



Bastyr Student Research Symposium

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2014 Student Research Presentations

Near Infrared Analysis of Botanical Products

Students: Argyle Baukol, Tais Douet, Dorie Hogan, Anahit Hovhannisyann, Amanda Rorvik, and Stacy Wallace

Cognitive and Behavioral Interventions Paired with Pharmaceutical Treatment for Adolescent Depression

Student: Ashley Hood
Faculty: Naomi Lester, PhD

Does Integrative Oncology Improve Survival in Advanced Brain and Pancreatic Cancer Patients? (Preliminary Clinical Data)

Student: Mallory Anderson
Faculty/Staff: Leanna J. Standish, ND, PhD, LAc, FABNO, Barbara Osborne, RN, Erin Sweet, ND, MPH, Frederick Dowd, and May Zhou

Comparing Complementary and Alternative Approaches with Prescription Medication for the Prevention and Treatment of Migraine Headaches: A Literature Review

Student: Jessica Bulleri
Faculty: Naomi Lester, PhD

The Usefulness of Dream Analysis in Psychotherapy: A Literature Review

Student: Klaudia Zelnik
Faculty: Naomi Lester, PhD

Challenges for Children's Prosthetic Feet: Kinetic Data for Walking and Running in Real-World Locations

Student: Christopher Villarosa^{1,2}
Faculty: Michael Orendurff, PhD^{1,2}
Co-authors: Toshiki Kobayashi¹, Arjan Buis³, Anthony McGarry³, Teri Rosenbaum-Chou¹, Wayne Daly¹, David Hensley¹, and Adam Arabian⁴

Bullying in Children with Disabilities

Student: Stella Mirzoyan
Faculty: Naomi Lester, PhD

The Chinese Herb, *Radix Pulsatillae*, or *Bai Tou Weng*, Demonstrates Anti-neoplastic and Cytostatic Effect on the MDA-MB-231 Mammary Adenocarcinoma Cell Line Along Multiple Signaling Pathways

Students: Zeyiad Elias, DAOM, Joshua Jangula, Lac and Thien Nguyen
Faculty: Young Cho, PhD

Breast carcinomas (BC) are recognized as one of the most frequently occurring and lethal of all cancer types, annually accounting for over 500,000 deaths worldwide. Furthermore, a subtype of mammary carcinoma, triple negative (TNBC), account for a disproportionate number of BC deaths, with the majority of studies indicating poor patient prognosis and long-term outcomes. There is a significant need for novel, and less toxic, interventions.

Preliminary testing suggested the Chinese herb *Radix Pulsatillae*, or *Bai Tou Weng* (BT), may possess anti-neoplastic effects on the MDA-MB-231 cell line. Further research utilizing cell viability assays, cell cycle analysis, and signal transduction assays were pursued to ascertain BT's potential as an anti-tumorigenic agent.

Cell viability analysis using MTT assay demonstrated that BT prevented tumorigenic proliferation of MDA-MB 231 cells over a six-day time course. The inhibitory action of BT was achieved in the absence of cytotoxicity. This was also supported in Trypan Blue staining assays. Cell cycle analysis, utilizing flow cytometry, showed significant cell cycle arrest at the G₀-G₁ phase of BT-treated cells, whereas fetal bovine serum (FBS) stimulated cells completed the cell cycle. Signal transduction pathways of mitogen-activated protein kinase (MAPK) and phosphatidylinositol 3-phosphate (PI3K) were tested in order to assess the molecular mechanism of the tumorigenic potential of cancer cells. Phosphorylation of both extracellular-signal-regulated kinases (ERK) and protein kinase B (Akt), the activation markers of these mitogenic pathways, was prevented or reversed by BT treatment when these cancer cells were stimulated by FBS.

In conclusion, agent BT demonstrates strong *in vitro* anti-neoplastic and cytostatic effect on MDA-MB-231 breast adenocarcinoma cells.

2014 Student Research Presentations

The Anti-Neoplastic Effects of *Niu Bang Zi* on the Mammary Carcinoma *In Vitro* MDA-MB-231

Student: Joshua Jangula, LAc
Faculty: Young Cho, PhD

Background: Triple negative breast cancer comprises 10-15% of all diagnosed breast carcinomas. Due to its lack of estrogen, progesterone and HER2/neu receptors, chemotherapeutic options are even more limited. *Niu Bang Zi* is traditionally used in Chinese herbology most often for respiratory infections. Recently, preliminary studies (Elias et al., unpublished data) suggest that it suppresses proliferation of MDA-MB-231 cells, the triple negative breast cancer cell line. Especially, its anti-proliferative effects appeared to cause significantly low cytotoxicity at therapeutic dose. This *in vitro* lab study will determine the anti-tumor activities of *Niu Bang Zi* on this particular cell line.

Materials and Methods: MDA-MB-231 cells represent the most invasive human mammary carcinoma. This cell line was obtained from the American Tissue Culture Collection. The cells were harvested using standard cell culture methods. They were stored in an incubator at 5% CO₂ and 37°C. Manual cell counts using Trypan Blue (TB) staining were performed to determine its anti-proliferative effect. Data collection occurred at days two, four, and six. In addition, an MTT assay is being conducted to further complement the viability of the treated cells. MTT is being performed in adherence to the MTT proliferation assay manual.

Results: Manual cell counts with TB staining revealed an incremental inhibition of cell proliferation. Statistical analysis of the raw data and MTT assay are currently being conducted.

Conclusion: The following assays reveal *Niu Bang Zi*'s effects of anti-proliferation on the MDA-MB-231 cells. Flow cytometry and Western blot are warranted to support the significance of the study and propel it into the next phase of this research project.

Funding: This research was funded, in part, by a grant from the Bastyr Center for Student Research (BUCSR-Y4-004).

Secondary Analysis of a Data Set, Performed As a Requirement of Research Methods 2 (BC3149), Integrated Human Biology Program, Bastyr University

Students: Gabriel (Cody) Enciso, Celia Fiordalisi, Rachel Harmon, Collin Perri, and Alexander Stone
Faculty: Cynthia Wenner, PhD

25-Hydroxyvitamin D Concentrations and Overall Survival in Autologous Hematopoietic Stem Cell Subjects

Student: Emily B. Clairmont^{1,2}
Co-authors: Gary Schoch³, Ajay K. Gopal, MD^{4,5} and Patty McDonnell, RD, CSO, CD^{1,2}

Birth Center and Home Birth Emergency Transfers: The EMS Factor

Students: Alyssa Hahn and Lisa Stotts
Faculty: Wendy Gordon, LM, CPM, MPH, Clarissa Hsu, PhD, and Mark M. Martzen, PhD, CIP

How Diet Impacts Performance in Rock Climbers: A Pilot Study

Student: Katherine Ueland
Faculty: Cristen Harris, PhD, RDN, CSSD, CES

Comparison of Bone Mineral Density and Osteoporotic Risk Factors in Young Adult Vegans and Omnivores

Students: Dana L. Sitts and Dana N. Mockenhaupt
Faculty: June Kloubec, PhD

An Exploration of Power Within the Student-Preceptor Relationship of Direct-Entry Midwifery Students in the United States

Student: Lisa Wiley

Synergistic Effects of Polysaccharide Krestin and Toll-like Receptor Adjuvants in Dendritic Cell Activation

Student: Katie Strobe
Faculty: Cynthia Wenner, PhD

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Comparison of Alkaloid Content from Ceremonial Ayahuasca Brews

Students: Apryl Dennis, Maytha Frankford, Jakob Knieff, and Dana Mockenhaupt
Faculty: Kaleb C. Lund, PhD and Leanna J. Standish, ND, PhD, LAc, FABNO

Gratitude and Sense of Coherence: Exploring the Relationship Between Two Health-creating Variables

Student: Daniel Henderson
Faculty: Naomi Lester, PhD

Methodology to Evaluate Changes in Eating and Body-related Attitudes, Beliefs and Behaviors Among Female Graduate Students in Dietetics

Faculty: Cristen Harris, PhD, RD, LD/N

Exploring the JJ Way®: A Model of Care for Reducing Disparities and Improving Perinatal Health

Student: Sarah J. Day, MSM
Faculty: Wendy Gordon, LM, CPM, MPH, Tyann Parker Dominguez, PhD, MPH, MSW, and Mark M. Martzen, PhD, CIP
Co-authors: Jennie Joseph, LM, CPM

Assessing Microbe Presence and Organic Acid Content of Commercially Prepared Kombucha

Student: Katherine Leonard
Faculty: Lev Elson-Schwab, PhD, Kaleb C. Lund, PhD and Rebecca R. Achterman, PhD

The Effect of Reduced Claudin-8 on the Proliferation and Apoptosis of Prostate Epithelial Cells

Student: Benjamin Hawthorne
Faculty: Jing Meng, MD, PhD

The Effect of Harvest Time and Leaf Morphology on the N,N-Dimethyltryptamine Content of *Psychotria viridis* Leaves

Student: Eric Gray
Faculty: Kaleb C. Lund, PhD and Leanna J. Standish, ND, PhD, LAc, FABNO

The Effects of *Rosa canina* on Oxidative Damage Caused by CoQ10 Deficiency in HaCaT Cells

Students: Breanna Radoman-Shaw and Jeffrey Payne
Faculty: Kaleb C. Lund, PhD

Objective:

Analyzing the ability of *Rosa canina* (rose hips) to reduce the production of reactive oxygen species in CoQ10 deficient human keratinocytes.

Design, Measures, and Methods:

We cultured 2 groups of human HaCaT keratinocytes in standard DMEM solution treated with Fetal Bovine Serum (FBS) and Pen-Strep. CoQ10 deficiency was induced in one culture by applying 4-Nitrobenzoate (4-NB) and a non-treated culture served as a control. Using HPLC analysis, we produced a standard curve of CoQ10, and determined CoQ10 levels in the 4-NB treated cells, control cells, and *Rosa canina* extract. In the following phase of research we applied *Rosa canina* to the cultured cells, in dilutions of 50 micrograms/mL, and 150 micrograms/mL. These cell cultures will next be analyzed via TBARS Assay or MitoSOX™ Red Mitochondrial Superoxide Indicator for the presence of free radicals in order to determine the efficacy of rose hips as an antioxidant.

Results:

Although final results are pending, we hypothesize that the addition of *Rosa canina* extract to the CoQ10 deficient cells will reduce levels of reactive oxygen species in comparison to the control group.

Conclusion: TBD

Funding: This project was funded by a Bastyr Center for Student Research grant (BUCSR-Y4-007).

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The Antifungal Effect of *Allium sativum* Extracts on *Trichophyton equinum*

Students: Debra Daniels and Leesa Kim

Faculty: Rebecca R. Achterman, PhD

Objective:

Examination of the antifungal characteristics of fresh garlic (*Allium sativa*) extract compared to commercially available products that contain garlic.

Design, Measures and Methods:

We conducted an analysis using a Minimum Inhibitory Concentration (MIC) assay to quantitatively assess and compare the inhibitory effects of aqueous garlic extracts on germination of dermatophyte conidia. Previous preparation of four *Trichophyton equinum* conidial stocks were available, but due to their age they needed to be tested for purity and abundance. We prepared serial dilutions of each stock on YEPD plates. Two of these stocks were found to be pure cultures, one of which had a high enough concentration of viable conidia for use in the assay. This preparation was used in a 96-well plate format, MIC assay to compare inhibitory effects of aqueous garlic extract, Garlitrin 4000 tablets, and allicin in Allimax Liquid on the ability of *T. equinum* conidia to germinate.

Results:

The MIC for Garlitrin 4000 appears to be much higher than for the aqueous garlic extract (2 mg/ml in comparison to 1.17 ug/ml). Allicin did not inhibit the growth of conidia even at its highest concentration of 20 ug/ml.

Conclusion:

Preliminary results indicate that both aqueous garlic extract and Garlitrin 4000 inhibit the germination of conidia, but that aqueous garlic extract is more effective. Ongoing work includes confirming these results and examining garlic extract using High Pressure Liquid Chromatography (HPLC).

Funding: This project was funded by a Bastyr Center for Student Research grant (BUCSR-Y4-009).

Comparison of the Cell Killing Ability of Whole Rhizome Herbal Extracts Containing Podophyllotoxin to Pure Podophyllotoxin Standard

Students: Michele Milligan, Jila Misaghi-Benabi and Travis Simpson

Faculty: Kaleb C. Lund, PhD

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The Anti-Neoplastic Effects of *Niu Bang Zi* on the Mammary Carcinoma *In Vitro* MDA-MB-231

Student: Joshua Jangula, LAc

Faculty: Young Cho, PhD

The Chinese Herb, *Radix Pulsatillae*, or *Bai Tou Weng*, Demonstrates Anti-neoplastic and Cytostatic Effect on the MDA-MB-231 Mammary Adenocarcinoma Cell Line Along Multiple Signaling Pathways

Students: Zeyiad Elias, DAOM, Joshua Jangula, LAc and Thien Nguyen

Faculty: Young Cho, PhD

Near Infrared Analysis of Botanical Products

Students: Argyle Baukol, Tais Douet, Dorie Hogan, Anahit Hovhannisyan, Amanda Rorvik, and Stacy Wallace

Currently, the analysis of herbal products is riddled with the exorbitant consumption of resources and is still bound by the chemical properties of a vast array of constituents. Near Infrared Spectroscopy (NIR) is a newer analytical method employed in quality control measures in the herbal products industry. NIR utilizes infrared light to detect the spectrum of light reflected by a set of constituents. The application of NIR is a rapid, inexpensive, nondestructive, consistent, and accurate fingerprint for herbal products. This technology holds the possibility of being employed in the detection of adulterants and the quality of herbal extracts. The aim of our study is to use NIR to identify the species of a given single-herb tincture. The basis for this study was a preliminary project surrounding the analysis of six different *Matricaria chamomilla* tinctures from industry using NIR, which showed that a database was necessary to recognize the spectrum of one material from another. The construction of our reference database is being built by the collection of the spectra of the tinctures housed in the Bastyr Botanical Medicine Laboratory, consisting of over 400 specimens. The expansion of our database will allow for more accurate comparisons.

Comparison of the Cell Killing Ability of Whole Rhizome Herbal Extracts Containing Podophyllotoxin to Pure Podophyllotoxin Standard

Students: Michele Milligan, Jila Misaghi-Benabi and Travis Simpson
Faculty: Kaleb C. Lund, PhD

Background and Objective: *Podophyllum peltatum* (*Berberidaceae*) rhizome contains podophyllotoxin which has the unique ability to arrest cell development during mitosis by inhibiting microtubule degradation and causing apoptosis. Modern medicine has found that the main constituent, podophyllotoxin, can be synthesized to form cytotoxic drugs. This *in vitro* study seeks to compare the cytotoxic effects of pure podophyllotoxin relative to fresh and dried extract of the rhizome on normal keratinocytes.

Design, Measures and Methods: A podophyllotoxin standard curve for HPLC was created to determine the concentration of podophyllotoxin within 4 different *P. peltatum* preparations. The preparations analyzed were a 30% EtOH 1:5 of dry rhizome, 70% EtOH 1:5 of dry rhizome, 70% EtOH 1:5 of fresh rhizome, and a decoction of the dried rhizome. The concentration of podophyllotoxin in each preparation was then standardized to 250µg/mL and diluted by thirds to 8 test concentrations. Test solutions and corresponding vehicle controls were applied to an 8x12 MTT plate where they were tested in triplicate on healthy keratinocytes to determine cytotoxicity of each test solution at a standard concentration gradient.

Results: Pure podophyllotoxin shows greater cytotoxicity compared to whole rhizome preparations. The whole rhizome preparation with the greatest cytotoxicity is the 70% EtOH 1:5 tincture.

Conclusion: Based on the observed differences of cytotoxicity, we believe that podophyllotoxin has a variable therapeutic application when dosed in isolation compared to the whole rhizome tincture. Follow up studies will be conducted on cancerous skin cells in an attempt to demonstrate cell specific cytotoxicity.

Funding: This project was funded by a Bastyr Center for Student Research grant (BUSCR-Y4-018).

The Effect of Harvest Time and Leaf Morphology on the N,N-Dimethyltryptamine Content of *Psychotria viridis* Leaves

Student: Eric Gray

Faculty: Kaleb C. Lund, PhD and Leanna J. Standish, ND, PhD, LAc, FABNO

Ayahuasca has been used by tribes in the South American jungle to treat a large variety of illnesses. A lack of research warrants a full investigation into possible therapies. In order to quantify and test the efficacy of this plant based brew we must first understand the habits of the individual plants used. The brew is comprised of *Banisteriopsis caapi* known for its monoamine oxidase inhibiting beta-carboline alkaloids as well one of the many plant sources with analogues of dimethyltryptamine (DMT), such as *Psychotria viridis*. Ingested alone N,N-DMT from *P. viridis* is quickly metabolized by monoamine oxidase enzymes. When ingested together, the harmala alkaloids from *B. caapi* inhibit the breakdown of N,N-DMT which enables distribution throughout the body. We are examining the effect of harvest time and leaf morphology on the N,N-DMT content of *P. viridis*. Within the harvest time spectrum we examined N,N-DMT content variation with respect to not only time of day but also different phases of the lunar cycle – new and full. With regards to leaf morphology, we tested a “Broad Leaf” variety and a narrow leaf variety locally known as “White Queen”. Results from a previous study have indicated high concentrations of N,N-DMT present in the leaves around sunset and sunrise. Preliminary results from leaf samples harvested at 5pm on a full moon tested using high-performance liquid chromatography against a N,N-DMT standard have indicated that the “White Queen” variety contains 20.07 mg/g N,N-DMT whereas the “Broad Leaf” contained 15.12 mg/g N,N-DMT in the plant material. During this time period using the “White Queen” variety results in an increased yield of N,N-DMT by 33% which then allows you to use 25% less plant material to make the same amount of medicine. With this knowledge we are one small step closer towards standardizing the medicine for clinical trials.

This project was funded by a grant from the Bastyr Center for Student Research (BUCSR-Y4-013).

Cognitive and Behavioral Interventions Paired with Pharmaceutical Treatment for Adolescent Depression

Student: Ashley Hood

Faculty: Naomi Lester, PhD

This literature review examined the research literature on the effectiveness of pharmaceutical and cognitive behavioral treatments for adolescent depression. Depression is a debilitating disorder that is estimated to affect about 11% of adolescents in the U.S. by age 18. Research indicates that while pharmaceutical medications may be effective for treating depression, they have many drawbacks and adverse side effects. Therefore the literature was reviewed to determine if pairing pharmaceutical medication with Cognitive and Behavioral Therapy (CBT) could be as effective as using medication alone. **Methods:** The hypothesis of this research synthesis was that the research literature would show that cognitive and behavioral interventions paired with pharmaceutical medications for adolescent depression are more effective than pharmaceutical medication used alone. The research synthesis was done by reviewing research literature on the treatment of depression on adolescents. Studies that supported my hypothesis and failed to support my hypothesis were both examined objectively. **Results:** The results summarized the current research on the effectiveness of pharmaceutical treatment and CBT for adolescents suffering from depression. Pharmaceutical treatment, along with psychotherapy has been shown to be an effective way to treat depression in adolescents and adults, though a number of troubling side effects are also common. Based on the literature reviewed, the research did not support my hypothesis. While CBT paired with medication is another effective intervention to treat depression, it is not more effective than medication used alone. **Conclusions:** The research literature shows that for some depressed individuals, medication may not be an effective treatment and it may be associated with unacceptable side effects, such as an increased risk for suicide. CBT is a safe option for those who do not benefit from medication alone.

Does Integrative Oncology Improve Survival in Advanced Brain and Pancreatic Cancer Patients? (Preliminary Clinical Data)

Student: Mallory Anderson

Faculty/Staff: Leanna J. Standish, ND, PhD, LAc, FABNO, Barbara Osborne, RN, Erin Sweet, ND, MPH, Frederick Dowd, and May Zhou

Glioblastoma multiforme (GBM) is the most aggressive primary brain tumor. Pancreatic cancer is the 4th common cause of death in cancers. Studies have shown survival benefit in cancer patients who receive physician-provided integrative oncology (IO) care. Since the opening of the Bastyr Integrative Oncology Research Center (BIORC) in February 2009, 545 cancer patients have consented to participate in a prospective outcomes study investigating the effects of IO on clinical outcomes. Early consecutive case prospective outcomes data for GBM and stage III and IV pancreatic cancer patients who received IO care at BIORC from 2009-2013 is presented. Of the 545 patients in the trial, 4 had GBM and 11 had pancreatic cancer. Patients completed questionnaires at the first visit and yearly thereafter. The National Death Index was queried in September 2013 and the data plotted on Kaplan-Meier survival curves. BIORC survival was compared to national survival data provided by SEER. BIORC treated 4 GBM patients with 1- and 2-year survival rates at 78% and 50% compared to national survival rates at 46% and 20% reported by SEER. For the 3 BIORC stage III pancreatic cancer patients, 1-, 2-, and 3-year survival rates were 70%, 70% and 70% compared to 75%, 52%, and 40% nationally. For the 8 BIORC stage IV pancreatic cancer patients, 1-, 2-, and 3-year survival rates were 39%, 39% and 39% compared to 25%, 15% and 5% nationally. BIORC's preliminary clinical data on GBM and stage III and IV pancreatic cancer compares favorably with national survival statistics and suggests patients may benefit from IO care. A prospective matched controlled study design is required to determine the cause of the apparent survival benefit. Limitations to the study include small sample size and aggressiveness of the cancers under investigation.

The Effect of Reduced Claudin-8 on the Proliferation and Apoptosis of Prostate Epithelial Cells

Student: Benjamin Hawthorne

Faculty: Jing Meng, MD, PhD

Objective: To reduce expression of tight junction protein Claudin-8 in both normal and cancer prostate epithelial cells and measure the effect on cell proliferation and apoptosis.

Design, Measure and Methods: Our research will involve the culture of cancer and normal prostate epithelial cells. The cells will be treated with Claudin-8 RNAi in order to decrease Claudin-8 mRNA levels. This will be assessed with real-time PCR. The relative amount of Claudin-8 protein in the treated cells versus the controls will be determined using Western blot. We will then investigate the effect of decreased Claudin-8 on cell proliferation and apoptosis relative to untreated controls in both cell lines using real-time PCR and/or fluorescent assays analyzed with flow cytometry.

Expected Results: We anticipate that decreased expression of the Claudin-8 gene will be associated with increased proliferation and reduced apoptosis in both normal prostate epithelial cells and cancer prostate epithelial cells.

Conclusion: Previous research has demonstrated that androgen deprivation results in reduced expression of the Claudin-8 gene in prostate epithelium, suggesting that Claudin-8 gene expression is regulated by androgens. A result showing that Claudin-8 plays a role in regulating cell proliferation will help explain why androgen deprivation is associated with prostatic inflammation as well as support the hypothesis that androgen suppression induced reduction of Claudin-8 is one of the reasons for the initiation of tumor development and the regrowth of prostate cancer. This will shed light on understanding the mechanism of castration-resistant prostate cancer.

Funding: This research is funded by a Bastyr Center for Student Research grant (BUCSR-Y4-017).

Assessing Microbe Presence and Organic Acid Content of Commercially Prepared Kombucha

Student: Katherine Leonard

Faculty: Lev Elson-Schwab, PhD, Kaleb C. Lund, PhD and Rebecca R. Achterman, PhD

Objective:

This project aims to identify the presence and abundance of predominant probiotic microorganisms, pre-biotic organic acids, and epigallocatechin gallate in four different commercial brands of kombucha.

Design, Measures, Materials:

We plated serial dilutions of four brands of kombucha on selective media types to identify the concentration of microorganisms including fungi (YEPD), *Lactobacilli* (MRS), and bacterial growth (non-selective medium, LB). Predominant colonies were examined by Gram stain and microscopy to determine (1) whether they were yeast or bacteria, and (2) bacterial cell wall type. As a future direction, prevalent colony types will be examined by sequence analysis to identify the organism to the species level. HPLC analysis will be used to identify the presence of organic acids, including butyric acid, acetic acid, lactic acid, propionic acid, gluconic acid, gluconic acid, and EGCG.

Results:

Total microbial content varied between brands (370,500 CFU/mL - 8,513,700 CFU/mL) and within different bottles of the same brand. Microscopy results indicated all brands predominantly contain yeast and one contains yeast and Gram-negative and Gram-positive bacteria. Interestingly, the predominant colony type was yeast, even on media that should have been selective for *Lactobacilli*.

Conclusion:

Current results indicate there is variation of microbes found between brands and within each brand (bottle-to-bottle variation), with yeast being a dominant organism. Ongoing work will determine the species identity of the most abundant isolated microbes, as well as presence of six organic acids and EGCG known to have intestinal health benefits.

Funding: This project was funded by a Bastyr Center for Student Research grant (BUSCR-Y4-008).

Comparing Complementary and Alternative Approaches with Prescription Medication for the Prevention and Treatment of Migraine Headaches: A Literature Review

Student: Jessica Bulleri

Faculty: Naomi Lester, PhD

Study Objective: The objective of this literature review was to test the hypothesis that the research literature would show that for the prevention and treatment of migraine headaches, complementary and alternative medicine (CAM) treatments are more effective and have fewer side effects than prescription pharmaceutical interventions.

Methods: The design of this study was a literature review examining the effectiveness of treatment methods for the prevention and treatment of migraine headaches. The research included peer-reviewed articles from scholarly journals that were accessible through ProQuest, PubMed, and academic libraries. Search terms included phrases such as migraine, migraine headache, migraine pain, complementary and alternative medicine, chronic pain, mindfulness, herbal supplements, nutrition, and prescription medication.

Results: Some CAM treatments, such as spinal manipulations, meditation, and yoga were found to be nearly as effective as some pharmaceutical medications for preventing migraines. CAM modalities were found to have very few side effects, while most of the pharmaceutical treatments had at least one adverse side effect, and many prescriptions had a variety of adverse side effects that affected the tolerability of the medication. While CAM modalities seemed to be a favorable alternative for preventing migraines, pharmaceutical medication was more effective in aborting migraines once they started. Few studies were found that focused on the effectiveness of CAM treatments in aborting migraines.

Conclusion: CAM treatments were found to be promising alternatives for pharmaceutical medications in preventing migraines, and were much better tolerated. Additional research should be conducted to examine the effectiveness of CAM treatments in treating and aborting current migraines.

The Usefulness of Dream Analysis in Psychotherapy: A Literature Review

Student: Klaudia Zelnik

Faculty: Naomi Lester, PhD

Hypothesis: The hypothesis of this study was that the research literature would show dream analysis is a helpful tool in psychotherapy. **Introduction:** Dreams, which have long been philosophically and spiritually admired as gateways to the subconscious mind, are sometimes viewed in Western cultures as irrelevant. Dreams are often forgotten within minutes of awaking from REM (Rapid Eye Movement) sleep. However, researchers from various cultures around the world are finding that the analysis of dreams can be a helpful aid in psychotherapy, and that incorporating personal dream symbolism into counseling sessions may increase therapy efficacy. **Methods:** The 43 research studies reviewed in this project were retrieved from academic databases such as ProQuest, PsycInfo, and PsycArticles. **Results:** The research literature suggested that including dream analysis in psychotherapy contributes to improvements in subjective therapy session insight, increased meaningfulness and the lessening of anxiety-related symptoms. Dream analysis may also aid in the retrieval of repressed emotions and can help in the recovery from traumatic events. According to a large-scale dream theme survey study, individuals from the same culture tend to share dream symbolism and themes. Understanding these shared dream themes and symbols may also aid in the therapy process. **Discussion:** The results of this literature review indicate that dream analysis is a helpful and easily implemented tool in psychotherapy. Future research needs to further examine the cultural components of dreams and determine in greater detail the ways in which dream analysis can help promote personal growth and psychological well-being.

Exploring the JJ Way®: A Model of Care for Reducing Disparities and Improving Perinatal Health

Student: Sarah J. Day, MSM

Faculty: Wendy Gordon, LM, CPM, MPH, Tyan Parker

Dominguez, PhD, MPH, MSW, and Mark M. Martzen, PhD, CIP

Co-author: Jennie Joseph, LM, CPM

Abstract: “The JJ Way®” is a model of prenatal care designed by Florida midwife Jennie Joseph to reduce health disparities and adverse birth outcomes. This study compared the outcomes of patients who participated in The JJ Way® to outcomes in a matched comparison group from Florida Vital Statistics of women who took part in standard prenatal care. A historical comparison group was created by matching age, race, and zip code; outcome measures included gestational age at birth and infant birth weight. The results show that the women who had The JJ Way® model of care had marginally statistically significantly higher gestational age (38.9 weeks versus 37.9 weeks, $p=0.07$) than the women who went through standard prenatal care, but no difference in birth weights (3359.4 grams versus 3265.9 grams, $p=0.41$). The JJ Way® women had fewer preterm infants (4.5% overall) than the women who had standard prenatal care (14.9%, $p=0.04$). When outcomes were analyzed by race, there were no statistically significant differences between White women in the two groups in gestational age or birth weight, but there were for Women of Color. The JJ Way® Women of Color group had higher gestational age than their counterparts who had standard prenatal care: 39.0 weeks versus 37.4 weeks, $p=0.03$. They also had no preterm births versus 17.1% in the standard care group ($p=0.01$). A secondary analysis was conducted comparing White women to African American women only. The sample size was small, although the magnitude of differences were striking, none of them were statistically significant. According to the results of the primary study, the care that Women of Color, in particular, are receiving in The JJ Way® model results in outcomes that are superior to those of their counterparts who are experiencing standard prenatal care.

Funding: This research was supported by a grant from the Bastyr Center for Student Research (BUCSR-Y4-012).

Methodology to Evaluate Changes in Eating and Body-related Attitudes, Beliefs and Behaviors Among Female Graduate Students in Dietetics

Faculty: Cristen Harris, PhD, RD, LD/N

Background:

Students may enter the dietetics field because of personal experience with disordered eating or body-related issues and concerns. A graduate school education that leads to increased knowledge of nutrition may lead to healthier eating, body image and physical activity patterns in some students.

Objective:

The purpose of this study was to create a method for evaluating changes in eating and body-related attitudes, beliefs and behaviors among graduate students in dietetics during their two-year professional education.

Methods and Measures:

To retain the anonymity of each respondent, recruitment requests were e-mailed to all graduate dietetic students for each data collection period, including a direct link to the study survey at baseline, at the end of respondents' first academic year, and at the end of their second academic year. Respondents created confidential codes so responses from different time points could be compared. The 185-item online survey, accessible to participants via REDCap™ software, consisted of several validated instruments. Information was obtained on demographics; dieting and weight history; eating behaviors; physical activity; orthorexia; cognitive restraint; dietary style and intake; intuitive eating; depression; and perceived stress.

Summary:

This method may be a valuable tool for dietetic educators who are in a unique position to address food- and body-related issues held by students early in their professional training.

Funding: This study was partially funded by the Bastyr Center for Student Research; grant award number BUCSR-Y4-014.

Challenges for Children's Prosthetic Feet: Kinetic Data for Walking and Running in Real-World Locations

Student: Christopher Villarosa^{1,2}

Faculty: Michael Orendurff, PhD^{1,2}

Co-authors: Toshiki Kobayashi¹, Arjan Buis³, Anthony McGarry³, Teri Rosenbaum-Chou¹, Wayne Daly¹, David Hensley¹, Adam Arabian⁴

¹Biomechanics Laboratory, Orthocare Innovations, Mountlake Terrace, WA, ²Bastyr University, Kenmore, WA, USA, ³University of Strathclyde, Glasgow, Scotland, UK, ⁴Engineering Department, Seattle Pacific University

Objective

Designing a prosthetic foot for children is challenging. Walking optimization creates deficiencies in running performance, while running optimization creates instability during standing and walking. The goal of this project was to quantify the peak moments (Nm) and loading rate (Nm/s) to understand the strength requirements of children's prosthetic components during locomotor activities.

Methods

A load cell (Europa, Orthocare Innovations, LLC) was placed in the prosthetic limb of six transtibial amputee children and transmitted force and moment data while participants walked and ran on level ground and up and down 6° and 20° slopes.

Results

The highest sagittal moment values were approximately 100 Nm on the prosthetic limb. Negative moments varied more frequently across activities with -15 Nm the most substantial values. The loading rate of the forefoot region of the prosthetic foot reached 400 Nm/s.

Conclusion

A primary challenge for the design of a children's prosthetic device is the requirement that it performs well in both running and walking, and can endure load demands without failure. These real-world values indicate that the peak loads only 20% of adult values, but the loading rate is 5 times faster than adults.

Bullying in Children with Disabilities

Student: Stella Mirzoyan

Faculty: Naomi Lester, PhD

Objective:

Bullying is a significant challenge for many American children and can lead to adverse long term effects. This literature review examined the research on bullying to determine whether children with learning or physical disabilities are bullied more frequently than children without those added stressors.

Methods:

Applicable research studies were identified via searches of databases such as PubMed and PsychInfo and each study was critically examined.

Results:

The results indicated that children with learning disabilities such as Autism and Attention Deficient Hyperactivity Disorder are bullied more frequently than children without these disorders. The research literature also shows that 34.6% of children with physical disabilities report being bullied but also 45.1% of these children report being bullies.

Implications:

The results of this literature review indicate that children with learning and/or physical disabilities are bullied more than the children without these challenges but also that these children may be at heightened risk of bullying others. Future research needs to explore effective interventions for decreasing bullying for all children.

Gratitude and Sense of Coherence: Exploring the Relationship Between Two Health-creating Variables

Student: Daniel Henderson

Faculty: Naomi Lester, PhD

Objective: To determine whether or not gratitude as a personality trait (TG) was related to an individual's sense that their life is meaningful, predictable, and manageable (Sense of Coherence, SOC).

Design: The study used a correlational design to assess this relationship using measures of TG and SOC.

Methods: Undergraduate and graduate students from Bastyr University were given a survey packet which assessed TG, SOC, and other demographic variables.

Results: The 136 participants were between the ages of 19 and 61 with approximately 85% being female. Correlation analysis indicated that there was a strong positive relationship between TG and two components of SOC: meaningfulness, $r(132) = .368, p < .01$, and manageability, $r(131) = .232, p < .01$. This indicates that both of these health-creating factors share commonalities and that those in the sample who reported higher TG also reported higher senses of meaningfulness and manageability. The SOC components were also related to scores for self-rated health (meaningfulness, $r(132) = .347, p < .001$; manageability, $r(131) = .261, p < .01$).

Conclusion: The relationships between TG and meaningfulness and TG and manageability suggest that gratitude might be an important factor in both an individual's sense of meaningfulness and manageability and that this could lead to a greater understanding of these health-creating factors as well as lending support to a future therapeutic model using gratitude.

Funding: This project was partially funded by a Bastyr Center for Student Research grant (BUCSR-Y4-019).

Comparison of Alkaloid Content from Ceremonial Ayahuasca Brews

Students: Apryl Dennis, Maytha Frankford, Jakob Knieff, and Dana Mockenhaupt

Faculty: Kaleb C. Lund, PhD and Leanna J. Standish, ND, PhD, LAc, FABNO

Objective:

Ayahuasca is an herbal preparation containing *Banisteriopsis caapi* and other admixtures, most commonly *Psychotria viridis*. The synergy of these plants lead to visionary and healing effects on the body and mind. It is a large part of South American cultural herbal medicine tradition. A collection of ceremonial Ayahuasca brews were donated and analyzed to find the concentration ranges of 4 alkaloids which have been previously correlated to the therapeutic efficacy of Ayahuasca; Harmine, Tetrahydroharmine (THH), N,N-Dimethyltryptamine (DMT), and 5-methoxy dimethyltryptamine (MEO-DMT) within each preparation.

Design, Measures and Methods:

High performance liquid chromatography (HPLC) allows for the separation of chemicals due to polarity over time. This enables specific alkaloids to be identified and quantified. Gas chromatography/Mass spectrometry (GC/MS) is another analytical method used to identify molecules within a test sample. In the GC/MS molecules are broken into ionized fragments and detected using their mass-to-charge ratio.

Standards and samples were diluted with methanol. Each individual brew was tested in triplicate and analyzed via HPLC to arrive at an average value for each of the alkaloids present. Formic acid (0.1%) was used as the HPLC mobile phase. For verification, GC/MS analysis was performed on select samples and standards to confirm that the quantitative data from HPLC was congruent.

Results:

Data is currently being processed and results will be presented at the 2014 Research Symposium.

Conclusion(s):

Interpretations to follow analysis of data.

Funding: This project was partially funded by a Bastyr Center for Student Research grant (BUCSR-Y4-011).

Secondary Analysis of a Data Set, Performed As a Requirement of Research Methods 2 (BC3149), Integrated Human Biology Program, Bastyr University

Gabriel (Cody) Enciso: **Effect of Reiki on Management of Pain**

Celia Fiordalisi: **Cholesterol Levels after Heart Attack**

Rachel Harmon: **A Questionable Correlation: A Secondary Analysis of the Relationship Between Weight Loss and Triglyceride Levels**

Collin Perri: **Personal Characteristics Affecting Resting Pulse Rates**

Alexander Stone: **Capacity of New Proprietary Drug XMPLAR in Reducing Obesity**

Faculty: Cynthia Wenner, PhD

25-Hydroxyvitamin D Concentrations and Overall Survival in Autologous Hematopoietic Stem Cell Subjects

Student: Emily B. Clairmont^{1,2}

Co-authors: Gary Schoch³, Ajay K. Gopal, MD^{2,4} and Patty McDonnell, RD, CSO, CD^{1,2}

¹Medical Nutrition Therapy, Transplant, SCCA, ²Clinical Research Division, FHCRC, ³FHCRC, ⁴Department of Medicine, University of Washington

Purpose: Prior studies have suggested associations with vitamin D concentrations, increased survival and prognosis in patients with lymphoma and multiple myeloma (MM); however little is known about patients undergoing autologous hematopoietic stem cell transplant (AHSCT). We, thus, investigated pre-AHSCT 25-hydroxyvitamin D [25(OH)D] concentrations and transplant related parameters to determine incidence of vitamin D insufficiency and overall survival in subjects diagnosed with lymphoma and MM.

Methods: An IRB approved waiver of consent retrospective analysis was performed at Seattle Cancer Care Alliance (SCCA) in Seattle, Washington. Data, from May 2009 to May 2010, were collected from the medical records of AHSCT adults (n=132) diagnosed with MM and lymphoma. Variables collected included mean pre-AHSCT total 25(OH)D concentrations, demographics, body mass index, vitamin D-containing supplement use, date of death, and date of last contact.

Results: The majority of both male and female subjects were >50 years old, white and non-Hispanic/Latino, overweight or obese, living above the 37th parallel, and reported use of a vitamin D-containing supplement. Mean pre-transplant 25(OH)D concentrations of 29.0 ± 11.0 ng/mL suggested a significant incidence of vitamin D insufficiency in the sample ($p = <0.001$). Ultimately, pre-transplant vitamin D status (insufficient vs sufficient) had no significant impact on overall survival in subject's post-AHSCT [HR = 0.99 (95% CI 0.45-2.20) Log-rank $p = 0.997$].

Conclusion: The majority of lymphoma and MM patients have insufficient pre-AHSCT 25(OH)D concentrations. In contrast to prior studies, no association of 25(OH)D and survival was observed. These findings support a rationale to continue this investigation in a larger prospective sample.

Funding: This project was funded in part by a Bastyr Center for Student Research grant (BUCSR-Y4-010).

Synergistic Effects of Polysaccharide Krestin and Toll-like Receptor Adjuvants in Dendritic Cell Activation

Student: Katie Strobe

Faculty: Cynthia Wenner, PhD

Objective: An extract from the "turkey tail" mushroom has been shown to activate the immune response and to have anti-cancer effects. This mushroom extract is recognized by a receptor called toll-like receptor 2 (TLR2). It is related to a family of receptors that recognize foreign particles in the body such as cancer cells or bacteria. The goal of this research is to learn more about the effects of activating the immune system response using toll-like receptor agonists (activators of toll-like receptors such as TLR2). This is medically significant because it could potentially lead to novel combinatorial therapies for treating cancer.

Methods: 1) Measure TNF α and IL12 p70 cytokine production when co-stimulating JAWS II cells with PSK and TLR ligands. 2) Measure the dendritic cell surface antigens CD11C, CD80, CD86, MHC II when co-stimulating with PSK and TLR ligands.

Results and Conclusions: Preliminary results show evidence that JAWS II dendritic cells are synergistically activated when PSK is added in conjunction with the TLR ligands Pam3SK4, Lipopolysaccharide (LPS), Poly (I:C) and Imiquimod. This is demonstrated by increased cytokine production and up-regulation of cell surface antigen markers. There is a significant measurable increase in TNF α cytokine production when PSK is co-stimulated with the mentioned TLR ligands. Interestingly, there appears to be an orchestrated down-regulation of IL12p40 cytokine production when PSK is added in conjunction with LPS and Poly (I:C). Additionally, synergistic co-stimulation is seen in the up-regulation of the CD11c/CD86 and CD11c/CD40 double-positive JAWS II dendritic cells. These cell surface antigens are important in priming T cell mediated killing of tumor cells. Overall, these results show promise in mechanistically tailoring the immune response and generating novel therapies to increase the body's ability to reduce tumor growth.

Acknowledgements: The support of the Bastyr Center for Student Research (BUCSR-Y4-020) and the Poncin Scholarship is gratefully acknowledged.

An Exploration of Power Within the Student-Preceptor Relationship of Direct-Entry Midwifery Students in the United States

Student: Lisa Wiley

Abstract: It is widely acknowledged that the preceptorship model is the primary mode of transmission of clinical knowledge within the profession of midwifery. It is natural that a power imbalance resides between preceptor and student; however, research has revealed that this inequality bears not only the potential for facilitating the conveyance of wisdom, but as well for mishandling. The concept of power within the student-preceptor relationship of Direct-Entry Midwives (DEMs) within the U.S. has not been explored through existing literature, despite the fact that increased understanding of this educational relationship may impact the institution of DEM education. Qualitative inquiry was conducted in collaboration with individuals who recently concluded a course of DEM education, and phenomenological analysis of the findings was performed. A summary of themes was compiled, eliciting insight into the nature of power within this relationship and as well the implications of this dynamic upon the profession.

Acknowledgements: This research was supported by Grant Award BUCSR-Y4-003 from the Bastyr Center for Student Research.

Birth Center and Home Birth Emergency Transfers: The EMS Factor

Students: Alyssa Hahn and Lisa Stotts

Faculty: Wendy Gordon, LM, CPM, MPH, Clarissa Hsu, PhD, and Mark M. Martzen, PhD

Background/Purpose:

A choice of location for the birth of one's child, particularly private homes and freestanding birth centers, is becoming increasingly more available, born out of the necessity to meet a growing demand. With the number of births occurring in homes or freestanding birth centers on the rise, the need for a smooth and efficient process for transferring to the hospital in the rare case of an emergency becomes apparent. The first step of this process is the Emergency Medical Services, universally known as 911. A review of current literature unearthed no studies exploring this emergency transfer experience, from the specific standpoint of interactions between attending midwives and EMS professionals and the transfer of care that occurs within this interface.

Design, Measures and Methods:

A qualitative research study, employing one-to-one interviews for gathering data, was conducted to explore the emergency transfer experience of 14 midwives and EMS professionals. Interviews were transcribed and coded for recurrent themes using immersion/crystallization technique.

Findings:

Themes arose from key stories shared by participants and were further verbally reflected upon within the limitations of semi-structured interviews. Both facilitating and challenging aspects of the transfer experience and interdisciplinary relationship were identified. Similar themes and sub-themes were organized within four main categories: assessment of current transfer state, key factors that affect transfers, strategic facilitators and actions to make change.

Conclusion:

This research emphasizes the need for cross professional education, debriefing, and research to enable accurate development of future cross-training of both EMS and midwifery providers leading to a more effective transfer experience. The authors plan to implement phase two, an inter-disciplinary group member check, as a first action step to not only confirm the accuracy of the findings, but also begin implementing change towards the two professions working together as one team.

Funding: Funding for this project was provided, in part, by a grant from Bastyr Center for Student Research (BUCSR-Y4-016).

How Diet Impacts Performance in Rock Climbers: A Pilot Study

Student: Katherine Ueland

Faculty: Cristen Harris, PhD, RDN, CSSD, CES

Objectives: This observational, cross-sectional, pilot study was conducted to establish a nutritional profile among experienced climbers, both non-elite and elite, and to evaluate factors that influence time to exhaustion while climbing to volitional failure.

Methods: Elite ($n = 10$) and non-elite ($n = 5$) climbers, aged 18-45 years participated in the following: (1) nutritional analysis - 3-day food record and 24-hour dietary recall were analyzed using Food Processor and compared to government daily recommended intake; (2) climbing trial - after completing a climbing-related questionnaire and measuring anthropometric characteristics and hand grip strength, participants climbed a moderately difficult pre-set indoor route continuously until reaching volitional exhaustion.

Results: The major findings were significant differences for total climbing time between non-elite and elite, ($t(13) = -2.6$, $p = 0.02$), protein intake from 24 hour recall ($n = 15$, $r_s = -0.53$, $p = 0.04$) and total percent water intake ($n = 15$, $r_s = -0.60$, $p = 0.02$).

Conclusions: These results indicate that a longer climbing time to exhaustion is related to self-reported climbing ability. Protein and total percent water were negatively correlated to climbing time, suggesting that carbohydrate intake may play a more important role in climbing performance than protein intake.

Acknowledgements: This research is supported by Grant Award BUCSR-Y4-015 and BUCSR-Y3-010 from the Bastyr Center for Student Research.

Comparison of Bone Mineral Density and Osteoporotic Risk Factors in Young Adult Vegans and Omnivores

Students: Dana L. Sitts and Dana N. Mockenhaupt

Faculty: June Kloubec, PhD

Objective:

This observational study examined the effect of a vegan diet on osteoporotic risk factors, in comparison to an omnivorous diet.

Methods:

Ten young adult female subjects (5 vegan, 5 omnivore) completed a four day physical activity log and diet journals, followed by a DEXA scan of the femoral neck bone mineral density (BMD), lumbar spine BMD, total body BMD, and total body composition. Comparisons were made between vegans and omnivores, and median splits of protein intake, calcium intake, BMI, and physical activity were calculated using T Tests.

Results:

No significant difference was found in the data collected between vegans and omnivores. Subjects with higher BMI (>21.2) had higher femoral neck BMD than subjects with low BMI (<21.2) ($p=0.015$). Subjects that consumed less calcium ($<50\%$ RDA) had higher lumbar spine BMDs, and more total high intensity physical activity. Other trends were found in the data, but none reached statistical significance.

Conclusion:

A vegan diet did not have adverse effects on bone density in the subjects studied, and BMI may be a better indicator of osteoporotic risk.

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