Application for 2015-2016- Burnell Student Research Award

Office of Associate Dean for Research and Innovation
Nova Southeastern University College of Osteopathic Medicine

Project Title: Quantitative assessment of static magnetic field (SMF) effects on skin water and mechanical properties.

Applicant (s): Print each name and class (i.e., OMS I, II, III, or IV):

1. Fernando Doval **Class** OMS I
2. Shannon Mohabir **Class**
3. Allen Abello **Class** OMS II

1. **Signature:** Fernando Doval **Date** 10/5/2015
2. **Signature:** **Date** 10/5/2015
3. **Signature:** **Date** 10/6/2015

E-mail of Student Applicant (s):

1. fdz21@nova.edu
2. smohabir@nova.edu
3. aa1732@nova.edu

Faculty Mentor: Dr. Harvey Mayrovitz **Signature**
Print Name

By 4 p.m. Monday, November 9, 2016 submit completed application electronically to levyleon@nova.edu **or deliver to Office of Associate Dean for Research and Innovation**

Summary of Proposal
TYPE FONT NO LESS THAN 12 and provide an abstract of 500 words or less including:

1. **Hypothesis**
2. **Background/Significance**
3. **Methodology**
4. **Evaluation**

HYPOTHESIS: We hypothesize that a static magnetic field (SMF) produced by a magnet will alter skin water content and thereby alter the indentation resistance of tissue.

BACKGROUND/SIGNIFICANCE: Prior work has shown that magnets with surface fields in the range of 4,000 Gauss reduce skin blood flow when applied for about thirty minutes and also reversibly reduce capillary blood velocity in experimental preparations. SMF have also been reported to increase vascular permeability in an experimental tumor model. Based on these and other reports, we believe that in addition to a SMF affecting tissue water features in the inflammatory induced edematous state, there is likely to be an effect on normal skin water properties. There are currently no known data published that specifically tested the impact of a SMF on the skin parameters that are planned to be tested. Given the wide use of magnets by the public for a host of conditions, the documentation of such effects has a broad significance.

METHODS: A series of non-invasive forearm skin measurements will be made prior to exposure to a magnet with a static magnetic surface field of 5000 Gauss for 30 minutes. These measurements will assess skin water properties by measuring the tissue dielectric constant (TDC), stratum corneum capacitance (SCC), transepidermal water loss (TEWL) and skin temperature (TSK). The effect of SMF exposure on skin firmness will be assessed by measuring the force (FORCE) required to indent the skin 1.3 mm prior to and after exposure. The possible role of total body water (TBW) and body fat (TBF) as covariates will be tested by measuring each using a body composition scale. All measurements will be done on 50 volunteers divided equally by gender. To separate potential effects attributable to simple skin covering vs. actual SMF effects three forearm sites will be measured; one exposed to the magnet, one exposed to a sham magnet that has the same weight and dimensions as the magnet and one exposed to a thin wood disk with the same surface area of the magnet but weighing much less. These three sites will be measured prior to covering and after the 30 minute exposure time. All pre-exposure measurements will be done in triplicate and post-exposure measurements done sequentially for up-to 20 minutes.

EVALUATION: The primary research question is; does the SMF produce a different effect on skin properties than does the sham? To answer this question, the three tissue water parameters (TDC, SCC and TEWL) and the skin mechanical parameter (FORCE) will be tested separately using pre-post exposure data in a paired T-test analysis for both genders combined. The possible differential effect of simply covering the skin with different loading weight will be tested using the pre-post sham vs. wood disk data. The secondary research question regarding possible gender differences in SMF effects, will be evaluated by comparing pre-post changes in each parameter between genders using independent T-tests. In all tests a significant effect difference will be based on a p-value <0.01 to account for the multiple parameter comparisons.