

Brain Cooling Device

Client

Dr. Ugo Faraguna

Team Members

Jay Sekhon(Leader)

David Leinweber(BSAC)

Jon Seaton(Communicator)

Mark Reagan(BWIG)

Progress Report

April 24 to May 1, 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 final prototype construction
- Test device in static and dynamic agar apparatuses

Summary of Accomplishments

- Built final Peltier cell circuit
- Attached heatsinks to Peltier cells
- Completed vortex tube calibration for cooling
- Finished final prototype
- Tested device in agar in dynamic environments
- Made thermal gradient
- Finished poster + presentation

This Week's Goals

- Finish end of semester deliverables

Individual Goals

Mark: Built final Peltier circuit. Worked on data collection. Calibrated vortex tube.

Jay: Wrote progress report. Attached heatsink to Peltier device. Obtained thermal gradient.

David: Built final Peltier circuit. Worked on data collection. Worked on testing apparatus.

Jon: Worked on data collection and heatsink. Built housing for final Peltier device. Calibrated vortex tube.

Project Difficulties

Activities

- 4-24-09: Meeting with Mitch to talk about pre-poster session game plan
- 4-28-09: Final prototype construction meeting, testing, and poster work
- 4/29/09: Final prototype construction meeting, testing, and poster work
- 4/30/09: Final prototype construction meeting, testing, and poster work
- 5-1-09: Jay wrote progress report. Poster session.

Expenses

