

UNDERGRADUATE RESEARCH LONG TERM GRANT APPLICATION Budget Worksheet

BUDGET ITEM	Department or College Funds	Outside Agency Funds	Personal Funds	Undergrad. Research Funds	GRAND TOTAL
Materials				BDNF Sandwich ELISA Kit from ChemiKine (\$379 x2 each + 10% shipping and tax) = \$833.80 Disposable GLOVES (1 Box x \$15.00 per box) = \$15.00 22 GAUGE NEEDLES (1 case x \$9.87 each + 10% shipping and tax) = \$10.86 Red Top 6 ml VACUTAIN RS 1 case x \$35 each +10% shipping and tax) = \$38.50 ALCOHOL WIPES (1 case x \$15.00) = \$15.00 Miscellaneous and Disposable lab supplies (cryobox, cryovials, parafilm, funnels, pipette tips, reagent reservoirs, Sigmaclean, etc.) = \$116.65	

				Office supplies (copies, desk supplies, postage)= \$20.00	
				Venipuncture labor (to be conducted by a Utah certified phlebotomist or registered nurse) \$5/draw x 80 subjects = \$400	
Equipment	All equipment needed is supplied by the HPHP Nutrition Laboratory				
Stipend: Hrs @ \$10/hr Benefits @ 8.5% Total			NA (this project is for course credit)		
Mileage to gather Data (.36 per mile)			N/A		
GRAND TOTAL				\$1449.81	

UNDERGRADUATE RESEARCH LONG TERM GRANT APPLICATION

Body of Proposal

Project Description

(Approximately 2 pages)

This research project will examine the effect of exercise on increasing brain-derived neurotrophic factor (BDNF) in obese women initiating an exercise program. BDNF is found in the hippocampus and cerebral cortex of the brain. It can also be found in circulating blood within the platelets and plasma (Chan, et al., 2008). BDNF may prevent neural death; promote neuronal growth and neural regeneration (Gold, et al., 2003). Therefore BDNF may improve brain health; and lifestyles to enhance BDNF levels may be beneficial.

There is evidence from previous studies that shows the positive effects of exercise on brain health and function. Exercise or physical activities can increase the level of BDNF in animal studies (Chan, et al., 2008). One study found that thirty minutes of moderate exercise significantly induced BDNF production in multiple sclerosis patients and controls (Gold, et al., 2003). In another study short episodes of high intensity exercise transiently increased serum levels of BDNF in humans (Currie, et al, 2008). In regards to studies that investigate BDNF levels in obese subject, there is no research at all. Additionally, there is no research that has investigated BDNF in obese humans that are exercising. This study may show evidence that exercising is good for brain health in obese, exercising women.

The objective of our research is to investigate any association of exercise and BDNF in obese women. This study will contribute to future clinical studies that study positive effects of exercise for obese individuals. We hypothesize that BDNF levels will increase in obese subjects after exercise which will improve brain function as well as improve physical health.

My role in this research project will be mostly independent. Although I will rely on Dr. Rodney Hansen of the human performance and health promotion department for help with the IRB, recruitment and hiring of a phlebotomist, and guidance with working with the Women in Motion program, most of the work will be conducted by myself. I will keep a record of procedures throughout the study, collect data and store serum, and analyze serum for BDNF. I will then be required to present the results at a public forum. I would like to eventually present this research at the WSU Undergraduate Symposium, and possibly NCUR 2010 or FASEB 2010.

My education at Weber State University, thus far, includes the following classes which contribute to my knowledge of this study: Foundations in Nutrition (NUTR 1020), of which I learned about the basic principles of human nutrition and obesity, Healthy Lifestyles (HLTH1030), which focused on health promoting activities in prevention of disease and optimal health, Human Biology (ZOOL 1020), where I learned the basic structure and function of the human body, and Principals of chemistry I (CHEM 1210), which has prepared me for clinical laboratory work involving qualitative and quantitative methods of analysis. I have also taken Food Values, Diet Design & Health (NUTR 2320), which covered chronic diseases, and Foundations of Health Promotion (HLTH 3000). In all of my upper division classes I have obtained a grade of A- or higher. I will take the following classes in fall 2009 as I conduct my undergraduate study: Directed Undergraduate Nutrition Research (NUTR 4520) and General Chemistry II (CHEM1220).

I have gained lab experience from general chemistry and am familiar with laboratory equipment and protocol. I have followed precise procedures that have been essential in obtaining reliable results. In preparing for this study I will continue to do literature reviews relevant to the research question. This study will be used for my capstone project for completion of my bachelor of integrated studies degree. I will work diligently to execute a successful research project that will benefit current research and future research projects.

The study will be catalogued in the Stewart Library archives as a research paper which will detail the original hypothesis, the methods used, and the results found. It will also be presented at the Weber State Undergraduate Research Symposium.

Project Methods & Timeline

This study involves human subjects. An application for IRB approval from the WSU Institutional Review Board was submitted on 9-18-09.

Hypotheses:

1) After exercise, BDNF levels will be different between normal weight students, obese women starting an exercise program, and women who have been exercising for at least a year.

Subject Selection:

Women in Motion is a service program of the Health Promotion and Human Performance Department at WSU and is in its fifth year. Women in Motion is a low cost, group training program for women with a BMI over 30. Participants meet twice a week for sixteen weeks for education, strength training and walking at Weber State University. At the end of the sixteen weeks, the women compete as a relay team in the Ogden Marathon. All subjects will be recruited from the Women in Motion Program. This proposal would investigate the BDNF changes during the first three months (12 weeks) of the program.

This project will require 20 subjects. The subjects will be six student interns (who assist in the Women in Motion program), fourteen women in action participants (seven new and seven returnees). Table one gives an outline of how I plan to conduct the project. All Data collection will be carried out in the Swenson Gym, Weber State University (contact: Dr. Hansen, PhD).

Table 1

Itinerary	Hours	Dates
Data Collection inc. blood separation	40	Jan 21 st – April 13 th
Blood analysis	55-70	April 17 th – June 11 th
Data analysis	50	June 11 th – July 9 th
Prepare presentation	50	Fall 2010

Blood Collection for BDNF Analysis:

Serum for BDNF analysis will be obtained by needle and syringe via sterile venipuncture, at the following time points: prior to initiation of WIM program and treatment, and every four weeks for the twelve week duration (four total time points). Participants in the study will walk for thirty minutes as part of the regularly scheduled activities of Women in Motion. Five minutes after they have finished walking a licensed phlebotomist will draw 5-10 ml of blood from each participant. Blood will be allowed to sit at room temperature for twenty minutes until it is centrifuged and serum is drawn off and stored at -80C. The serum BDNF will be detected in a sandwich ELISA kit. We will compare data between the groups and within groups and look for significant differences between groups and for significant differences within and between groups over time. The control group (student interns) will be used as a reference, for optimal body weight BDNF production compared to the women in motion subjects. The new subjects BDNF levels will be compared to the returnees BDNF levels, to see how those new to exercise experience an increase opposed to those who have exercised before. Within groups we will analyze the change of BDNF levels from the start of the program to the end, noting any significant differences.

Long-term grant funds will not be used to purchase equipment, travel or stipend. Equipment needed will be provided by the Nutrition Laboratory in the Human Performance and Health Promotion Department at Weber State University. Equipment provided includes a centrifuge for blood separation, a -80 C freezer for blood serum storage, a 96 well plate reader for analysis of BDNF, and the use of laboratory space. They will also provide test tubes for mixing and diluting agents and blood serum, pipettes for precise measurement of liquids and immunoassay micro-plate reader for quantification of BDNF in blood serum.

With funding for this project, a better understanding of the effects of exercise on the brain health in obese, exercising women will be derived. Brain Health and specifically BDNF in obese, exercising women is currently under researched. This study will significantly contribute to researching brain health in obese women.

References

- Chan, K., Tong, K., & Yip, S. (2008, December 12). Relationship of serum brain-derived neurotrophic factor (BDNF) and health-related lifestyle in healthy human subjects. *Neuroscience Letters*, 447(2/3), 124-128. Retrieved July 15, 2009, doi:10.1016/j.neulet.2008.10.013
- Currie, J., Ramsbottom, R., Ludlow, H., Nevill, A., & Gilder, M. (2009, February 20). Cardio-respiratory fitness, habitual physical activity and serum brain derived neurotrophic factor (BDNF) in men and women. *Neuroscience Letters*, 451(2), 152-155. Retrieved July 15, 2009, doi:10.1016/j.neulet.2008.12.043
- Gold, S., Schulz, K., Hartmann, S., Mladek, M., Lang, U., Hellweg, R., et al. (2003, May). Basal serum levels and reactivity of nerve growth factor and brain-derived neurotrophic factor to standardized acute exercise in multiple sclerosis and controls. *Journal of Neuroimmunology*, 138(1/2), 99. Retrieved July 15, 2009, doi:10.1016/S0165-5728(03)00121-8