

Draft Submission for UW BME Undergraduate Student Design Project

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for submission at

http://ecow.engr.wisc.edu/cgi-bin/get/bme/200/webster/webform_21feb2006.html

Project Title:

Design and Construction of a Quad Rat Vitals Monitor

Project Description:

In positron emission tomography (PET) radiotracer imaging experiments, four isoflurane anesthetized rats are simultaneously scanned in the Waisman Laboratory for Brain Imaging microPET P4. These are complex and expensive experiments where it is essential to keep the animals anesthetized deeply enough that they do not move throughout a three hour scanning session while, of course, avoiding killing or otherwise harming them with too much anesthesia. A system has been built in-house to independently vary the concentration of isoflurane anesthesia delivered to each of the four rats. Currently, heart rate and blood oxygenation are monitored with a commercial device intended for larger animals having a single pulse/ox clip (Heska Vet/ox), and rectal temperature is monitored with battery powered human oral thermometers. This arrangement has certain disadvantages: the pulse/ox clip must be periodically moved from rat to rat, the device can not interpret heart rates above 350 beats per minute and often fails to correctly interpret rates, and logging of all measures must be done by hand. The goal of this project is to design and construct a quad rat vitals monitor using commercially available pulse/ox and temperature sensors, National Instruments hardware and software, and a laptop computer. Additional circuitry may be required to power the sensors and amplify their output signals. labVIEW software will be developed to interpret the signals and simultaneously display the four pulse/ox traces, heart rate, and SpO2 values. The heart rates and SpO2 values will be logged. This might be a patentable device, but it is not clear how large the market might be.

Expected expenses are <\$1000 for four pulse/ox sensors (eg Harvard Apparatus 723256), <\$800 for four rectal temperature probes (eg Harvard Apparatus 599808), <\$500 for amplification and conditioning circuitry, <\$500 for National Instruments ADC (e.g. USB-6008), <\$800 for laptop computer (eg Dell Inspiron 1525), and <\$400 for miscellaneous. Total <\$4000. Significantly cheaper sources may be found for the pulse/ox and temperature sensors.

Project Supervisor:

Alexander K. Converse, Ph.D.

<http://www.waisman.wisc.edu/faculty/converse.html>

Materials and Supplies available:

LabView software, rats as needed for testing, machine shop, many standard electronics components, supplies, and tools including oscilloscopes and DVMs.

Project is likely to include:

Software, Electronics, Animal Experiments

Relevant journal articles and/or websites:

Ford DJ et al, Design of a pulse oximeter for use in mice, Penn State Dept Bioengineering, Spring 2005 Senior Design Project

<http://www.bioe.psu.edu/SeniorDesignProjects/SD2006/DFord/bioe450%20web%20page.htm>

Starr Life Sciences, "Inventors of the world's first and only pulse oximeter for mice and rats."

<http://starrlifesciences.com/#star>

Budget available for this project:

\$4000