

Brain Cooling Device

Client

Dr. Ugo Faraguna

Team Members

Jay Sekhon(Leader)

David Leinweber(BSAC)

Jon Seaton(Communicator)

Mark Reagan(BWIG)

Progress Report 3

February 12 to February 19, 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

- Finish calculating device requirements to meet specifications
- Met with Ugo to begin examining vortex tube
- Begin analyzing designs in a design matrix

Summary of Accomplishments

- Met with Ugo to get additional information about design specifications
- Did preliminary testing with vortex tube (i.e., does it work)
- Set up temperature sensor in agar for device testing
- Began setting up the design matrix and weighting aspects

This Week's Goals

- Finish the design matrix so that designs can be evaluated
- Begin outlining components of mid-semester report
- Continue vortex tube testing for proof-of-concept

Individual Goals

- Mark: Began to outline the requirements in matrix form. Went and picked out valves/tubing to test the vortex tube for proof of concept.
- Jay: Set up vortex tube schematic with all components. Wrote weekly progress report. Went and picked out valves/tubing to test vortex tube.
- David: Began to outline the requirements in matrix form. Set up temperature sensor and agar gel. Looked for ideas on efficiently compressing air to use in vortex tube.
- Jon: Completed vortex tube schematic for testing purposes. Sized valve/tubing components. Set up temperature sensor and agar gel.

Project Difficulties

There have not been any notable difficulties yet.

Activities

- 2-13-09: Project meeting with Dr. Tyler
- 2-19-09: Team meeting to test vortex tube; Mark & Jay picked out valves and tubing; David & Jon set up agar gel and temperature sensor
- 2-20-09: Jay wrote progress report.

Expenses

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 Progress Reports				x	x	x	x									
Final Report	X	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
											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								
Presentations																
MidSemester End						x	x					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	