friday team meetings	■	■	■	■	■										
Meetings outside of class	■	■	■		■										
Semester wrap up with advisor and final client meeting															
Design (pre-mid-semester)															
Brainstorming design ideas	■		■	■	■										
Researching articles / products	■	■	■	■											
Design (post-mid-semester)															
Researching materials and cost		■	■	■											
Prototype building															
Prototype testing															
Deliverables															
Progress Reports	▨	▨	▨	▨	▨	▨									
Project Design Specification	■	■	■	■											
Mid-semester presentation															
Mid-semester paper															
Final presentation															
Final paper															
Other duties															
BSAC meetings		■	■	■	■										
Updating website				▨	▨	▨	▨								
Contacting client/suppliers	■		■	■	■										

Key:	 Dhaval	 Kyle	 Tim	 Jon	 All
	 Holiday(s)				

Only individual tasks are indicated with special gradients

Expenses

There are no expenses to be reported.