Brain Cooling Device

Client
Dr. Ugo Faraguna

Team Members
Jay Sekhon(Leader)
David Leinweber(BSAC)
Jon Seaton(Communicator)
Mark Reagan(BWIG)

Progress Report
April 2 to April 23, 2009

Problem Statement:
Sleep is homeostatically regulated; the more we are awake, the more and more intensively we need to sleep afterward. Despite this common notion, the mechanisms underlying the homeostatic regulation of sleep are still unknown. One key question pertains to which brain activities during waking are relevant for the subsequent homeostatic increase in sleep intensity. In parallel, one could argue what is relevant for the homeostatic decline of sleep intensity across the night. In other words what are the mechanisms underlying the idea that the more we sleep, the less we need to sleep. One option is that just the passage of time is relevant for both aspects of the homeostatic process regardless of any specific brain activity. Another option is that specific activities inducing neuronal or metabolic changes during waking are reflected during subsequent sleep. To distinguish these possibilities, an intriguing approach consists of selectively silencing neural activity in brain areas important for the sleep-wake cycle regulation; in particular of locally and reversibly silencing patches of cerebral cortex (where the homeostatic process most likely occurs). The specific aim of the project consists of developing a miniature cooling device able to reversibly silence neural activity in spatially defined brain areas of freely moving rodents.

Last Week's Goals
- Build a prototype Peltier cell circuit
- Test Peltier cell at different voltages to see cooling effects

Summary of Accomplishments
- Built prototype Peltier cell circuit
- Ordered parts for Peltier heatsink
- Began heatsink construction
- Gathered data on time required for heatsink to reach target temperature

This Week's Goals
- Finish final prototype construction
- Test device in static and dynamic agar apparatuses

Individual Goals

Mark: Built prototype Peltier circuit. Worked on data collection
Jay: Wrote progress report. Built tubing/heatsink combination
David: Built prototype Peltier circuit. Worked on data collection
Jon: Worked on data collection and heatsink.

Project Difficulties

We ordered the last necessary parts about 1 week ago and they still have not arrived.

Activities

- 4-10-09: Short meeting with Mitch to talk about attaching heatsink to Peltier cell
- 4/16-18/09: Engineering Expo
- 4/17/09: Ordered parts listed below
- 4/20/09: Short meeting to hash out final schedule
- 4–23–09: Jay wrote progress report. Meeting at Ugo's lab to build testing apparatuses and gather data.

Expenses

Thermal Paste-- $10.99
Hose-- $19.99
Power Supply-- $150.00

Task	January		February				March				April				May	
Papers	23	30	6	13	20	27	6	13	20	27	3	10	17	24	1	8
PDS	X	x	x		x	x	x									
MidSemester				X	x	x	x									
Progress Reports	X	x	x	X	x	x	x	x	X	x	x	x	x	x	x	x
Final Report											x	x	x	x	x	x
Prototype																
Preliminary Design	X	x	x													
Actual Design			x	X	x											
Order Parts				X	x	x										
Build					x	x	x	x					x	x	X	
Presentations																
MidSemester						x	x									
End												x	x	x	x	
Meetings																
Dr. Tyler	x	x	x	X	x	x	x	x	x	x	x	x	x	x	x	x
Client	x		x		x		x		x		x		x		x	