IUPUI Life-Health Sciences Internship Program

Spring 2011 Poster Session

Thursday, April 7, 2011
3:00 PM—5:00 PM
VanNuys Medical Science Building Atrium
Vision

The Life-Health Sciences Internship 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.

The IUPUI Life-Health Sciences Internship Program is funded by the Indiana University Commitment to Excellence Grant.

Welcome to the IUPUI Life-Health Sciences Internship Program Spring 2011 Poster Session.

The Life-Health Sciences Internship 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 IUPUI Commitment to Excellence grant to Dr. Doug Lees, Purdue School of Science and Dr. Simon Rhodes, Indiana University School of Medicine.

Life-Health Sciences Internship students represent 14 different majors and minors spanning six schools on the IUPUI campus. Many of these undergraduates have career goals involving research, medicine, dentistry, occupational therapy, physical therapy, and pharmacy. 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, Methodist Research Labs, and the pharmacy department of Indiana University hospital (Indiana University Health). 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!

Brandi Gilbert

Director, Life-Health Sciences Internship Program
Thank you to our 2010-2011 participants:

Interns

Milata Abraham  Paula LeBlanc
Perez Agaba  Katelyn MacPherson
Fatima Ali  Charla McGough
Alisha Allison  Tomas Meijome
Corey Ariss  Hengameh Olhagh
Fatoumata Bah  Opeyemi Olorungbounmi
Brett Barnes  Nehal Parikh
Alemayehu Bittimo  Matthew Rehmel
Heather Bolan  Morgan Rhodes
Kylie Bontrager  Jessica Rodenbeck
Alyssa Burton  Jennifer Romine
Megan Delaney  Devin Schlueter
Doug Engle  Pich Seekeaew
Rachel Gasaway  Kristyn Seibert
Samuel Gerhardt  Jeremy Sherer
Jessica Hashu  Cleandrea Spencer
Jessica Head  Corey Summers
Kendra Heeke  Corrie Swihart
Kreyl Henderson  Christopher Taylor
Jessica Jackson  Elizabeth Tombers
Joyce Jiang  Keerstin Whitefield
Gloria Kwizera  Ashley Winfield
Lindsey Lazo

Intern: Ashley Winfield
Major: Biology

Mentor: Dr. Linda DiMeglio
Department: Pediatrics - Pediatric Endocrinology and Diabetology

Primary Care Physician Knowledge and Reported Compliance with American Diabetes Association (ADA) Guidelines for Care of Children with Diabetes: A Cross Sectional Survey

Type 1 diabetes (T1D) is the result of immune system destruction of beta cells in the pancreas resulting in loss of insulin production. Family practitioners and pediatricians often find themselves responsible for care of children with T1D, but may not be aware of guidelines for optimizing medical management. Therefore, our study focused on how physicians reported implementing the 2010 ADA clinical guidelines into their practice. We mailed a survey to all pediatricians and family practitioners in the state of Indiana in order to assess their volume of T1D patients, the knowledge they have about guidelines for diagnosis, and the techniques and resources that they use to help their patients manage their diabetes effectively. We developed the survey, obtained a mailing database, and sent 3 waves of letters/surveys to increase response rates. We included a 2 dollar bill honorarium with the survey. Mailings were sent over the course of 5 months. We had a 40% response rate with 963 physicians returning surveys. 56% of these 963 physicians reported taking care of children with diabetes. We are currently analyzing results. We will look at differences between pediatricians and family practitioners in knowledge of guidelines and reported compliance with recommended assessments.
In-Situ Simulations
Simulation is becoming a great tool in medical education. It allows medical personnel to train in how to best care for their patients in a safe environment. It is also promising in the reduction of medical accidents and improving teamwork. The debriefing portion of a simulation is what immediately follows the scenario where all those that participated watch the video recording of the simulation session and reflect about how they performed during the scenario. They are encouraged at that time to work as a team to find what they did well, what they did wrong and to brainstorm how they could have handled the situation better. Our goal in this study was to explore the feasibility of in-situ simulation in the NICU as part of a bigger research study to test the effectiveness of in-situ simulation to improve teamwork skills. During the debriefing some staff expressed concerns about the realism of the scenario. However, most were able to reflect about their performances with other disciplines and found the in-situ simulations session and the debriefings an advantageous tool for their learning.
DLC1 Translocation in Normal and Ischemic Kidney Cells

DLC1 (Deleted in Liver Cancer 1) is a protein which is a tumor suppressor. The DLC1 gene is deleted in the primary tumor of hepatocellular carcinoma (HCC). Ischemia is a condition resulting from blood supply restriction to an organ characterized by a shortage of oxygen and glucose. This research involves following the biochemical localization of DLC1 in normal and ischemic mouse kidney S3 cells. Antimycin A, when added to S3 cells, acts as a mitochondrial inhibitor that results in ATP depletion. The S3 cells were exposed to antimycin A and nuclei were isolated from the cytosol by lysing and centrifugation. The proteins were then separated using gel electrophoresis. The membrane on which proteins were transferred was then probed with antibodies to identify DLC1. The antibodies identified two DLC1 bands on the western blot. The lower band translocated to the nucleus with antimycin A. An increase in protein mobility is often associated with dephosphorylation of a protein. It is also a well known fact that ischemia results in a large increase in dephosphorylation. We speculate that only the dephosphorylated form can translocate to the nucleus in this ATP depletion model of ischemia.
TOTAL INTRAVENOUS ANESTHETIC INCREASES SPECIFICITY AND SENSITIVITY FOR INTRA-OPERATIVE NEUROMONITORING OF MOTOR EVOKED POTENTIALS

This research study dealt with studying the effects of a total intravenous anesthetic (TIVA) versus a gaseous anesthetic regime on the monitoring of transcranial motor evoked potentials (MEPs). A TIVA regimen does not significantly decrease waveform amplitudes, and therefore, increases the specificity and sensitivity of the interpretation of MEP monitoring. In contrast, a gaseous anesthetic technique reduces the amplitude and increases latency of the MEP waveforms and makes accurate interpretations difficult. Through this research project, 300 TIVA surgical cases will be analyzed to support the use of TIVA for MEP monitoring practice in the operating room.
**Intern:** Fatima Ali  
**Major:** Pre-Med Biology  
**Mentor:** Zeynep Salih, MD  
**Department:** Neonatology

**In-situ interprofessional high-fidelity simulation in a level IIIC NICU-A Descriptive Study**
Simulation is the imitation of a realistic situation or process which is generally conducted for training and educational purposes. After observing and minimally participating in several neonatal simulation sessions at the SIM center, we conducted our own in-situ (in the patient care unit) interdisciplinary high-fidelity simulation sessions at Riley Hospital’s Neonatal Intensive Care Unit (NICU). The purpose behind this research was to test the feasibility of organizing in-situ simulation sessions in preparation of a larger study to improve teamwork during resuscitation in a level III C-neonatal intensive care unit. I actively participated in setting up the equipment as well as actual sessions. Due to my prior intensive research on neonatal simulations and resuscitations, I was able to analyze as well as critique the staff’s actions while performing resuscitations and also reflections during debriefings. Working in collaboration with other interns, these sessions were video-recorded for debriefing purposes. During the debriefing sessions, I created a list of the pros and cons regarding the simulation session. Results illustrated that interprofessional high-fidelity in-situ neonatal resuscitation simulation is feasible and effective in exploring the technical, cognitive and behavioral issues in addition to latent safety hazards related to neonatal resuscitations in a hospital setting.

**Intern:** Corrie Swihart  
**Major:** Biology  
**Mentor:** Fengyu Song  
**Department:** Department of Oral Biology

**The Homology of EVI5 and ABK Sequences among Animals**
Amphibian Axolotl (Ambystoma mexicanum) can regenerate its limbs after amputation. During the early stage of regeneration, a G2 maintaining protein, ecotropic viral integration site 5 (EVI5), has dramatically increased, which suggests the delay of cells entering mitosis. Aurora B Kinase (ABK) assists to degrade EVI5, which moves cell from G2 to mitosis. Unfortunately, sequence information of EVI5 and ABK was unknown for axolotl, hindering future study on their roles in axolotl limb regeneration. The cDNA sequences of ABK and EVI5 from human, mouse, rat, and Xenopus were then collected from GenBank database and compared utilizing ClustalW software. Total RNA was extracted from axolotl tissue for degenerate reverse transcriptase polymerase chain reaction (RT-PCR). GAPDH was used as an internal control. The RT-PCR products were analyzed by two direction sequencing. After comparison, 342 bp of nucleotides from EVI5 and 1035 bp from ABK were highly conservative among animals and used as templates to design primers for degenerate RT-PCR. The sequencing analysis on axolotl RT-PCR products identified 166 bp and 261 bp nucleotides for EVI5 and ABK, respectively. This study provided us the partial sequence information of axolotl EVI5 and ABK, which advanced the study on their roles in regeneration.
Intern: Cleandrea Spencer  
Major: Pre-Medical Biology  
Mentor: George Sandusky  
Department: IU Dept. of Pathology

Quality Control From a Subset of Human Surgical Tissue Specimens from the IU Simon Cancer Center Tissue Procurement and Distribution Core collected in 2009-2010. An H&E and RIN Value Assessment.

Quality control (QC-) of human tissue specimens for research is critical for the development of new bio-markers and their ability to determine clinical trial outcomes. In this study we evaluated sixty-nine samples for both RNA and histology quality control measures from the IU Simon Cancer Center Tissue Bank.

The IU Simon Cancer Center Tissue Bank is a centralized tissue procurement resource established to collect high quality tissue for basic clinical and translational research, collecting approximately 550 clinical cases per year using an informed consent and HIPAA signed document. All tissues are collected and processed in liquid nitrogen within 30 minutes of removal. The tissue samples are sliced and diced into 100 to 150 mg sample size. Each sample is placed into individual 2ml cryovials. Two representative samples are placed in 10% neutral buffered formalin. Two investigators QC the slides by microscopy to evaluate the following: percent of tumor, percent of necrosis, percent of fibrosis/inflammation, and percent of normal adjacent tissue. RNA was extracted using the Purescript RNA isolation kit (Gentra).

Fifty-four of sixty-nine cases passed both histology and RNA (RIN value) QC. Of the fifteen cases that did not pass our QC criteria, thirteen cases did not pass the histology QC due to lack of tumor content (below 50%) in the sample, while the remaining two cases failed the RNA QC. Seventy-eight percent of samples passed our QC measures. The results were consistent with the existing literature on tissue quality control in human surgical tissue specimens.

Intern: Alisha Allison  
Major: Nursing  
Mentor: Zeynep Salih, MD  
Department: Pediatrics/Neonatology

Study of Staff Perceptions after Interdisciplinary, High-fidelity In-situ Simulations in a Level IIIIC Neonatal Intensive Care Unit.

This research is the feasibility portion of a bigger project aiming to improve the teamwork during neonatal resuscitations at Riley Children’s Hospital neonatal intensive care unit (NICU). Using a high-fidelity infant simulator (SimNewB, Laerdal, Inc), we worked with teams of nurses, pediatric residents, and respiratory therapists by exposing them to neonatal code situations in the NICU. After the sessions, we took all of the participants into a room and went over the video footage in a debriefing session. They also gave us feedback via a survey, and I conducted the analysis of that data. We found that in every session 100% of the participants agreed that the in-situ simulation session and the debriefings were both very helpful. Majority of the participants offered suggestions on how to make our simulations better, and most of them requested that we practice these sessions more often. The participants also suggested that we do troubleshooting on the system and run another practice session after the debriefing so the staff can correct their mistakes and return with more confidence the next time. We are working on implementing these suggestions to ensure that our training sessions are ran as efficiently and effectively as possible.
Characterizing Novel Fluorescent Protein Pairings for Förster Resonance Energy Transfer (FRET)

Förster Resonance Energy Transfer (FRET) microscopy overcomes the resolution limits of the conventional light microscope, achieving ångstrom (Å) scale measurements. FRET is the process by which excited-state energy is transferred from one fluorophore (donor) to another nearby molecule (acceptor) via electromagnetic dipole interactions. FRET is a dynamic quenching pathway that depletes excited-state energy from a donor molecule. Currently, the most common fluorescent protein (FP) donor (D)-acceptor (A) pair used for FRET is mCerulean and mVenus. This study was designed to test the utility of different FP pairings for FRET studies with the objective to identify potentially improved FRET pairs. The acceptor FPs tested were mVenus, mKO2, mApple, tdTomato, and mRuby. A series of plasmid DNAs encoding the D, mTFP, directly linked to each different A FP by the 5 amino acid (AA) sequence was generated. The plasmids were expressed in living cells, and Fluorescence Lifetime Imaging Microscopy (FLIM) measurements were made to determine the FRET efficiency. These studies demonstrated that tdTomato is the best FRET acceptor tested. Additionally, mKO2 and mApple had a high FRET efficiency. The longer wavelength emission of these acceptor FPs allow a wider donor detection channel, permitting more sensitive FLIM measurements.

DMAPT Inhibits Pancreatic Cancer Cell Growth and Increases Sensitivity to X-ray-induced DNA Damage and Cell Killing

Pancreatic cancer is one of the most deadly forms of cancer with a survival rate of less than 5% five years after diagnosis. Modern treatment for pancreatic cancer consists of surgery, chemotherapy, and radiation therapy. Despite this multimodality approach local reoccurrence of pancreatic cancer is common. We hypothesize that increasing the effectiveness of the X-ray treatment may improve patient survival. Our approach was to treat AsPc-1 and BxPc-3 pancreatic cancer cells with Dimethyl-amino-parthenolide (DMAPT) a new drug that inhibits the transcription factor NF-kB. NF-kB is highly active in many cancers and makes cancer cells resistant to chemotherapy and radiation. We found that the treatment of both pancreatic cancer cell lines with 15 mM DMAPT induced significant cell killing and slowed cancer cell growth. DMAPT treatment also increased X-ray induced cell death for fractionated X-ray irradiation. Split-dose radiation experiments indicated that cell repair is significantly inhibited by almost 50% in DMAPT treated pancreatic cancer cells. We propose that suppressing the activation of NF-kB after radiation exposure with DMAPT prevents the repair of DNA double strand breaks which leads to increased cell death.
Delivery of a human artificial chromosome into kidney epithelial cells from a patient with a polycystic kidney disease 1 (PKD1) gene mutation

Autosomal dominant polycystic kidney disease (ADPKD) results from mutations in polycystic kidney disease 1 (PKD1) gene. ADPKD may be amenable to future somatic cell based gene therapy approaches. A novel non-integrating gene therapy vector is a Human Artificial Chromosomes (HAC) that offers several advantages. HACs can incorporate large genes, are non-immunogenic and use natural mechanisms for replication and segregation. Our lab has shown that HACs are capable of expressing the PKD1 gene (PKD1HAC). However, transferring PKD1HAC into kidney cells was problematic. This study centered on improving HAC delivery using a new HAC construct (tetO-HAC). Tet-OHAC was delivered from Chinese hamster ovary cells into immortal kidney cells from a patient with ADPKD by microcell mediated chromosome transfer. TetO-HAC was detected in the kidney cells using a GFP reporter and fluorescence in situ hybridization (FISH). Previous attempts at HAC delivery into kidney cells had been unsuccessful, so the successful delivery of tetO-HAC was an important breakthrough. We have now proven that kidney cells are capable of accepting a HAC. The PKD1 gene can now be incorporated into tetO-HAC using Cre-recombinase to test effects of PKD1 expression on ADPKD cells as a model for future gene correction.

Liver Transplantation: Coping with symptoms during the waiting and recovery periods

Liver transplantation is often thought to be organ recovery and life-saving. The reality is a prolonged and stressful time for the patient and their family. Pre-transplant, patients and family members need to cope with problems such as declining health with encephalopathy, ascites, pruritis, muscle wasting, and fatigue, all of which impair functional capacity. The long post-transplant recovery is characterized by heightened risk of infections and organ rejection. Physical healing after surgery and the recovery of strength and endurance is difficult as patients struggle with the effects of multiple anti-rejection medications and fatigue. This poster describes an ongoing longitudinal study aimed at better understanding the recovery process. Patients are followed post-discharge, at weeks 1-8 and at months 3, 6, 9, and 12, with the FACIT, SF-36, OSA, and Role Checklist. Currently initial indications are that fatigue is a primary issue. A case study of a white male in his 50s recovering from a liver transplant is used to illustrate the preliminary findings. Through this research Dr. Scott and her team hope to be able to better prepare individuals to cope with these pre- and post-transplant periods and return more smoothly to full productive lives.
The Effects of Drug and Talk Therapy on Fibromyalgia

Fibromyalgia is a chronic medical syndrome affecting 2-4% of the general population, with a female to male frequency of approximately 9:1. Fibromyalgia is characterized by widespread musculoskeletal pain. Researchers believe that fibromyalgia amplifies painful sensations by affecting the way the brain processes pain signals. Symptoms include muscle tenderness, soreness, fatigue, problems sleeping, headaches, and impairment of physical function. As an intern under Dr. Dennis Ang and Ms. Janna Hilligoss, I was able to take part in a research study that allowed us to better understand therapies used to help alleviate the physical and emotional pain caused by fibromyalgia. The study I am currently involved in is the Drug and Talk Therapy Study. The purpose of the Drug and Therapy Talk Study is to better understand how talk therapies can improve the benefits of the FDA approved drug for fibromyalgia, Savella (milnacipran). Volunteers of the study are randomized into two different groups. Each participant receives either Savella or a placebo and receives either educational therapy or cognitive behavioral therapy. Because the benefits of Savella are known the study was conducted in order to determine whether a combination treatment of both Savella and talk therapy is more beneficial than either treatment alone.

Molecular signaling regulating neural stem cell proliferation in the adult brain following traumatic brain injury

Traumatic brain injury (TBI) is one of the most serious injuries that human can suffer. Currently, there is no effective treatment available to reduce the neurological dysfunction following TBI. The identification of neural stem/progenitor cells (NSCs) in the adult brain holds the hope of repairing the damaged brain following TBI. By using a transgenic reporter mouse line, Nestin-GFP, in which green-fluorescent protein (GFP) is driven by Nestin promoter to express in the NSCs, NSCs are easily visualized and different subtypes of NSCs are distinguishable. We took the advantage of this transgenic mouse to quantify the proliferation of different subtypes of NSCs following TBI. We found that TBI rapidly induced both quiescent neural progenitors (QNPs) and amplifying neural progenitors (ANPs) to enter cell cycle within a few hours after injury. The proliferation of NSCs was correlated with activation of mammalian target of rapamycin (mTOR) signal pathway. Blocking this signaling pathway with rapamycin attenuated NSCs proliferation after TBI. These results suggest that TBI promotes both QNPs and ANPs proliferation after TBI, and mTOR signal pathway is required for their activation. NSC activation by TBI may reflect the induction of innate repair and plasticity mechanisms by the injured brain and mTOR signaling may serve as a novel target for augmenting neurogenesis in the adult brain for promoting post-traumatic functional recovery.
**Intern:** Devin Schlueter  
**Major:** Biomedical Engineering

**Mentor:** Dr. David Basile  
**Department:** Cellular & Integrative Physiology

**Reactive oxygen species following recovery from acute kidney injury enhance renal hemodynamic responses to Angiotensin II**

Acute kidney injury (AKI) predisposes chronic kidney disease (CKD), possibly via alterations in renal vascular structure and/or hemodynamic responses. We tested the hypothesis that renal hemodynamic responses are altered in the post-AKI kidney secondary to increased reactive oxygen species. AKI was induced in SD rats by 45 min bilateral I/R; after 5 weeks, total and renal medullary RBF responses were measured by ultrasonic flow and laser-Doppler flowmetry in response to increasing Ang II while holding perfusion pressure constant. Reductions in total RBF were significantly enhanced in post-AKI rats in response to Ang II. Ang II increased renal medullary flow in control rats, but only 8.2% in AKI rats (P<0.05). Renal superoxide levels, measured by dihydriodilium uptake were significantly enhanced following AKI. Apocynin treatment in the drinking water for one week reduced DHE incorporation and normalized total RBF, but not MBF responses to Ang II. Interestingly, there were no changes in the expression of NADPH oxidase genes following AKI, but PCR array studies identified 8 pro-oxidant genes significantly enhanced following AKI including the NADPH oxidase related gene, duox1. These data suggest that acute renal injury alters the oxidant profile of the kidney and influences RBF responses to Ang II.
The Impact of Yoga on Quality of Life after Stroke
A stroke is considered the most disabling chronic disease in America. Patients who have experienced a stroke often suffer from a decreased quality of life, which can mean negative changes in empowerment, choice, capability, and social integration. This rehabilitative treatment program contains the yoga techniques asana (physical postures) and pranayama (breathing) together to see if there is a positive effect on chronic stroke patients. This study included 15 veterans whom received yoga and nine veterans whom received no yoga, both for a total of eight weeks. Both groups sustained a chronic stroke (9 months ago), completed inpatient rehabilitation, and had some residual disability. QOL assessments were completed before and after the yoga intervention. We analyzed data, and found a significant increase in QoL for people in the yoga group (p=0.010). These findings indicate that our 8-week post-stroke yoga intervention positively improved Quality of Life.

Rejuvenating Neural Stem Cells in the Aging Brain
Neural stem cells (NSC) have been found in the adult mammals brain. These NSCs can continue to generate new neurons throughout the life span. Decrease in neurogenesis in the aged brain has been correlated to cognitive decline. The molecular signaling that regulate age-related decline in NSC proliferation is still poorly understood. Here we took the advantage of a transgenic mouse, Nestin-GFP, to quantify the total number and proliferation of different subtypes of NSCs at different ages. In this transgenic mouse, green-fluorescent protein (GFP) is driven by Nestin promoter to express in the NSCs, thus NSCs are easily visualized and different subtypes of NSCs, including quiescent neural progenitors (QNPs) and amplifying neural progenitors (ANPs), are distinguishable. We found that the total number of both QNPs and ANPs decreased as the mice aged, while the number of ANPs exhibited a more dramatic decline. DNA synthesis analysis confirmed that proliferation of ANPs reduced significantly while proliferation of QNPs remained relatively consistent in aging mice. These results imply that the NSCs become more quiescent in aging mice. We further found that mammalian target of rapamycin (mTOR) signal pathway may be involved in regulating NSC proliferation and we are in the process of assessing whether we can rejuvenate NSCs by restoring their proliferation capacity through activating this signaling pathway. The results from this study aim to identify a molecular signaling that regulates NSCs proliferation and potentially can be targeted to enhance neurogenesis for attenuating cognitive decline in aging brain.
EFFECT OF NICOTINE ON METABOLISM OF STARVED AND UNSTARVED STREPTOCOCCUS MUTANS

Streptococcus mutans is the major etiological agent of dental caries. Nicotine is the addictive ingredient present in most tobacco products that has been shown to have an effect on the growth and metabolism of oral bacteria, specifically S. mutans. This same bacterium has been recently linked to heart disease. Smokers regularly introduce this chemical into their system which causes an increased growth and metabolic rate of the bacteria, thus increasing their chances for dental caries. This research worked to further qualify the increase of metabolic rates by subjecting the bacteria to nicotine in a starved environment, on the basis that humans do not constantly have nutrients available to oral bacteria. Metabolic rates of an established biofilm of S. mutans were measured through an XTT and menadione assay with a spectrophotometer. The un-starved bacteria were grown in a full concentration of TSBS while the starved were grown in a 1:10 dilution of TSBS with sterile saline in various nicotine concentrations (0.0, 0.25, 0.50, 1.0, 2.0, 4.0, 8.0, 16.0, 32.0, 64.0, and 128.0 mg/ml). As the concentration of nicotine increase, the metabolic rates of S. mutans also increased. The high concentrations in which the bacteria were no longer metabolically active are very high and a normal smoker would not be able to reach these concentrations. However, as more nicotine is present in smokers these more metabolically active bacteria would be more likely to cause caries.

Effects of Camel Orbs® on Cytokine/Growth Factor Expression from Human Gingival Fibroblasts

As an alternative to lighting up a cigarette, tobacco companies are manufacturing a line of smokeless spitless tobacco products such as Camel Orbs® containing the same harmful chemicals found in cigarettes. The purpose of this study was to determine the effects of the Camel Orbs® on the expression of cytokines and growth factors from human gingival fibroblasts (HGFs). In order to examine the effects of the Camel Orbs® on the HGFs, WST-1 and LDH assays were utilized to determine their effects on cell proliferation and cytotoxicity, respectively. HGF cells were seated in 6 well plates at a concentration of 75,000 cells per well. Orbs® extracts were prepared by incubating 1 g/ml of product in distilled water at 37°C for 1 hour. HGFs were then exposed to a range of concentrations of extracts for 72 hours. The media was then collected and used to determine cytokine/growth factor expression. The extracts of these Orbs® products altered multiple cytokines and growth factors. This work was supported by the IUPUI Life-Health Science Internship and the Tobacco Cessation and Biobehavior Group.
Intern: Alyssa M. Burton  
Major: Biology (B.A.), Psychology (B.A.), Chemistry Minor  
Mentor: Dr. Simon Rhodes  
Department: Cellular and Integrative Physiology

Cloning and Characterization of the Zebrafish Somatolactin Beta Promoter

LHX3, a homeodomain transcription factor, regulates development of the hormone-producing cells of the anterior pituitary gland. Mutations in the LHX3 gene have been linked to pediatric combined pituitary hormone deficiency diseases. The LHX3/Lim3 protein sequence is highly conserved in zebrafish, a valuable experimental model for developmental studies. We are using this tractable model system to better understand the role of transcription factors such as LHX3 in pituitary hormone gene regulation and pituitary development. Somatolactin (SI), a pituitary hormone with similarity to mammalian growth hormone and prolactin, is involved in stress responses and immune function. SI is unique to fish, with two forms (alpha; and beta;) found in the zebrafish genome. Approximately 1kb of the SI beta; gene proximal promoter was examined for potential LHX3 binding sites and several candidates were found. This region was cloned from genomic DNA and subcloned into the pGL3-basic vector, which contains a luciferase reporter gene. This plasmid will next allow us to determine whether the gene is a target for LHX3 regulation. Pituitary GHFT1 cells will be transfected with an expression vector for zebrafish LHX3/ Lim3 with the SI beta; promoter pGL3-basic vector. A luciferase assay will be performed to determine if LHX3 promotes the expression of SI beta.

Intern: Morgan Rhodes  
Major: Pre-med Psychology  
Mentor: Dr. Terrell Zollinger and Ms. Carolyn Muegge  
Department: Family Medicine, Bowen Research Center

Assessment of Knowledge, Attitudes, and Practices of Trujillo Residents Regarding Malaria

IUSM Department of Family Medicine has collaborated with the Hospital Salvador Paredes to provide medical services to residents of Trujillo, Colón in Honduras. Malaria is a major health concern in this area of the country. According to the World Health Organization, the department of Colón reported a burden of 583 cases of malaria per 1,000 population in 2006. The purpose of this project was to assess knowledge, attitudes, and practices of Trujillo residents regarding malaria. Surveys were completed by a convenience sample of 71 people consisting of health care providers, community leaders, and patients with malaria. Over half of the respondents knew that fever (88.7%), joint pains (64.8%), and chills (56.3%) were symptoms of malaria. Most knew anyone could be infected (92.8%) through a mosquito bite (94.3%), but had misconceptions about how to prevent malaria. All respondents knew that malaria was curable. While most felt well-informed about malaria (89.9%), the majority wanted more information (94.2%) and reported that information could be best delivered through the radio (42.3%), health workers (35.2%), and television (29.6%). These findings provide instruction on how to develop malaria prevention strategies that would be tailored to Trujillo, specifically. Such strategies might include educational intervention programs or increased distribution of protective insecticide bed nets.
Telomere regulation changes in different subpopulations of normal human mammary tissue

We are analyzing telomeres in subsets of human breast tissue to better understand tumorigenesis. Our studies were performed using cells from women with no history of breast cancer. Mammary organoids were obtained by centrifugation. A single-cell suspension was prepared by filtering the cells from organoids. Hematopoietic and endothelial cells were removed and three live mammary cell fractions were isolated by FACS. Inspection of telomere length of these cells revealed age and differentiation dependent changes. We found a decrease of telomere length in the luminal progenitor cell-enriched fraction compared to the telomere length of the stem/bipotent cell-enriched fraction, regardless of patient age. In younger patients, the telomere length in the differentiated luminal cells displayed a recovery comparable to the stem/bipotent cell-enriched fraction. Early results indicate that a similar recovery does not occur in the differentiated luminal cells isolated from older patients. Interestingly, the level of telomerase activity in cells from younger patients was comparable to that found in breast tumors, whereas telomerase activity was not found in cells from the stem/bipotent cell-enriched fraction at all. These findings infer that luminal mammary progenitor cells may be especially sensitive to telomere dysfunction, leading to genomic instability.

Perspectives on Mental Illness in a State Psychiatric Hospital

Despite the recognition of the stigma faced by those suffering from severe mental illness, research in this area is limited. In particular, there is a lack of empirical research focusing on stigma in the setting of an inpatient psychiatric facility. The purpose of this study is to examine the stigma perceived by those suffering from severe mental illness (as defined by inpatient status in a long-term psychiatric facility) and the perceptions of severe mental illness by both those suffering from it (current inpatients) and those caring for them (health care workers). To accomplish this surveys are distributed to both inpatients and health care workers to measure perceptions of mental illness. Additionally, inpatients completed a survey of perceived self-stigma due to their mental illness. The perceptions of mental illness are compared between the two groups while the impact of each group’s view on perceived stigma is also evaluated. The hypotheses include: 1. a difference exists in perceptions of mental illness between inpatients and health care workers, 2. stigma perceived by inpatients is related to the perceptions of mental illness held by inpatients, and 3. stigma perceived by inpatients is related to the perceptions of mental illness held by health care workers.
Clinical Research Center

The Indiana Clinical and Translational Science Institute (CTSI) is made up of many different components; one of its main components is the Clinical Research Center (CRC). The CRC is located on the fifth floor of University Hospital. It is comprised of fourteen outpatient rooms and ten inpatient rooms with a reception lab. These facilities provide investigators with appropriate space to conduct their research. In addition, the CRC provides a skilled staff of nurses that specialize in conducting clinical research. The CRC facilitates research in multiple medical disciplines including: Medicine, Pharmacy, Pediatrics, Pathology, Genetics, Psychiatry, Radiology, Surgery, Gastro, Hematology/Oncology, Infectious Disease, Urology, OB/Gyn, Neurology, and Pulmonary. Every research protocol must be approved by the Institutional Review Board (IRB), the CRC Managers, and members of the Advisory Committee. The CRC receives an average of 7 new protocol submissions per month. Studies are funded by a variety of grants, including NIH (National Institutes of Health), foundations, and Industry. After the research protocol is finished, the principal investigator analyzes the data and submits the findings to a journal in the hopes of being published.

Acute activation of the betaine/GABA transporter in renal cells by low extracellular calcium

The betaine/GABA transporter (BGT1) is important for osmoprotection in kidney medullary cells. In a previous study we reported that an acute (30 min) increase in extracellular calcium resulted in dose-dependent inhibition of BGT1 in renal MDCK cells (AJP Renal 291:F305-12, 2006). Inhibition reached 50% at 5 mM calcium and was due to endocytosis of BGT1 protein from the plasma membrane. A decrease in extracellular calcium was found to have the opposite effect on BGT1 activity, as reported here. Low calcium growth medium was serum-free S-MEM modified for suspension culture (GIBCO). Total content of Ca2+ was 0.09 mM compared to 1.25 mM in standard DMEM/F12/BCS culture medium. A study of the time course of activation showed that BGT1 was activated in MDCK cell monolayers within 30 min after transfer from normal culture medium to low calcium medium. The peak of activation was 30 min after which there was a decline in BGT1 transport. Activation by low Ca was observed both in isotonic medium and after overnight exposure to hypertonic (500 mOsm) growth medium. Prolonging low Ca treatment for 24 hr produced a marked decrease in BGT1 transport accompanied by cell rounding and detachment. Acute exposure to low calcium medium (calcium switching) is often used to disrupt tight junctions between cells in confluent monolayers. The initial activation of BGT1 by calcium switching is unexpected and the mechanism will be studied further. Confocal microscopy will be used to follow the intracellular location of tight junction proteins (e.g. ZO1 and occludin) during calcium switching in order correlate integrity of tight junctions with intracellular trafficking of BGT1.
Use of tissue macroarrays (Multichambered 9 well cassettes) to Perform Immunohistochemistry Studies. An efficient use of tissue plus effective cost control for a Tissue Bank Facility

Background: Tissue microarray is a technology that has been in use for the past twelve years. The core specimens on tissue microarrays are 0.6, 1.0, and/or 1.8 mm in diameter. Tissue microarray technology facilitates using multiple tumor tissue samples on one slide for predicting targeted therapy and biomarkers to predict clinical treatment outcomes. It is also a proficient and an easier way to evaluate multiple samples in these high throughput studies.

Methods: We created tissue macroarrays using a 9 well cassette and placed 8 tissues plus one control tissue in one macroarray. The tissue macroarrays have larger tissue sample sizes, about 6 to 7 mm in diameter and about 3 to 4 times the size of a tissue microarray core. This study evaluates the use of tissue macroarrays, which are created in multichambered 9 well cassettes, and how they can be used to do large biomarker studies.

Results: Approximately 250 macroarrays has been built in the past ten years. A typical immunohistochemical study usually involves examining 50 cases which requires 7 tissue macroarrays. The cost of a 50 case study usually costs about $1250.00 per antibody. In a multiple antibody (biomarker study), 4 to 6 antibodies are evaluated, costing $7000.00. Using tissue macroarrays, the cost is cut by about $1,000.00 an antibody.

Conclusions: This is an efficient use of tissue and effective cost control for tissue banks, histology labs, and immunohistochemistry labs. This technology saves on reagents, technical time, histologic supplies and immunohistochemistry antibodies and supplies.

Effect of Strontium and Zinc on the Demineralization of Enamel

The roles of zinc and strontium in the caries process are poorly understood despite the presence of these elements in oral care products. The objective of this study was to investigate the effects of zinc and strontium on enamel de- and remineralization. Sound enamel specimens were demineralized (lactic acid solution, pH 5.0) in the presence of varying concentrations of zinc (1mM, 2mM, 3mM, or 5mM) or strontium (5mM, 10mM, 15mM, or 20mM) for 24h and then remineralized (artificial saliva, pH 7.0) for 70h. Specimens demineralized in the presence of calcium (1mM, 2mM, 3mM, or 5mM) served as a control. A Vickers microindenter was used to determine changes in surface hardness throughout the experiment. Data were analyzed using ANOVA. Demineralization in the presence of both zinc and calcium appeared to provide similar protection from demineralization. However, demineralization in the presence of zinc somewhat hindered remineralization. Strontium showed only very little effect on protection from demineralization at low concentrations, and appeared to offer more protection from demineralization at higher concentrations. The presence of strontium in the demineralization solution did not negatively affect remineralization. In conclusion, zinc and strontium vary in their effects on enamel de- and remineralization in comparison to calcium.
Pilot Study of the Perceptions of the Ethics of Placebo and Mental Illness Among Healthcare Professionals

Psychotic disorders and other severe mental illness are complex pathological entities whose underlying pathology continues to elude complete biological explanation. This has led to mental illness being regarded with skepticism. Furthermore, modern medicine and bioethics have questioned the use of placebo as a treatment and its role in research medicine leading to controversy on the matter. While it is recognized that both have an impact upon healthcare professionals and the care that patients suffering from mental illness receive, there is a lack of both objective data and impact analysis of these views. This study examines the perceived differences between mental illness and physical illness, the ethics of using placebo to treat physical and mental illness, and the ethics of placebo use in clinical drug trials. This is evaluated by distributing questionnaires among healthcare professionals in area hospitals. The completed questionnaires are then analyzed to provide a baseline description of healthcare professionals’ views on placebo use in clinical investigational drug trials and to answer the two proposed hypotheses that follow. First, health professionals do perceive a difference between physical and mental illness; second, health professionals see an ethical difference between physical illness and mental illness.

Effects of Camel Orbs® on p53 and p21 in Human Gingival Fibroblasts

Tobacco companies are promoting smokeless tobacco products (i.e., Camel Orbs®) as a result of the bans on smoking. Orbs® comes in sticks, strips, and pellets, and contain the same harmful chemicals as cigarettes. The goals of this project were to investigate the effects that Camel Orbs® have on cell proliferation, cell toxicity, and the expression of p53 and p21 in human gingival fibroblasts (HGFs). The Orbs® were extracted by incubating 1 g/ml of each product in water at 37 C₀ for 1 hour. Cells were seeded in 6 well plates (75,000 cells/well) and exposed to different concentrations of the extracts for 72 hours. Cell proliferation and cytotoxicity were determined by WST-1 and lactate dehydrogenase assays, respectively. A nontoxic concentration of each extract was incubated with HGFs for 72 hours and the expression of p53 and p21 was determined by Western blot analyses. Extracts of these tobacco products altered p53 and p21 protein levels. This work was supported by IUPUI Life-Health Sciences Internship Program and IUSD Tobacco Cessation and Biobehavior Group.
C-mpl is Expressed on Osteoblasts and Osteoclasts and is Important in Regulation of Skeletal Homeostasis

C-mpl, the thrombopoietin receptor, is the main megakaryocyte growth factor. As megakaryocytes enhance bone formation, it may be expected that c-mpl-/- mice, which have reduced megakaryocyte numbers, would have decreased bone. However, c-mpl-/- mice have similar or higher bone mass compared to controls. Here we show, c-mpl expression on both osteoblasts and osteoclasts, and begin to identify how c-mpl regulates bone. While bone volume was identical or elevated in c-mpl-/- mice and osteoblast number was identical, bone formation rate and mineral apposition rate were significantly elevated as were all osteoclast-regulated parameters, suggesting that c-mpl deficiency results in a high bone turnover state with a net balance or gain in bone volume. In vitro, a higher percentage of c-mpl-/- osteoblasts were in active phases of the cell cycle, leading to an increase in osteoblast number. No differences in osteoblast function or mRNA expression were observed. In vitro stimulation of c-mpl-/- osteoclast progenitors with M-CSF and RANKL produced fewer mature osteoclasts. Although in co-culture systems c-mpl-/- osteoblasts enhanced osteoclastogenesis, the OPG/RANKL axis was unaffected. While further work is required to understand how c-mpl-/- osteoblasts are regulating osteoclastogenesis, these data begin to clarify the roles of megakaryocytes and c-mpl in regulating bone.

Good Samaritan Hospital - Knox County Community Needs Assessment

The purpose of the Good Samaritan Hospital Knox County community needs assessment was to identify the health status, lifestyle risk factors, and perceived healthcare barriers of Knox County residents. Additionally, the awareness and use of Good Samaritan’s free health screening programs and low cost primary care services were assessed. Responses were weighted to match the gender and age distributions of Knox County residents to enable inferences to be made for all residents. A majority (74%) responded that their health status was good; or very good. About one-half (63%) were meeting the American Cancer Society’s cancer screening guidelines. About one-third (35%) were meeting the Centers for Disease Control and Prevention recommended physical activity level. Nearly three-quarters (74%) were either overweight or obese. Over half (61%) had never smoked and about 14% were current smokers. Many (71%) responded that they had not have problems receiving health care. A majority (87%) had health care coverage. More than half (64%) had heard of Good Samaritan Hospital’s programs, and nearly one-half (40%) were familiar with the Good Samaritan Hospital Primary Care Clinic. The results provided Good Samaritan Hospital health planners information about community health status and health behaviors they needed to determine future efforts.
Effects of subtherapeutic levels of the anticonvulsant lacosamide on the functions of CRMP-2

Lacosamide (LCM), a common anticonvulsant drug used for epilepsy, obtains its therapeutic effect by targeting voltage-gated sodium channels. CRMP-2, a protein that controls increased neurite outgrowth and polymerization, has been revealed as another target of binding for LCM. The ability of CRMP-2 to fulfill its functions once bound by LCM was studied within the Khanna Laboratory. Cortical cells were transfected with the CRMP-2 protein in the presence of various sub-therapeutic concentrations of LCM. My project consisted of obtaining images of the various transfections using a Nikon Eclipse 90i microscope. Images were taken of cortical neurons without the CRMP-2 protein, with the CRMP-2 protein, with a mutant CRMP-2 protein, with the CRMP-2 protein in conjunction with various levels of LCM, and with a mutant CRMP-2 protein in conjunction with various levels of LCM. The mutated CRMP-2 protein had mutations in pockets of the protein that are most commonly targeted by LCM. The neurite outgrowth and tubulin polymerization could then be analyzed using Sholl analysis and dose-response curves.

The Effect of CSC, Nicotine and Dissolvable Tobacco Products on Streptococcus mutans Metabolism

Streptococcus mutans, a common oral bacterium proven to be a causative agent of dental caries, forms biofilms and has shown to be more prevalent in mouths of smokers versus non-smokers. Generally, biofilms show increased resistance to antimicrobial agents than free-floating, planktonic bacteria. By using an XTT metabolic activity assay, this study aimed to observe the metabolism of established S. mutans biofilms and planktonic bacteria when treated with cigarette smoke condensate (CSC), nicotine and dissolvable tobacco products. Tryptic soy broth with 1% sucrose (TSBS) was inoculated with Streptococcus mutans UA159 and incubated overnight in 5% CO2 at 37oC. This 24-hour culture was added to wells of a 96-well microtiter plate where biofilm formation occurred for 24 hours in 5% CO2 at 37°C in the presence of increasing concentrations of nicotine, CSC, and dissolvable tobacco products: Orbs, Sticks and Strips. Biofilms were incubated with XTT/menadione reagent and a spectrophotometer at 490nm read the oxidation of XTT/menadione. The biofilm demonstrated a negative correlation between the concentration of tobacco products and metabolic activity whereas planktonic bacteria demonstrated a positive correlation. In conclusion, other inhibitory chemicals found in tobacco inhibited metabolic activity of the biofilm whereas planktonic bacteria did not experience similar inhibition.
Intern: Katelyn MacPherson  
Major: Nursing  
Mentor: Sharon Cromer  
Department: CTSI Clinical Research Center, IU Hospital

Laboratory Processing at the Indiana Clinical Translational Sciences Institute Clinical Research Center  
Research is a systematic process. One of the potential steps in this process is conducting human clinical trials. The Indiana Clinical Translational Sciences Institute Clinical Research Center (ICTSI CRC) provides the resources needed to conduct the trials. Everything from the inpatient/outpatient rooms, study coordinators, nursing, nutritional support, and laboratory processing all can be obtained through the Indiana CTSI CRC.  
A Principle Investigator and their team must first submit the protocol to the CRC in conjunction with IRB submission. After approval, trials can begin. One of the important resources of the CRC is the reception laboratory. Laboratory technicians collaborate with the study coordinators to reach the optimal set up. Specific to each protocol, processing sheets are made as instructions and laboratory tracking. This provides the study coordinator with the tool to track their samples for deviations. On average, the laboratory is capable of managing over 80 samples a day which can create as many as 250 aliquots. The laboratory has Point of Care Testing. Certified trained technicians provide the opportunity for Urine Pregnancy Test, Hemoccult assays, and urine chemistry dipsticks. As with all the resources provided laboratory processing is essential to achieving accurate results and clean data for clinical research.

Intern: Kendra Heeke  
Major: Biology  
Mentor: Dr. Richard Gregory  
Department: Department of Oral Biology and Tobacco Cessation and Biobehavioral Group

The effect of nicotine on Streptococcus mutans UA159 bacteriocin production against Streptococcus sanguis  
Introduction: Streptococcus mutans is the main etiological cause of dental caries, and it has been shown that individuals who smoke have increased dental caries. S. mutans produces bacteriocins, which inhibit the growth of similar strains or species. The objective of the present study was to determine if nicotine upregulates S. mutans bacteriocin production against a noncariogenic bacteria, Streptococcus sanguis. Previous research has shown that S. mutans and S. sanguis have an inverse relationship pertaining to their growth. If nicotine upregulates bacteriocin production, the study would give further evidence that nicotine may facilitate S. mutans colonization over S. sanguis on the tooth surface.

Materials and Methods: Todd-Hewitt Broth (THB) containing either 0 or 4 mg/ml of nicotine was inoculated with S. mutans UA159. THB alone served as a control. The cultures were clarified by centrifugation, filter-sterilized and 300 ul of the supernatants were added to corresponding cultures of S. sanguis (ATCC 10556). A LIVE/DEAD BacLight Bacterial Viability Kit for microscopy (Invitrogen) was used to stain the S. sanguis cells. All live, bright green fluorescent cells in 10 microscopic fields were counted. Student’s T-test was used to find P values for statistical difference (p<0.05).

Results: The data suggest that nicotine does, in fact, increase S. mutans UA159 bacteriocin activity against S. sanguis. Nicotine at 4 mg/ml significantly upregulated (p<0.05) S. mutans bacteriocin activity compared to the THB control. In addition, 4 mg/ml of nicotine significantly increased S. mutans bacteriocin activity compared to the 0 mg/ml nicotine supernatant. S. mutans with 0 mg/ml nicotine also demonstrated a significant increase in S. mutans bacteriocin activity against S. sanguis compared to the THB control.

Conclusion: Incubation of S. mutans with 4 mg/ml nicotine significantly increases bacteriocin activity against S. sanguis. This supports our previous work indicating that nicotine increases S. mutans bacteriocin activity and provides additional evidence that S. mutans establishes a special niche in the oral cavity allowing for greater caries activity in smokers.

Acknowledgements: This work was funded by the Center for Research and Learning and Life-Health Sciences Internship at Indiana University-Purdue University Indianapolis.
Mitochondrial DNA Release into Plasma in Human and Mouse Models of Emphysema

Chronic obstructive pulmonary disease (COPD) is a disorder that persistently obstructs bronchial airflow. COPD mainly involves emphysema. This causes chronic obstruction of air flowing through the airways and in and out of the lungs. The obstruction is generally associated with tobacco smoke. Recent reports have shown an increase of mitochondrial DNA released into the plasma following certain type of trauma as a marker of tissue damage. However, release of mitochondrial DNA into the plasma following smoking or in diseased states such as COPD has not been characterized. To determine if mitochondrial DNA was a potential marker of lung disease, we quantified changes in mitochondrial DNA content in the plasma from air-control and cigarette smoked mice, as well as in COPD and normal human plasma. These changes were assessed using real-time polymerase chain reaction (real-time PCR) from isolated mitochondrial DNA. We found no significant increase of mitochondrial DNA in our samples. Our data suggest that while an increase in mitochondrial DNA can be a marker of tissue damage in severe cases of trauma and injury, smoking and emphysema may not be a severe enough of an insult to cause such release into the plasma.

Efficacy of bisphosphonate treatment on skeletal properties in a model of chronic kidney disease

Patients with chronic kidney disease (CKD) have increased fracture rates. Bisphosphonates are routinely used to reduce bone fractures in non-CDK patients, but limited data exists concerning their efficacy in CKD. The goal of this study was to assess multiple doses of a bisphosphonate, zoledronic acid (ZOL), in a CKD animal model. At 25 weeks of age, normal rats (NL) were treated with saline or 100mcg/kg of ZOL while animals with CDK (Cy) were treated with a single dose of saline, low dose ZOL (20mcg/kg), or high dose ZOL (100mcg/kg). Skeletal properties were assessed 5 weeks later using micro-computed tomography and mechanical testing. Proximal tibia trabecular bone was significantly higher in Cy rats treated with low (+73%) and high (+93%) doses of ZOL compared to untreated Cy rats. Cortical bone strength (-28%) and energy absorption (-37%) were significantly compromised in untreated Cy rats compared to NL. These effects were partially normalized by the low and high doses of ZOL. There were no significant differences between the two ZOL doses in Cy rats for any outcome parameters. Based on these results we conclude that a 20 mcg/kg dose of ZOL is effective in the Cy rat.
**LIFE-HEALTH SCIENCES INTERNSHIPS**

**Intern:** Lindsey Lazo  
**Major:** Biology  
**Mentor:** Dr. Deanna Willis  
**Department:** Department of Family Medicine

**Social and Community Contexts of Health Care Competency Curriculum VI in the Indiana University School of Medicine**

The Indiana University School of Medicine has a competency curriculum that consists of nine competencies, each one intended to shape compassionate, capable, and well rounded physicians. The objective of this research was to identify and analyze course curricula in the framework of competency VI, which is the social and community context of health care. This competency focuses on the aspects that influence and impact individuals and communities within the health care system, such as economic, familial, environmental, legal, political, sociocultural, and spiritual factors. This competency also works to assure that all graduates from the IU School of Medicine recognize his or her role within these influential factors, and know how to appropriately act within the framework of each situation.

The course that was studied was Introduction to Clinical Medicine (ICM) II, taught in the Indianapolis campus during the fall semesters of 2009 and 2010. Previous research done under Dr. Willis provided competency framework mapping for ICM I during the fall semesters of 2009 and 2010, and was used in order to compare consistency, similarities, and differences between the two courses. The research was done through computer, requiring the IU School of Medicine media recording catalog and Microsoft Excel. With this research, a proper assessment can be done over how much the competency VI framework is taught in the ICM curricula at the IU School of Medicine.

**LIFE-HEALTH SCIENCES INTERNSHIPS**

**Intern:** Jessica Jackson  
**Major:** Biology BA, Minors: Chemistry and Medical Sociology  
**Mentor:** Dr. George Sandusky  
**Department:** Pathology Department

**Factors Affecting Gene Expression (RIN Value) and Tissue Histology in Human Post-mortem Tissues: A Focus on Tissue Sample Quality at Four Different Post Mortem Time Intervals.**

The traditional markers of postmortem tissue quality have been descriptive with gross and histology analysis and have considered postmortem intervals (PMI), agonal condition, patient age, and disease state. The postmortem neuropathology field has acquired chemical markers for tissue quality, starting with pH, and 28S/18S ratio, and now includes RNA quality determined by RIN values. In this postmortem autopsy study, 10 organ tissues from 4 postmortem cases with different PMI were evaluated. Clinical history, agonal state, and PMI of 10, 12, 16, and 24 hours were evaluated to determine histology and molecular markers of the postmortem tissue. In this study, PMI was not predictive for RNA stability (RIN values). Refrigeration time after death did influence body temperature, delayed postmortem autolysis, and increased RIN values. However, prolonged interval of hypoxemia decreased RIN values. The clinical medical history and agonal state scores were probably the most important variables affecting RIN values. According to the data, the pancreas and small intestine autolysed quickly. The 16 and 24+ PMI cases had greater than 80% autolysis in the pancreas and small intestine compared to the 10 and 12 PMI cases with minimal to moderate autolysis (25-40%). Of the 10 tissues evaluated, the highest average RIN values were heart (7.1), lung (5.9) and skin (5.9). In conclusion, as with previous postmortem brain banking studies, the RIN values in most postmortem tissues, except the GI tract, is highly correlated with medical history and agonal state, but was not greatly influenced by the PMI in this small case study.
Intern: Zhuoyi Jiang  
Major: Biomedical Engineering

Mentor: Michael Justiss  
Department: Occupational Therapy

Interventions to improve the driving performance and community mobility of older adults with low vision
The object of this study is to find evidence for the effect of interventions available to older adults with low vision as well as community mobility methods when driving is no longer an option. A systematic literature review has been conducted to detect the interventions and determine the effectiveness of these interventions which rehabilitate an individual’s low vision or enhance vision while driving. The literature review will be done in parallel with The American Occupational Therapy Association (AOTA). All the collected articles will be shared with AOTA by posting them on Master Citation Table on SharePoint. Databases like PubMed, Psych info, CINAHL, Web of Science, TRIS, as well as journals like JAMA and AJOT have been utilized during the systematic reviewing process. Another parallel library research was conducted under the scope of rehabilitation engineering by using the same research question: What is the evidence for the effectiveness of interventions within the scope of occupational therapy practice to improve the driving performance and community mobility of older adults with low vision?

Intern: Gloria Kwizera  
Major: Biology

Mentor: Lim Hyun-Suk  
Department: Department of Biochemistry and Molecular Biology

Aryl-Brigded Cyclic Peptoids as Proteo-Mimetics
Peptoids, oligomers of N-substituted glycines, are a class of peptidomimetics, which are structural mimics of peptides. Peptoids have a great potential as therapeutic agents because they have much better cell permeability and metabolic stability compared to peptides. However, unlike native peptides, peptoids do not form secondary folding structures and are conformationally flexible. One possible approach to overcome this limitation is to make cyclic peptoids. Macrocyclization has been a highly successful strategy used by nature and chemists to restrict conformation flexibility of linear peptides. Similar to cyclic peptides, cyclic peptoids are also expected to have pre-organized structures with limited conformational rigidity, compared to their linear counterpart. Thus, cyclic peptoids could have folding structures. In this study, we investigate whether cyclic peptoids can form folding structures. To test this idea, we synthesized a series of cyclic peptoids with different ring sizes ranging from 3-mer to 10-mer by solid-phase synthesis developed by our group. The synthesized cyclic peptoids were analyzed by mass spectrometry and purified by high performance liquid chromatography (HPLC). Total 24 cyclic peptoids were successfully synthesized and purified. The folding propensity of the cyclic peptoids will be examined by using circular dichroism spectroscopy.