IUPUI Life-Health Sciences Internships

Spring 2009 Poster Session

Thursday, April 9, 2009
3:30 PM—5:30 PM
VanNuys Medical Science Building Atrium
Vision

The Life-Health Sciences Internships Program seeks to connect talented IUPUI undergraduate students in the life and health sciences with enriching experiences in laboratories, research projects, and other professional experiences on the IUPUI campus and in campus-affiliated locations.

Mission

To educate, engage, and enlighten IUPUI life and health sciences undergraduates through on-campus internship experiences. We seek to achieve this through the following means:

1. Seeking out and arranging high quality internship opportunities in relevant fields.
2. Nurturing mentor and intern relationships through structured meetings and gatherings.
3. Providing opportunities and support to present work.

IUPUI Life-Health Sciences Internships is funded by the Indiana University Commitment to Excellence Grant.
Sam Whipple  
Mentors: Mr. Daniel L. Alge and Dr. T.M. Gabriel Chu  
Title: Characterization of Polymer Reinforced Calcium Phosphate Cements  

This research dealt with studying the effects of polymer reinforcement on calcium phosphate cements, which could potentially be used as scaffolds for bone tissue engineering. The cement used was dicalcium phosphate dihydrate (DCPD), and poly(ethylene glycol) diacrylate (PEGDA) was used to reinforce it. DCPD cement was prepared by mixing monocalcium phosphate monohydrate (MCPM) and b-tricalcium phosphate (b-TCP) with water. While prior research dealing with polymer reinforced calcium phosphate cements has involved incorporating the polymer with the cement during mixing, our method is to add the polymer to the cement after the cement has been cast and dried thoroughly. This novel approach to polymer reinforcement relies on the polymer infiltrating the cement via its micropores. Specifically, this study dealt with finding evidence to support two hypotheses. The first is that the ratio of MCPM to β-TCP used during cement preparation will have no effect on the mechanical properties of the reinforced composite. The second hypothesis is that beyond a certain powder to liquid (P/L) ratio, PEGDA infiltration of the cements will be limited due to a lower percent porosity. The goal of this research was to find a powder to liquid ratio beyond which PEGDA infiltration becomes limited. It was found that polymer incorporation into the cements increased as the P/L ratio decreased and as excess β-TCP was added to the powder mixture. It was concluded that this reinforcement method is effective for improving the mechanical properties of the cement and could be applied for making scaffolds for biomedical applications.

James Wilcox  
Mentor: Dr. Terrell Zollinger  
Title: Area Health Education Center (AHEC) Health Workforce Project  

It is important to understand the reasons why residency and fellowship graduates choose to practice in specific locations to plan effective healthcare workforce development initiatives. This study documented the proportion of graduates who were practicing where they are needed. It also identified the factors affecting their practice location decision. A cross-sectional survey of 278 individuals completing graduate medical education programs at Indiana University School of Medicine was conducted using a standardized questionnaire. The results found that half of Indiana University residency and fellowship program graduates stay in the state to practice, many in MUAs or HPSAs.

IUPUI Life-Health Sciences Internships  
Spring 2009 Poster Session  
Thursday, April 9, 2009

Schedule:

3:30 pm– 5:30 pm Poster Presentations
3:45 pm Welcome  
Brandi Gilbert, MPH, Indiana University School of Medicine, Director of Life-Health Sciences Internships  
N. Doug Lees, PhD, Purdue School of Science, Chair of Biology Department  
Simon J. Rhodes, PhD, Indiana University School of Medicine, Associate Dean for Graduate Studies
4:00 pm Remarks  
Charles R. Bantz, PhD, Executive Vice President, Indiana University and Chancellor, Indiana University-Purdue University Indianapolis
Welcome to the IUPUI Life-Health Sciences Internships Spring 2009 Poster Session.

The Life-Health Sciences Internships program connects IUPUI life and health sciences undergraduates with research internships on and near the IUPUI campus. This program allows students to explore their career objectives and future career pathways, while also fostering valuable professional connections between students and faculty and staff. The students belong to a community of interns and mentors who support one another throughout the research experience and beyond. This program is funded by an Indiana University Commitment to Excellence grant to Dr. Doug Lees, Chair of IUPUI Department of Biology and Dr. Simon Rhodes, IU School of Medicine Associate Dean for Graduate Studies.

Life-Health Sciences Internships students represent nineteen different majors and minors on the IUPUI campus. Many of these undergraduates have career goals involving medicine, dentistry, occupational therapy, physical therapy, pharmacy, and nursing. These internships are an excellent stepping stone for future research and graduate study.

Mentors represent the Indiana University School of Medicine, the Indiana University School of Dentistry, the Indiana University School of Health and Rehabilitation Sciences, the Indiana University School of Nursing, the Indiana University School of Optometry clinics in Indianapolis and Carmel, and the Clarian Health Pharmacy Department. These professionals are providing invaluable experiences for undergraduate students and mentoring the next generation of scientists, researchers, and health professionals.

This program includes summaries of the posters presented and work completed by our interns. Thank you for joining us today!

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**Elisa van Eyk**  
Mentor: Dr. Robyn Fuchs  
Title: Skeletal Imaging Techniques for Animal Models

Skeletal imaging is an important tool in bone research utilizing animal models. Four types of imaging are used in the Bone Physiology Lab including digital radiography, dual energy X-ray absorptiometry (DXA), peripheral quantitative computed tomography (pQCT), and desktop X-ray micro-computed tomography (Micro-CT). Digital radiography is used to evaluate longitudinal changes in bone morphology and size during animal aging, and to evaluate the status of skeletal repair following bone fracture. DXA, which is the clinical gold-standard for determining bone health, is used to assess bone mineral density and content in both normal and previously injured bones. pQCT, a 3D measure is used to evaluate alterations in the size and volumetric mineralization of a single bone slice at user defined regions within a bone sample, such as the femur or tibia. Lastly, Micro-CT, a 3D measure is used to obtain structural properties and reconstructed 3D images of cortical and trabecular bone from various whole bone samples such as the tibia, vertebrae, and fracture calluses. Overall, skeletal imaging is an invaluable research tool for evaluating the skeletal phenotype of genetically modified mouse models, and to elucidate skeletal alterations in response to interventions, such as mechanical loading and pharmacologic agents.

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**Sara Walton**  
Mentor: Dr. Arlene Schmid  
Title: Therapist Role in Secondary Stroke Prevention-Qualitative Study

Objective: The objective of this research study was to explore and identify how rehabilitation therapists are engaging in secondary stroke prevention.  
Methods: Semi-structured interviews were conducted in 2007 in a Veteran Affairs Medical Center in a western state. Two authors have reviewed all of the interviews and developed codes.  
Results: Authors identified three common themes (current therapists’ roles, barriers to prevention, and advice for intervention).  
Conclusions: While some rehabilitation therapists are trying to make an effort to prevent secondary stroke, their time and knowledge hinder them from abiding to the Guidelines set forth by the Veteran Affairs Medical Centers and Department of Defense for Adult Stroke Rehabilitation Care.
**Benny Singh**

Mentor: Dr. Marc S. Mendonca  
Title: Dmapt Inhibits Cell Growth And Increases The Radiation Sensitivity Of Lung Cancer Cells

Parthenolide, is an anti-inflammatory experimental drug being evaluated for clinical use in oncology. Recently, a water soluble derivative of parthenolide, called DMAPT, has been synthesized for pre-clinical evaluation. We have shown that parthenolide is effective at increasing the X-ray sensitivity of prostate cancer cells with high NF-kB activity. This experiment investigates DMAPT’s effectiveness as a radiation sensitizer in radiation resistant lung cancer cells H1299 that also have high constitutive NF-κB activity. The NF-κB transcription factor is activated in a large number of cancers, appears to play an important role in progression of malignant cancer, and has been shown to be activated by ionizing radiation. We hypothesize that inhibition of NF-κB in H1299 lung cancer cells by DMAPT will increase their sensitivity to X-rays. We demonstrate that the incubation of H1299 cells for a total of 48 hours with 4.0 mM of DMAPT inhibits constitutive and radiation-induced NF-κB activity, cell growth, and enhances radiation induced cell killing. In addition, we found that DMAPT inhibited split-dose repair when radiation is fractionated. Taken together, the data indicate that DMAPT’s inhibition of NF-κB activation plays an important role in the observed enhancement of X-ray induced killing and suppression of split dose repair. DMAPT has excellent potential for clinical translation.

**Jasmina Spahic**

Mentor: Dr. David Basile  
Title: Pressure Natriuresis Modification

Kidneys have a major role in regulating blood pressure; when a healthy kidney expels Na+ adequately it prevents sodium sensitive hypertension. Injured kidneys have an impairment of maximal Na+ excretion when blood pressure is raised. A rat model of kidney injury was used to study the impairment. Ischemia reperfusion (I/R) injury was performed on male Sprague Dawley rats and creatinine levels were monitored to track the healing process. At day 35, when creatinine levels confirmed that the post I/R rats were healed, they were subjected to high pressure to evaluate the hypothesis of Na+ excretion impairment in post I/R rats. Three samples of urine were collected and the kidneys were harvested. The urines were tested for local hormones bradykinin and prostaglandin E2 (PGE2) using immunosorbent assays, and the kidneys themselves were stained for NHE3, the major apical Na+ transporter. The objective was to determine if the impaired Na+ excretion in post I/R kidneys, which predisposes hypertension, is due to local hormones or Na+ transporters’ inability to retract to endosomal pools. The study demonstrated that neither factors are the major cause of Na+ excretion impairment, opening up new pathways for further underlying causes of the problem.
Bailey Anderson  
Mentor: Dr. Stephen Kempson  
Title: Department of Cellular and Integrative Physiology: IU School Of Medicine  
As an intern under the direction of Dr. Stephen Kempson of the Department of Cellular and Integrative Physiology at IUSM, I was privileged to be an integral part in a project involving Aspirin, Tylenol, and caffeine and their role in impairing the transport of osmolytes, such as Betaine and Taurine, in the renal inner medullary collecting duct cells within my first semester. I had the ability to accompany Dr. Kempson on a departmental retreat where I was challenged to present the research to other departmental faculty. It was found that Aspirin, Tylenol, and caffeine all play a role in the inhibition of the uptake of certain osmolytes under hypertonic stress and may account for some of the nephrotoxic effects of long-term use of these drugs. Aspirin was found to inhibit the uptake of osmolytes possibly by way of the inhibition of COX-2 which in turn depletes the amount of prostaglandins needed in hypertonic adaptation. My second semester has been centered on the proper usage of the confocal microscopy using the Zeiss LSM 510 NLO microscope and program to observe the uptake of FITC dextran by endocytosis in kidney (IMCD3) cells. This system requires training and technique that can only be acquired from proper demonstration and continuous practice. I have become confident in my abilities to properly use this microscope system.

ChiaLei Ang  
Mentors: Dr. Mark A. Hallett and Dr. Simon J. Atkinson  
Title: AKT Phosphorylation After Metformin  
Akt, also known as PKB, is a well-characterized effector of phosphatidylinositol 3-kinase (PI3K). It is responsible for regulating cell survival by phosphorylating several targets. ATP depletion results in the down-regulation of Akt. During ATP depletion, AMP levels fall and AMP-Kinase (AMPK) is activated. Metformin is one of the oral anti-diabetes drugs that is commonly used in the United States. It has been characterized as an activator of AMPK. The phosphorylation of serine 473 in Akt is a surrogate for Akt activity. The objective of this study was to determine whether Akt activity is regulated in an AMPK dependent manner using metformin. The result of this study was Metformin would phosphorylate Akt at the concentration of 6 mM and Akt phosphorylation was increasing at temperature 37 °C.

Kathryn Shanks  
Mentor: Dr. Natalie Hamrick  
Title: The Pilgrimage Healing Process: A Randomized Controlled Trial Aimed to Reduce Depressive Affect and Fatigue in People with a Diagnosis of A Depressive Mood Disorder  
Mood disorders such as Depression and Dysthymia can take away from an individual’s quality of life. Traditional treatments such as anti-depressants and psychotherapy for depressive mood disorders can yield marked improvement in physical and emotional stamina. However, some individual’s improvements reach a plateau before they reach their desired peak. The Pilgrimage Healing Process is an energy modality created by Tanya Beck an Episcopalian priest. This energy modality uses prayer along with energy work very similar to Reiki and Therapeutic Touch (TT), to realign, rebalance, and recharge the human energy fields, creating optimal conditions needed for the body to heal naturally. This process has been noted to help with depression, fatigue, and promote well-being. The practitioners will either touch the body on certain joints or hold their hands just above a patient’s chakras while honoring the personal divine relationship of the patient. The purpose of the current project is to conduct a randomized trial of the Pilgrimage Healing Process as compared to prayer-only or usual care with respect to depression control efficacy. We hypothesize that individuals in the Pilgrimage group will have larger decreases in depression post-intervention compared to the other groups. We will use ANOVA to test this hypothesis.
Dan Rogozea  
Mentor: Dr. Yuichiro Takagi  
Title: Reconstitution of DNA Repair and Transcription Factor TFIIH complex  
A general transcription factor TFIIH is a large multi-protein complex, which plays critical roles in transcription initiation as well as a DNA repair. The ultimate goal of the project is to solve the structure of TFIIH complex by X-ray crystallography. For the first step to this end, I aim to reconstitute TFIIH complex in a recombinant form for crystallization trials. We have utilized the latest baculovirus expression technology, termed MultiBac system, which enables an integration of multiple genes into a single baculovirus expression virus for multi-protein complex expression in insect cells. My primary target is core TFIIH from yeast composed of 6 subunits, Rad3, Tfb1, Tfb2, Ssl1, Tfb4, and Tfb5 respectively. All 6 genes were cloned into the transfer vector by the SLIC cloning method followed by integration into baculovirus genome, resulting in a production of the recombinant baculovirus expressing all 6 genes encoding core TFIIH subunits. Protein complex was expressed in the insect cells followed by Ni column affinity purification, yielding a total of 6-subunit complex. An establishment of a through purification protocol followed by crystallization trials will be the next critical step in order to solve the structure of core TFIIH complex by X-ray crystallography.

Sairah Safdar  
Mentor: Dr. Janet Everly  
Title: The Systematic Review: Perspective from an Undergraduate Intern  
Researching Faculty Productivity  
In my internship, I learned about numerous methods of scientific research. One particular method interested me immensely: the systematic review. This method was, and still is, being used by a class of occupational therapy students in the IU School of Health and Rehabilitation Science. They are using this method to research, understand, and publish a work on faculty productivity. I was fortunate enough to have hands-on experience with the systematic review, and I was involved in many key steps throughout the process. This poster is a presentation of the work I have done using the systematic review.

Ashley Baldwin  
Mentor: Mr. Christopher Robbins  
Title: The Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research  
This research identifies long term effects of soldiers who sustained war-related traumatic amputations and looks at the outcomes of war-related traumatic amputation. Enrollment is limited to Vietnam veteran traumatic amputees. The main objective is to analyze if American veterans who have experienced a traumatic amputation during conflict have unique rehabilitation needs. Enrollment and completion of the survey for this research project can be completed on the website (www.vietnamwaramputee.org) or the veterans can request a survey to be sent by mail. Results show that pain is more common in the sample compared to other co-morbidities. Participants who use a prosthetic have a higher percentage of back pain, arthritis, stump pain, and other pain. Phantom pain is documented by many amputee veterans whether they are a prosthetic user or not. Results from the questionnaire have shown these veterans face pain issues, high incidence of depression, and PTSD. Pain while using a prosthetic is a significant issue with this population of veteran amputees but is possibly a trade-off for mobility or other quality of life measure. Further research is needed to understand the increased levels of co-morbidities among the traumatic amputee population. There may be health service implications for the long-term care of war-related traumatic amputees.

Rachael Basden  
Mentor: Dr. Simon J. Rhodes  
Title: Generation and Analysis of LHX3W224Ter Mice  
The anterior pituitary is responsible for growth, reproduction and homeostasis. A complex transcription factor cascade is required during anterior pituitary development for the generation of the five cell types and six hormones necessary for the body to function normally. One important transcription factor in this cascade is LHX3 which is essential for pituitary and nervous system development. Patients with mutations in LHX3 present with combined pituitary hormone deficiency, or CPHD, and lack multiple anterior pituitary hormones. Variable pituitary morphology, and limited neck rotation are also observed in most patients with an LHX3 mutation. However, of the ten different LHX3 mutations that have been published, only one of these mutations does not induce the characteristic limited head rotation. This W224ter mutation introduces a premature stop codon predicted to cause loss of the carboxyl terminus of the LHX3 protein. The phenotype of patients with this mutation supports the hypothesis that the actions of LHX3 in the pituitary and nervous system are functionally separable, perhaps mediated by the different domains of the protein, and that the carboxyl terminus of LHX3 is essential for pituitary development. To further investigate this hypothesis, a knock-in mouse model of this human disease has been generated so the molecular/cellular effects of this particular mutation can be studied throughout development, an approach that is not feasible with the human patients.
Alisa Beal
Mentor: Dr. David Basile
Title: Angiotensin II Sensitivity following recovery from ischemic acute renal failure

The present study examines the effects of Angiotensin II on rat kidneys with induced acute renal failure (ARF). The ARF rats, along with a control group of sham-operated rats, are injected with Angiotensin II and various measurements are taken including blood pressure. It was hypothesized that the ARF rats would be more sensitive to the introduction of Angiotensin II based on previous studies that have been conducted. Sensitivity to Angiotensin II is determined from various parameters including blood pressure and interstitial expansion. A slight increase in sensitivity was seen in rat kidneys injected with Angiotensin II following ischemic acute renal failure—marked by an increase in interstitial expansion and blood pressure. Although the exact cause of this sensitivity is unknown, it is possible that an increase of reactive oxygen species in ARF rats caused this increase in sensitivity to Angiotensin II. This hypothesis was supported by staining target kidney tissues with dihydroethidium, which showed an increase in reactive oxygen species in rat kidneys subjected to ischemic acute renal failure. This increase in reactive oxygen species implied that the ARF kidneys had elevated oxidant stress when compared to the sham-operated kidneys.

Katherine Biehl
Mentor: Dr. Jeffrey Crabtree
Title: Community Mobility

My poster basically summarizes my experience working at the Community Mobility and Participation in Society (COMPASS) lab. I explain the purpose and goals of the COMPASS lab. The COMPASS lab provides assessments for applicants of the IndyGo Open Door paratransit service, which enables members of the community with disabilities to access a manageable public transit services. The COMPASS lab is also home to many research projects. I explain the massive project I have been working on in order to compile the Functional Assessment of Cognitive Transit skills. This assessment will be used to more objectively assess applicants with cognitive disabilities and to conduct further research. I also explain IndyGo’s efforts to provide assistance for persons with disabilities under the American With Disability Act on both the fixed route and paratransit systems. Lastly, I explain who is eligible for Open Door services.

Rachel Rehlander
Mentor: Dr. Terrell Zollinger
Title: American College of Sports Medicine: American Fitness Index™

The American College of Sports Medicine (ACSM) American Fitness Index is a compilation of various data to help communities identify opportunities to improve the health of their residents and expand community assets to better support active, healthy lifestyles within the 50 most populous metropolitan statistical areas (MSAs) in the United States. Under ACSM, the Bowen Research Center researched data through the U.S. Census, CDC SMART BRFSS data, and the Trust for Public Land. Through these sources twenty different indicators were compared including: percent physically active, fruit and vegetable consumption, percent currently smoking, percent with obesity, asthma, angina or coronary heart disease, diabetes, health insurance, and cardiovascular and diabetes death rate as well as the number of recreation facilities, primary care providers, farmers’ markets, dog parks, and the mandating of school physical education programs. The 50 most populous MSAs were given a ranking score according to a weighted system that allowed each MSA to be compared based on their personal health and community/environmental indicator scores. As an intern at the Bowen Research Center, I assisted in research of the many variables, formatting the actual report, and creating a data collection manual. Currently, I have been helping in the distribution of a survey aimed at city officials who received the American Fitness Index report; the survey is meant to evaluate the effectiveness of the report and provide constructive criticism for future publications.

Geoff Ritter
Mentor: Dr. Patricia J. Scott
Title: Measurement of Participation, The Role Checklist – An Occupational Therapy Tool

Disease and disability are known to compromise role performance. However, medical advancements are giving more and more people the opportunity not only to survive life threatening and debilitating diseases and disabilities, but to become thriving participants in society. Current success is only determined through survival curves, return to work, and improvement in quality of life. Yet, we live in a society that expects more out of these individuals. My poster centers on the research that I have been involved with throughout the school year. The Role Checklist is an occupational therapy tool used to yield data on roles performed in past, present, and future (Part I), value associated with each role (Part II), and self perceived quality of role performance (Part III). It is used by clinicians to help determine whether an individual is successfully participating and an active member in society. Currently, Dr. Scott and Dr. Ghosh are working on a scaling system to determine whether an individual has healthy role participation or challenged role participation. Their research could help make this tool an integral part of the occupational therapy approach and in any form of rehabilitation for that matter.
Mary Powell  
Mentor: Mr. Ryan Lau  
Title: Neurotelemetry (ICU CEEG) Electrode Applications Compared

Electroencephalographic (EEG) monitoring is essential to patient care and diagnosis and efficient electrode application is necessary in order to successfully monitor the patient. Many times electrodes may come loose or fall off and when this happens an EEG Technician will need to repair the electrode. When too many repairs need to be made it is inefficient and can be stressful on both the patient and the technician. Both the pilot study and the second phase of this study look at variables that could cause these electrodes to fail as well as look at different methods of electrode application using collodion glue or sticky gauze. The goal of this study is to probe for the best type of electrode application. The pilot study concluded that collodion glue was the most efficient method of electrode application however there were not enough controlled variables, too much room for bias, and a small number of patients in the study leading to statistically insignificant results. In the second phase of the study the variables tested are rated precisely, there is more control over the types of products the technicians use, and the type of electrode application the technicians use is randomized.

Natasha Reed  
Mentor: Dr. Kathleen Russell  
Title: The Wisdom Of Lay Health Advisors: A Link Between Community And Breast Cancer Screening

Background: Medically underserved African American women have multiple personal, social, and environmental barriers to mammography for early detection of breast cancer. Lay Health Advisors (LHAs) are effective in decreasing barriers to screening. To better understand the experiences of LHAs in reaching these high risk women, we conducted a case study with LHAs, who were part of a Midwestern urban community intervention study to increase mammography screening. Methods: A focus group was conducted with the project’s three LHAs who were older African American women and residents of the community. Focus group questions involved descriptions of experiences in their role, challenges encountered in fieldwork, changes needed in the project, and processes that were working well. Data was transcribed and analyzed with content analysis procedures. Results: Three themes emerged including 1) What it takes to be an LHA, (2) Ups and Downs of being an LHA, and (3) Learning about the Community and Oneself. Conclusion: Study findings provide insight when designing LHA interventions targeting medically underserved populations for nursing research and public health nursing practice.

Kawa Cheong  
Mentors: Dr. Dennis Ang and Ms. Janna Hilligoss  
Title: Fibromyalgia Research Center

As an intern as a member of Dr. Dennis Ang’s Fibromyalgia research team, I am able to transfer the learning from school into practical manner by contacting patients directly. This experience had provided me valuable opportunity in learning about research and gaining knowledge in the seriousness of the Fibromyalgia illness. Fibromyalgia (FMS) is a chronic syndrome affecting 2-6% of the general population. FMS patients suffer from physical pain, muscular tenderness, fatigue, and especially the impairment in physical function. The purpose of Motivational Interviewing (MI) study is to promote a healthy living style to FMS patients, and further, to improve their symptoms. FMS participant will be randomized to either the MI intervention (MI) group or the attention control (AC) group. Both subjective and objective data will be elicited from the participants via the internet based questionnaires, GT1M ActiGraph accelerometer, and the 6 minutes-walk test (6 MWT) results. 6 telephone interventions will be delivered to all patients but with distinctive approaches. By comparing the MI group with the AC group, our primary goals are to see improvement in MI participants’ activity-self-report and the increase in their weekly exercise adherence by greater than 30 minutes as the projected result.

Stephanie Flagg  
Mentor: Dr. Jack Windsor  
Title: The Effects of Cigarette Smoke Condensate on Cancer Cell

Cigarette smoke condensate (CSC) is the particular matter of cigarette smoke. It is comprised of thousands of chemicals and is known to cause lung and oral cancer. The purpose of this study was to determine the effects that CSC has on cancer cells in order to better understand if tobacco further enhances the aggressiveness of these cells. Two oral cancer cell lines (SCC-25 and CAL-27) were propagated for the study. The SCC-25 cell line is considered metastatic and the CAL-27 is non-metastatic. The cell lines were seeded into 6-well plates at a density of 75,000 cells per well and then different concentrations of CSC was added. The CSC concentrations utilized were 400 mg/mL, 200 mg/mL, 100 mg/mL, 50 mg/mL, and 25 mg/mL. After incubation with the CSC, cell proliferation and toxicity were determined by WST-1 and LDH assays (Roche Diagnostics, Indianapolis, IN), respectively. The results showed CSC concentrations of 100 mg/mL and above significantly inhibited cell proliferation and increased toxicity for the CAL-27 and SCC-25 cancer cells. This demonstrated that cancer cells can still be affected by tobacco. The next steps are to determine how different cellular processes are further altered in these cancer cell lines when exposed to CSC.
**Will Grimm**  
Mentor: Dr. Alex Robling  
Title: Sost Regulation of Parathyroid Hormone Anabolic Action

Osteoporosis is a bone disease that makes bones very fragile and makes them easier to fracture. Eli Lilly and Company introduced a drug, called Forteo, which consists of the first 34 amino acids of the parathyroid hormone (PTH). The drug works to increase new bone formation. It is unclear how PTH works to increase the formation of new bone. Female wild type mice and those missing the Sost gene were given daily injections of PTH. A bone density scan was done to determine the amount of bone growth. PTH treatment resulted in significant bone accrual in the distal femur, regardless of genotype. However, whole-body bone mass measurements revealed that PTH was ineffective in increasing bone mass in the Sost-deficient mice. We conclude that trabecular rich areas (such as the distal femur) do not require Sost for PTH action.

**Eric Grow**  
Mentor: Dr. Fengyu Song  
Title: The Effects of CSC on Human Pulp Cells

Cigarette smoke condensate (CSC) is produced when tobacco is burned and it is composed of more than 4,000 chemicals. It is well known that smoking tobacco can cause lung cancer and other health problems such as periodontal disease and oral cancer. However, very little is known about the effects of CSC on cell repairing and regeneration ability. This research project examined the effects of CSC on human pulp cells (HPC) and is our first step to investigate smoking's effect on HPC repairing and regeneration ability. HPCs were collected from dental patients whose teeth were extracted for orthodontic treatment with Institutional Review Board approval. HPCs (50,000 cells/well) were exposed to various concentrations of CSC (0, 3.125, 6.25, 12.5, 50, 100, 200 and 400µg/ml) for three days. The cytotoxicity and cell viability effects of the CSC on HPCs were evaluated by performing lactate dehydrogenase and water soluble tetrazolium-1 assays, respectively. To test their collagen degrading ability under the influence of CSC, HPCs (100,000 cells/well) were seeded as a single colony in each well of Type I collagen-coated 6-well plates and supplemented with CSC (0, 12.5, 25, and 400µg/ml) for 1, 3 and 5 days before staining with Coomassie blue. The conditioned media were also collected to test for proteinase activity utilizing zymography. The CSC was toxic and inhibited HPC proliferation at 400µg/ml. Concentrations of CSC at 12.5 and 25µg/ml stimulated the HPC ability to degrade collagen. The production of pro- and active MMP-2 was increased in the cultured media. CSC is toxic to HPCs and affects pulp cell growth. CSC at non-toxic concentrations changes the HPC ability to remodel extracellular matrix, in part, by producing more MMP-2.

**Kateryna Petyaykina**  
Mentor: Dr. Joe Burrage  
Title: Health Seeking and Coping: HIV Salivary Rapid Testing in African Americans

The objective of this study is to identify barriers and facilitators of voluntary Salivary Rapid HIV testing decisions (SRT) among African Americans in order to develop interventions to improve HIV testing rates and care entry if HIV positive. Dr. Burrage’s two phase study included exploring research focus questions in confidential interview format (Phase 1) (focus groups). A semi-structured interview guide (SSIG) was used to conduct 10 focus groups of 2-5 African Americans (N=38) recruited from a large STI Clinic. Content analysis of the focus group transcripts was done using line-by-line analysis, and reviewing sentences and phrases for patterns or core meanings. The themes identified in Phase 1 are: Familiarity, Stigma, Fear, Access, Immediacy, Ease, Degree of Responsibility, and Trust. The second phase (quantitative) focuses on concepts described in Phase 1 regarding sexual behavior and demographic information using questionnaires. So far, questionnaire data from 270 subjects from Phase 2 have been entered into the SPSS database, and a biostatistician will be consulted for further analysis. The results of the study will provide needed information to develop and test targeted interventions to increase the number of individuals who get tested for HIV.

**Michael Piontek**  
Mentor: Mr. Scott Cross  
Title: Assay Qualification for Inhouse Testing of Common Herpes Viruses

The FDA enforces rigorous testing on vectors to be used in gene therapy, for common virus contaminates; this process is time consuming and costly. Qualifying assays in which this testing could be conducted in-house would save time and money. The development of these assays requires the creation of primer sets, which amplify the desired DNA sequences. A probe must be created that corresponds to a point in between the primers for quantification. There must be several successful runs that give supporting data of the identification of the desired DNA segment. A support assay shows that a shared protein between species is specific to each individual species and will not unintentionally amplify.
Abby Newbauer
Mentors: Dr. T. Zollinger and Ms. Carolyn Muegge
Title: Indiana State Department of Health Office of Women’s Health Evaluation Team: Bowen Research Center

In April 2008, the Indiana State Department of Health—Office of Women’s Health launched a pilot program called the Indiana Women’s Diabetes Initiative in order to improve diabetes self-management among women in three counties in Indiana. Now entering its second year, the IWDI program focuses on the Healthy People 2010 objectives for diabetes management, such as maintaining a healthy weight, health care self-management, and involvement in physical activity. Those eligible to participate in the program are female 18 years of age or older that have a physician’s diagnosis of diabetes. These women regularly consult with client navigators to establish and reach self-management goals. Carolyn M. Muegge, Epidemiologist and Research Manager for Bowen Research Center was called upon to assist with surveillance tracking, data collections, and reporting data. I have been working with Ms. Muegge and her Research Assistant Jennifer M. Kerner, to review and input client data baseline data, review and input community outreach and referral data, assist in quality checks and data analysis, and conduct literature reviews.

Ashley Peronis
Mentors: Dr. Daniela Bischof and Dr. Kenneth Cornetta
Title: Purification of Lentiviral Vector

Viral vectors have become a mode of transportation for genes that need delivered to specific cells in the body that do not express the gene. Lentiviral vectors are of particular interest because they can infect dividing and nondividing cells. Human embryonic kidney cells, 293T cells, were used to package the lentiviral vector. These cells are easy to grow and transfect. Lentiviral vectors made by transfecting the cells with plasmids expressing virus proteins (gag, pol, rev, and envelope). The way the vector was made can allow for there to be cell debris and protein debris, which is toxic to the target cells. A way to reduce or get rid of the cell debris is to purify the vector. Purification is done by using an anion exchange column.

Michael Hendon
Mentor: Mr. Ryan Lau
Title: Neurotelemetry at Methodist Hospital

The internship that I completed at Methodist hospital in the neurophysiology laboratory was focused on multiple projects mainly relating to neurotelemetry. Neurotelemetry is long term electroencephalogram (EEG) monitoring of patients. It has been shown to be useful in a variety of applications, including detection of subclinical seizures in comatose patients. I had the opportunity to observe multiple procedures in the lab as well as attend educational talks about the subject of neurotelemetry. Additionally, I spent time starting to extract useful information from past procedures performed at Methodist Hospital. I have also begun to look through and reformat every procedure on file in the department into a standardized format. The standard format as well as the index file I am creating will aid in quick and easy accessibility to desired procedures in information within the laboratory.

Richard Adam Hooker
Mentor: Dr. Melissa Kacena
Title: Integrin Signaling in Megakaryocyte-Induced Osteoblast Proliferation

Recent studies suggest that megakaryocytes (MKS) may play a significant role in skeletal homeostasis. Previously, we showed MKs enhance osteoblast (OB) proliferation by up to 6-fold. Here we show the involvement of integrin signaling and we begin dissecting the specific signaling pathways. To study integrin signaling in MK-induced OB proliferation we cultured cells with or without EDTA or RGDS. MK-induced OB proliferation was reduced 18% and 50% in cultures containing 125µM EDTA or 62.5 µM RGDS, respectively. In antibody neutralization studies, MK-induced OB proliferation was suppressed 21% and 20% with anti-α3 (10µg/mL) and anti-α5 (20µg/mL) integrin chains, respectively. Using Western blotting we found multiple signaling pathways activated in OBs cultured with MKs including: p38, JNK, MAPKAP Kinase 2, p90RSK, Elk1, and Mdm2. Phospho-ERK1/2 and -AKT were unaltered. In the presence of EDTA, p38 and Mdm2 levels were significantly reduced, while JNK levels were unaltered. This suggests that at least 2 separate intracellular pathways are activated when OBs are cultured with MKs and integrin binding appears to be involved in the regulation of p38 and Mdm2. Understanding the mechanisms by which MKs enhance OB proliferation will allow for the development of novel anabolic therapies to treat bone loss in osteoporosis.
Nhila Jagadeesan  
**Mentor:** Dr. Brittney-Shea Herbert  
**Title:** Oligonucleotide N3→P5-(Thio)-Phosphoramidates And Their Lipid Conjugates As G-Quadruplex Forming Compounds

G-quadruplex forming molecules may potentially be developed as therapeutic agents for indications on oncology, viral infections, blood coagulation. We investigated whether G-motif-containing N3→P5-(thio)-phosphoramidates (NPS) oligonucleotides (ODNs), and their lipid conjugates, form stable G-quadruplexes compared to ODNs with other backbone and no lipid conjugation. We evaluated the ability of NPS ODNs containing various nucleotide sequences to form G-quadruplex structure using thermal dissociation – association/annealing experiments. Experiments were conducted in both sodium and potassium containing buffers. G-quadruplex melting curves revealed the potential of NPS ODNs to form G-quadruplexes. To investigate the biological consequences of G-quadruplex forming ODNs with regards to cellular toxicity, the anti-proliferative effects and of these NPS ODNs were investigated in human cancer cell lines. Our experimental results indicate that G-rich NPS ODNs capable of forming stable G-quadruplexes affect the cell morphology and adhesion properties of some, but not all, cancer cell lines. At the same time, very similar 5'-palmitoyl group-containing thio-phosphoramidate oligonucleotides lacking –GGG- motif and unable to form stable G-quadruplex, had no effect on cell morphology and cell adhesion properties. These investigations reveal the potential for use of stable, RNase-resistant NPS ODNs as G-quadruplex forming compounds and therapeutic compounds.

Jordan Jenkins  
**Mentor:** Dr. L. Jack Windsor  
**Title:** Alendronate as a Contributing Factor to Osteonecrosis of the Jaw

The purpose of this study was to determine the effects of alendronate, a common amino-bisphosphonate, on human gingival fibroblast (HGF) proliferation and viability, as well as on HGF-mediated collagen degradation and MMP-2 activity. A water soluble tetrazolium (WST-1) assay kit and a lactate dehydrogenase (LDH) assay kit were used to determine the effects of alendronate on cell proliferation and viability, respectively. Six-well plates coated with collagen were used to determine the effects of alendronate on collagen degradation. Zymography was performed to examine the MMP-2 level in the media from the HGF mediated collagen degradation assays. Zymography was also used to determine alendronate's effect on MMP-2. The WST-1 assays showed significant (p<0.05) changes in cell proliferation at 10⁻⁵, 10⁻⁴ and 10⁻³ M (80, 32.9 and 2.1%, respectively). LDH assays showed significant cytotoxicity at concentrations of 10⁻⁴, 10⁻³ and 10⁻² M (26.5, 36.5 and 49.4%, respectively). The HGF-mediated collagen degradation assays showed non-toxic levels of alendronate caused little to no change in collagen degradation. The zymography results showed no significant inhibition of MMP-2 until a concentration of 10⁻³ M was reached, while the enzyme was almost completely inhibited by 10⁻² M alendronate. Alendronate affects HGFs and MMP-2 activity.

Donovan Moxley  
**Mentor:** Dr. Bruce Anthony  
**Title:** The Study of Fetal Alcohol Spectrum Disorder in a Mouse Model

Excessive alcohol consumption during pregnancy causes many developmental deficits to the fetus, represented as a spectrum of cognitive, behavioral, and structural abnormalities termed Fetal Alcohol Spectrum Disorder (FASD). Effective clinical diagnosis of FAS, the most severe form of FASD, depends in part on a distinct set of abnormal facial features. Studies using small animal models of fetal alcohol exposure demonstrate a strong connection between early fetal alcohol exposure and alterations in proliferation, apoptosis, differentiation, and migration in neural crest cells responsible for development of many facial dysmorphology features in FASD. More recent studies have used mouse models of FASD with varied alcohol doses and timing of exposure to study developmental defects distinct in structural head and face development, but a comprehensive understanding of the underlying mechanisms is unknown. We suggest that a C57BL/6 mouse model of FASD will assist in understanding facial dysmorphology and assist in clinical diagnosis of FASD. This model controls for timing and dose of exposure while also assuring consistent controls in maternal factors and assist in understanding mechanisms that contribute to abnormalities. We propose the use of two alcohol delivery systems to assist in regulating alcohol dose and timing of delivery during specific developmental periods.

Jessica Nees  
**Mentor:** Dr. Joe Dynlacht  
**Title:** Effect of a heat-enhancing/radiosensitizing Drug on HeLa CCL2 Cells

Combining a hyperthermia treatment with radiation tends to increase the effectiveness of radiation therapy. It has been shown that heat enhancing compounds have the tendency to increase radiosensitization (1). Heating cells at temperatures ~41.5 degrees Celsius combined with radiation, compounds such as (Z)-(+-)-2-(1-benzensulfonyl-indole-3-ylmethylene)-1-abzabicyclo[2.2.2]octoan-3-ol (VJ112-OH) cause an increase in cell death.
Jessica Morgan  
Mentor: Dr. Richard L. Gregory  
Title: Nicotine’s Effect on Hydrophobicity and Adherence of *Streptococcus mutans*.

*Streptococcus mutans* plays a major role in tooth decay, and thus increasing the rate of dental caries. *Streptococcus* antigen I/II is a surface protein antigen. The abundance of antigen I/II on the surface of *S. mutans* can be measured by assessing the hydrophobicity. Previous studies have shown that antigen I/II increases the hydrophobicity of *S. mutans*, and nicotine up regulates antigen I/II protein expression. The effect of nicotine on the hydrophobicity of *S. mutans* was measured. Nicotine dilutions from 0.1562 mg/ml -5 mg/ml were made in Tryptic Soy Broth without sucrose. Bacteria were grown in each of these dilutions for 16 hours at 37°C in 5% CO₂. The cells were washed three times in sterile saline and suspended in potassium urea magnesium (PUM) buffer. The initial optical density was measured (OD600). One milliliter of the bacterial suspension was transferred into an Eppendorf tube, and 0.1 ml of hexadecane was added. This was mixed and was allowed to stand until the phases separated. The final optical density of the aqueous bacterial phase was measured (OD600). Hydrophobicity was calculated by (Initial OD – Final OD/Initial OD) x 100%. The results demonstrated that the hydrophobicity of *S. mutans* increased as the nicotine concentration increased up to 1.25 mg/ml when hydrophobicity leveled off. The increase in hydrophobicity suggests that nicotine users will have increased *S. mutans* adherence and caries. Biofilm formation was initiated by inoculating 5 µl of suspended bacteria cells just as in the hydrophobicity assay. The same nicotine dilutions, 0.1562 mg/ml-5 mg/ml were placed into the wells of 96 well sterile microtiter plates, and incubated at 37°C with 5% CO₂ for 16 h. After incubation, liquid was removed and wells were rinsed with sterile saline. The wells were stained with crystal violet stain for 10 min. The plates were rinsed with sterile saline and the absorbance was measured at 490 nm with a microplate reader. The data indicates that as the nicotine dilutions increased, the adherence of the bacteria increased in the wells. This data suggests that the increase in hydrophobicity observed with nicotine and the adherence of *S. mutans* to the tooth surface is directly related.

Anthony Kiesel  
Mentor: Ms. Sharon Cromer  
Title: Clinical Research from Conception to Completion: Genetics of Bone Loss and Bone Strength in Men and Women

Clinical Research is the process of bringing to the patient, discoveries and knowledge obtained in the lab, expanding the horizons of medicine. Clinical research is a highly complex process. Throughout this year I have interacted with several departments within the Indiana Clinical Research Center (ICRC), specifically in context of patient relations and laboratory work. I have seen firsthand how a clinical research trial is conducted from conception to completion both as a patient and a research assistant. As an intern at the ICRC I was able to experience all sides of the clinical research process. I was given training and received my certification through Clarian on Phlebotomy and PIV insertion. This enabled my to gain valuable first hand experience working with the nurses in direct contact with the patients. I was trained on the lab procedures, operations, and protocols, and have become familiar with the organization and function of the lab in the clinical research process as well as practiced in many of the commonly used lab techniques. I also was able to participate in the study as a patient enabling me to truly gain a full understanding of the clinical research process from every angle.

Sajel Kumar  
Mentor: Dr. Johnathan Tune  
Title: Perivascular adipose-derived leptin exacerbates coronary endothelial dysfunction in the metabolic syndrome

Obesity has reached epidemic proportions in the United States and worldwide. Importantly, obesity is strongly associated with cardiovascular disease and metabolic syndrome. Adipose tissue, an active endocrine and paracrine organ, releases adipokines which may influence key mediators in coronary artery disease (CAD). The link between obesity and CAD, however, is remains poorly understood. Previously, our laboratory has shown that adipose-derived factors from perivascular adipose tissue (PVAT) impair coronary endothelial-dependent vasodilation through direct inhibition of endothelial nitric oxide synthase. To date, however, our understanding of how surrounding PVAT contributes to CAD as a complication of obesity remains limited. Accordingly, the current study investigated both the mechanism and mediating agent(s) by which adipose-derived factors impair coronary vascular function in the obese swine. Results from this investigation implicate perivascular adipose-derived leptin as a pro-atherogenic mediator of coronary arterial dysfunction in the obese swine. These findings suggest a novel mechanism of obesity-induced cardiovascular disease.
Nichole Leahy  
Mentor: Dr. Matt Allen  
Title: Bisphosphonates do not adversely affect bone toughness after 6 months of treatment at doses consistent with those used in cancer patients.

Bisphosphonates are a class of drug widely used to treat various skeletal conditions including osteoporosis and cancer. Previous work in our laboratory has shown that bisphosphonates can adversely affect bone toughness, a measure of the skeleton’s ability to resist fracture. As our previous work suggests the effects of bisphosphonates on bone toughness are dose-dependent, and cancer patients are treated with much higher doses of bisphosphonates than patients treated for osteoporosis, we hypothesized that cancer dosing regimens of bisphosphonates (zoledronate) causes time-dependent reductions in bone toughness. Female beagle dogs were treated for 3 or 6 months with a placebo vehicle or zoledronate. Ribs were collected and analyzed for measures of bone density and geometry and then subjected to mechanical testing to determine numerous biomechanical parameters. Zoledronate expectedly resulted in higher bone mass and strength compared to vehicle-treated animals. Most notably, we found no difference in toughness between vehicle and zoledronate groups. We therefore conclude that during the early stages of treatment with cancer-relevant doses of zoledronate there is no adverse effect on bone toughness.

Indolfo Luna  
Mentor: Dr. Javier Sevilla  
Title: Global Health in Honduras

For my poster presentation I was planning on discussing the report that I had helped to create for Dr. Sevilla’s 2007 trip to Honduras. I discuss what this trip is and what it is for. This poster also contains a portion of a table that I made. The table is what I made when I organized all of the data about how much of each medicine the group used on their trip. However the table is too big to fit so I ended up only putting a portion of the full table on my poster presentation. I have also included a photo from a past trip before 2007 that shows Dr. Sevilla and a student helping a patient with a problem.

Mustafa Mavi  
Mentor: Dr. Mark Hallett  
Title: Activation of S6 Kinase by Using Metformin in S3 Mouse Kidney Cells

Activation of AMPK by using Metformin causes mTORC1 to be activated. Components of mTORC1 are raptor, mTOR and mLST8. The mammalian target of rapamycin (mTOR) pathway is a key regulator of cell growth and proliferation and increasing evidence suggest that its deregulation is associated with human diseases including cancer and diabetes. The mTOR pathway integrates signals from nutrients, energy status and growth factors to regulate many processes, including autophagy, ribosome biogenesis and metabolism. Activation of mTORC1 down regulates and activates S6 kinase by Phosphorylation. The highly homologous 40S ribosomal protein S6 kinases (S6K1 and S6K2) play a key role in the regulation of cell growth by controlling the biosynthesis of translational components which make up the protein synthetic apparatus, most notably ribosomal proteins. In this study we discuss by using S3 mouse kidney cells to active AMPK by using metformin and in turn the activation of S6 kinase.

Adam Miller  
Mentor: Dr. Linda DiMeglio  
Title: Insulin Dose Changes in Children Attending a Diabetes Camp

Diabetic children starting periods of intense exercise (such as camp), need to adjust insulin to minimize hypoglycemia. However, few guidelines exist. We retrospectively analyzed insulin dose changes and outcomes in children attending a week-long residential diabetes camp. During the first day, pumpers received 11.1±6.3% less basal insulin than home doses, whereas children on injections decreased their long-acting insulin 8.2±12.8% (p<0.02). 79% of campers had no change in mealtime insulin dosing from home. 60% had ≥ one low blood sugar. Pumpers were more likely to have hypoglycemia during the first day than those on injections (mean 1.4±1.3 vs 0.8±1.0 lows/camper, p<0.001). The number of lows increased with increasing camper age but was not correlated to A1c prior to camp. Overall, children did not have significant further reductions in their total insulin dose from the first to the last camp day. However, by the last day, children had fewer lows than during the first day (0.7±0.9 vs 1.1±1.2, p<0.01) with no low blood sugars in 51%. While an empiric reduction in basal insulin appears reasonable, hypoglycemia was still common. Prospective studies are needed in order to facilitate tailored adjustments that minimize glycemic variability and improve overall diabetes control at camp.