




## **Abstract**

The peripheral nervous system (PNS), consisting of the sympathetic (SNS) and parasympathetic nervous system (PSNS), innervates organs of the body, providing information from external and internal stimuli to the central nervous system (CNS, or brain), in turn allowing the CNS to communicate with internal organs. Energy balance relies on tightly maintained crosstalk between the CNS and peripheral metabolic tissues and organs such as adipose tissue (or fat tissue). In addition, peripheral neuropathy (or death of peripheral nerves) is a hallmark of certain metabolic conditions, such as type 2 diabetes mellitus, obesity, and aging. However, the exact mechanisms by which peripheral innervation, action of peripheral nerve products, and peripheral neuropathy occur are not clear. Sympathetic nervous system innervation and activation of the thermogenic (energy-expendng) brown adipose tissue (BAT) is well documented and crucial to proper tissue function (1). Sympathetic innervation and activation of fuel-storing white adipose tissue (WAT) promotes lipolysis and development of brown adipocytes in this depot, termed ‘browning’ (2). Some studies also suggest that proper peripheral nerve function is integral in maintaining healthy WAT function (3). Therefore, my thesis research aims to fill in the gaps of the current body of knowledge regarding the role of the PNS in adipose tissue, and the subsequent effects on metabolic function and energy balance.

Productivity in science is enhanced by a collective effort, which is often key in timely publication of research. Two aspects of my thesis work have already benefited from the contributing efforts of undergraduate students assisting with experiments that comprised their Capstone projects. While contributing data to larger projects, these students were trained to work independently and employ novel techniques, providing them with invaluable skills for future careers and the possibility of authorship in publications. Enabling undergraduates the opportunity



to be involved in laboratory research supports the reputation of the University of Maine as a formidable research center. However, during the months when school is not in session it becomes difficult to retain undergraduate students in the lab. For many students the summer interim is a necessary period to acquire financial support for the coming academic term or to secure a paid internship. The prospect of remaining in a current lab position to continue building acquired skills is an explicit preference for one of my Student Lab Technicians, however, without financial compensation it is not a feasible option. Therefore, I am requesting a grant of \$850 from the GSG to help offset the cost of financing a Student Lab Technician for the summer months. Being able to maintain an already trained student throughout the summer would be a tremendous asset to my thesis work improving project continuity for me as well as the student who could seamlessly transition to Capstone work once the Fall Semester begins. Moreover, the Student Lab Technician would be contributing to research that directly relates to the State of Maine, as we are a state disproportionately affected by ageing diseases such as obesity and diabetes.

References:

1. Bartness TJ, Vaughan CH, Song CK. Sympathetic and sensory innervation of brown adipose tissue. *Int J Obes (Lond)*, **34**, S36-S42 (2010).
2. Cannon B, Nedergaard J. Brown adipose tissue: function and physiological significance. *Physiol Rev.*, **84**, 277–359 (2004).
3. Ruschke K, *et al.* Defective peripheral nerve development is linked to abnormal architecture and metabolic activity of adipose tissue in Nsc1-2 mutant mice. *PLoS ONE*, **4:5**, e5516 (2009).



**Itemized Budget**

<b>Item #</b>	<b>Description of Item</b>	<b>Source</b>	<b>Quantity</b>	<b>Individual Cost</b>	<b>Total Cost (Quantity x Ind. Cost)</b>	<b>Amount Required</b>	<b>Amount Requested (max GSG award)</b>
1	Hourly Wage - Student Lab Tech IV Step II	University of Maine	360	\$8.35	\$3006.00	\$3006.00	\$850.00
<b>TOTAL</b>					<b>\$3006.00</b>	<b>\$3006.00</b>	<b>\$850.00</b>

**Budget Explanation**

1. The University of Maine wage for a Student Lab Tech at the stage of my current student is \$8.35 per hour. Full-time employment is defined as 30hrs/week. For the cost calculation a 12-week period covering the summer months was used; this was then multiplied by 30 for a total amount of 360 hours. At a wage of \$8.35/hour the total cost of a full-time Student Lab Tech for the summer would be \$3006.00. No other options or alternative sources of wages are provided, as they are not applicable in this scenario. The wage is set by the University of Maine and is not a point of negotiation. This is incidentally the most economic choice, as the student is already trained in many techniques and paid time hours will not need to be devoted to initial training.

The entirety of the GSG grant would be used to offset the costs of wages for a full-time summer Student Lab Tech. My advisor has agreed to supplement a portion of the cost not covered by grant sources. Other sources of funding are being explored. Currently, a submission to the CUGR Undergraduate Research & Creative Activities Summer Fellowship as well as Summer Work Study are being prepared, however, these are very competitive.