

## Perfusion Chamber with Elastic and Porous Membrane

*Client:* Dr. Donna Peters, UW Medical Sciences Center Department of Pathology

*Advisor:* Professor William Murphy, Ph.D.

*Team:* Holly Liske, Leader  
Laura Piechura, Communicator  
Joey Labuz, BWIG  
Kellen Sheedy, BSAC

### Problem Statement

Dr. Peters aims to test the effects of various drugs on the movement of fluid across a layer of human eye cells. Currently, the eye cells are supported on a silicon membrane that simulates the flexibility of the tissue in vivo. The membrane is placed in an Ussing perfusion chamber that measures the effects of pressure on the cell layer. This experimental system must be redesigned to allow greater control of the experimental conditions. Specifically, the chamber must allow for control of the movement of fluid, easy replacement of cell culture plates, and measurement of fluid pressure with computer-controlled transducers. In addition, a porous elastic membrane that permits fluid flow will replace the silicon membrane of the current system. A successful design will be used to screen for potential treatments of glaucoma.

### Week Eight

#### Goals:

- Pending Dr. Peters's response to the material list and budget, we hope to order materials by Monday, November 5. The majority of materials will be ordered from McMaster-Carr so are expected to arrive by Wednesday, November 7. The magnets may arrive later, but construction can begin prior to their arrival.
- Construction will begin with careful machining of the upper and lower pressure chambers from Plexiglas. The metal shells to be placed around the magnets will be machined after the magnets have arrived.

#### Activities:

Holly: Sketched dimensions of each design component as determined at an earlier group meeting (2.5 hr)  
Compiled a list of specific materials, dimensions, and budget for review by Dr. Peters (1.5 hr)

Laura: Began planning methods of construction (2 hr)  
Emailed Dr. Peters the material list and budget for final review and also to confirm the upper and lower chamber well dimensions (0.5 hr)

Joey: Reviewed and revised material list (2 hr)  
Researched construction methods, including Plexiglas machining techniques (1.5 hr)

Kellen: Began planning methods of construction (2 hr)  
Reviewed and revised material list (1)

#### Accomplishments:

- Components of the final design were carefully sketched with detailed dimensions and consideration of machining techniques.



Week Nine Progress Report: November 2 to November 8, 2007

**Expenses**

No expenses have been incurred.

**Material List and Preliminary Budget**

| Material  | Distributor        | Product # | Price            |
|---|--------------------|-----------|------------------|
| <i>O-ring: round PTFE (12)</i>  | Mcmaster.com       | 9559K22   | \$14.97 (50)     |
| <i>Upper chamber: 2.5" diameter, 1" length cast acrylic rod</i>   | Mcmaster.com       | 8528K41   | \$32.02          |
| <i>Lower chamber: 2" thick, 12" x 12" cast acrylic sheet</i>  | Mcmaster.com       | 8560K914  | \$72.24          |
| <i>Metal: 1.75" diameter, 12" length machinable low-carbon steel rod</i>                                | Mcmaster.com       | 8290T281  | \$18.89          |
| <i>Magnets: 1" outer &amp; 1/2" inner diameter, 1/4" thick, axially-magnetized, neodymium rings (4)</i> | Amazingmagnets.com | H250H     | \$23.00          |
| <i>Plastidip or Epoxy coating</i>   | Home Depot         |           | ~\$10            |
| <b>Total</b>  |                    |           | <b>~\$171.12</b> |