

# SUBMITTED POSTER ABSTRACTS

## ENGINEERING AND APPLIED RESEARCH

**Chong, Alex\* and Syed R. Hussaini**

### **AN INVESTIGATION OF THE USE OF COPPER(I) TRIFLATE CATALYZING OPTIMUM ENAMINONE SYNTHESIS**

The research focuses on the use of copper(I) triflate (CuOTf) as a more cost effective alternative to current methods of catalysis for enaminone synthesis. Thioamide and  $\alpha$ -diazocarbonyl starting compounds catalyzed by copper(I) triflate with varying solvents (toluene, benzene, dichloromethane, 1,2-dichlorobenzene, and 1,2-dichloroethane) are used to synthesize a known chiral enaminone. Reaction time, temperature, and percent conversion of reactants to products are monitored for each solvent to determine optimum conditions for enaminone synthesis. Using toluene, the reaction lasts 21 hours at 90°C to produce 100% conversion while using 1,2-dichlorobenzene, the reaction lasts 26 hours at 90°C to produce 91% conversion. The other three solvents tested produce less than 15% conversion of reactants to enaminone product. Further research is being conducted to determine the effectiveness of other copper catalysts compared to copper(I) triflate. The most effective copper catalyst will then be used to produce enaminones of varying structure.

**Ivanoff, Douglas**

### **FRACTURE TOUGHNESS MEASUREMENT WITH A TDCB SPECIMEN**

Fracture testing using a tapered-double-cantilever-beam (TDCB) specimen geometry for an experimental self-healing resin for dental applications was conducted to measure fracture toughness. With eight trial runs consisting of at least four TDCB specimens, fracture toughness values and the linear relationship between initial crack length and material stiffness showed variation from trial to trial due to small batch composition disparities. Initial cracks were created with a precision saw with lengths varying from 6 to 8 mm. Corrected crack length was found using digital microscope photographs and computer software relating pixels to distance. Stiffness of the material varied from 20 to 60 mm/N depending on the crack length present. Advances were made in the material mold and mixing procedure to ensure consistent placement of pins and complete mixing of components, respectively. Improvements of TDCB testing allow for easier testing of self-healing materials due to predictable crack propagation and single fracture surface.

**Johnson, Trokon**

### **FPGA Solutions for the Optimization of AFNI Processing**

In recent years, the prevalence of Functional Magnetic Resonance Imaging has increased greatly. An fMRI scan gathers data of blood oxygenation in the brain in order to ascertain what areas are active, usually in response to some stimulus to the subject's senses. Researchers can then draw and test hypotheses about what neural processes and pathways are linked in certain ways. While this technology has increased both the quantity and the quality of the amount of data that can be gleaned from a neural imaging session, this also increases the computational complexity and intensity that is required in order to analyze the raw data, and convert it into more processed and applicable forms. With the recent trend of hardware acceleration, applying this solution to the data analysis problem could reduce the computational time and intensity of the data analysis. In particular, Field Programmable Gate Arrays

provide an ideal platform for this, as their parallel structure and logic blocks can be fully used for the iterative process of data analysis.

We chose to experiment with the Analysis of Functional Neural Images software package in order to observe the effects of hardware acceleration. Reasons for this choice include the fact that AFNI is open-source, allowing for changes and translation of its source code into other languages. In addition, the project well documented, used widely, as it is available on most UNIX systems, and has an active support community.

Much of my research looked at exploring VHDL and FPGA design for the first time. From this foundation, I looked into designing a custom hardware implementation for some AFNI processes. Both the board and the chip are compatible with the Xilinx Integrated Software Environment, which we are using to program the board with algorithms coded in VHDL, a hardware description language that allows for more complete control over hardware than higher level, more abstract language; we hope that his fact will increase the impact of the hardware acceleration.

Currently, we are investigating communication and processing protocols for the data. We are in the process of translating the C code of some AFNI commands into VHDL, in order to transfer them to an FPGA for enhanced processing. We will then preform tests using different metrics in order to measure the change in speed and runtime of the program, as compared to the standard machines that the data analysis is computed on.

**Dierker, Logan, Jarett Martin, Andrew Chandler, Braeden Williams, Joseph Shook, Caleb Roach, Ken Martin and Grant Volle**  
**DESIGNING, PROTOTYPING AND BUILDING A ROBOT SO LITTLE LIGHT HOUSE CHILDREN CAN PLAY IN A SANDBOX**

This project for the Little Lighthouse (LLH) embodies FIRST Robotics competition principles. Given the description of a game, the teams design and build a robot that follows the game rules and regulations. Our group met with one of the LLH therapists to discuss the parameters of the project, from the ages of the children to size and environmental restrictions. The request was to build a robot that could pick up toys in the sandboxes.

Following FIRST design principles, our group considered several options to satisfy the requirements, built and tested prototypes, and decided on a rotational shoulder with an extendable arm fitted with a forearm that allows vertical movement and an attached hand. The components of the robot were designed and built. The frame was built using square steel tubes that were welded to flat steel plates. Both extendable arms were constructed using a rack and pinion system, for which the custom transmission boxes were designed and built. The gripping hand took several different designs. Ultimately a fail-safe hand using pneumatics was installed.

This presentation makes emphasis on the process of design from user requirements to prototypes and final design selection. It includes discussion of the design of each component and the process of building them.

The robot allows interaction with toys in a sand box by some children at the LLH that were unable to do so before. The whole design group furthered their knowledge of robotics, specifically in the mechanical components, and was a part of creating a robot to benefit the children at the LLH.

The main sponsor for this project is the Tandy School of computer Science in the College of Engineering and Natural Sciences at the University of Tulsa.

**Taylor, Samuel, Colin Hicks, Braeden Williams, Charles Bales, Hana Dickens, Joey Clancy, Caleb Roach, Scott Rainwater, Dana Swift, Suqin Lin and J.C. Diza**  
**THE CONTROL STRUCTURE FOR A ROBOT THAT ALLOWS LITTLE LIGHT HOUSE CHILDREN TO PLAY IN A SANDBOX**

Rusty the robot at the LLH allows interaction with toys in a sand box by some children that were unable to do so before.

Rusty has three basic joints and a hand for gripping toys. It is built as a tower on wheels with a rotational shoulder mounted at the top. Mounted on the shoulder there is a prismatic arm. This arm can extend out over the sandbox. At the end of this arm there is a prismatic forearm to provide vertical movement. At the end of the forearm, there is a hand whose grip is controlled by pneumatics.

This presentation makes emphasis on the design requirements for the electronics for the robot and the programming involved in allowing movements for its joints. It includes discussion of the design and the process of controlling them.

The children interact with Rusty through a control box. The control box has four sets of buttons that afford control over each of the four functions of the robot. The control box input is handled through a Teensy 2.0 microcontroller board. The buttons are connected to the Teensy digital inputs. The button presses are processed in the Teensy and sent, via serial communication, to an Arduino Mega 2560. The Arduino connects to the motor controller indicated by the button on the control board. The motor controller provides power to the particular motor affording the appropriate action by the robot. The Teensy-Arduino combination is programmed in C++ using the Arduino open source environment. The electronics also allow two additional buttons for the caretaker to deploy the robot and to safely store it away. This was programmed as a state machine with four states.

The main sponsor for this project is the Tandy School of computer Science in the College of Engineering and Natural Sciences at the University of Tulsa.

**Lin, Suqin**  
**MOBILE HEXAPOD ROBOT**

Mobile Hexapod Robot is a robot with six legs, is able to walk down a hallway. All the legs are articulated individually.

The robot's components are made with 3D printers using the facilities of FabLab. Each individual leg movement upward, downward, forward and backward requires three servomotors. The control system is an Arduino, which is an open source platform for embedded controlling of robots. The robot is powered with an on-board Lithium Ion battery.

**Rake, Nathanael\* and Lindsay Flasch**  
**INVESTIGATION OF AUTONOMOUS BIPEDAL ROBOT DESIGN**

This report details the research done by a small team from the University of Tulsa as a beginning step to constructing a low-cost autonomous bipedal robot with a heel-to-toe walking style. Information obtained by the team through investigation of similar projects is used to outline desirable physical specifications for bipedal robots. Optical and sonar based sensing are discussed with respect to object recognition and depth perception. The benefits and drawbacks of various platforms and programming schemes are also examined. The report concludes with a tentative physical design and loose overview of programming architecture.

**Arun Darunkar, Bhagyashri and Pramode Verma**  
**BRAIDED SINGLE-STAGE PROTOCOL FOR QUANTUM-SECURE COMMUNICATION**

Securing information in transit is an increasingly important need of the modern society. Quantum cryptography is the only known means to provide unconditional security. Contemporary cryptographic solutions based on the BB'84 protocol rely on the availability of single photons to carry information. This constraint restricts the distance and speed over which quantum cryptography can be offered, resulting in limiting its application to Quantum Key Distribution (QKD) over short distances as opposed to quantum communication.

This paper presents the concept of a braided single-stage protocol for quantum-secure communication. It is based on the use of multiple photons for quantum secure communication. The obstacles associated with distance and speed of quantum communication are overcome by using multi-photon implementation of the three-stage protocol. However, the three-stage protocol requires information to traverse the transmission link between the two communicating endpoints three times. The concept of braiding results in the protocol transferring quantum-secure information in just one step without the need for it going back and forth three times. The braided single-stage protocol requires the use of the three-stage protocol technique just once, initially, to exchange an initializing vector prior to its operation.

The braided single-stage protocol has been implemented in the laboratory using optical devices and components over free space. In brief the proposed protocol capitalizes on strengths of the three stage protocol and while using the concept of braiding to transfer quantum-secure information in a single step. The proposed protocol thus reduces the consumption of transmission resources by a factor of three.

**COMMUNITY SERVICE/OUTREACH**

**Milton, Robin M.**  
**DESIGN AND IMPLEMENTATION OF REFERENCE CARDS TO AVOID LOOK-ALIKE, SOUND-ALIKE MEDICATION ERRORS**

**Objective:** To evaluate and determine if use of reference cards identifying potential look-alike, sound-alike medication errors heightened awareness for nurses in the community-based Integrated Multidisciplinary Program of Assertive Community Treatment (IMPACT) program.

**Background:** Medication errors continue to be a significant problem. Adverse drug events (ADEs) can occur any time a medication or supplement is dispensed and administered and can most often be prevented. A report published by the Institute of Medicine (IOM) identified medication errors as the

most common healthcare error and attributed seven thousand deaths annually to medication errors. The report also identified the confusion with sound-alike and look-alike drug names as a major contributor to medication errors. The Food and Drug Administration (FDA) established screening guidelines to assist with the review of proposed drug names. The pilot project was initiated following discovery that chlorpropamide was inadvertently dispensed in place of the chlorpromazine by the outside provider.

**Methods:** A one-time focus group session was conducted to elicit information on the use of reference cards as an educational tool. Anonymity was maintained. The responses were evaluated for themes. The moderator asked questions regarding reference cards about each for the following areas: ability to help identify potential medication errors, recommendations for card enhancements, and presentation of information.

**Results:** All IMPACT nurses participated. Identified themes were quick reference/reminder, convenience of information on frequently prescribed medication, and easily identifiable information. Feedback indicated the cards were helpful. The language was appropriate for the cards, and the cards were visually appealing. Suggestions for changes to the existing cards included changing the size of the cards and ensuring the dispensing pharmacy received a copy.

**Conclusions:** The use of reference cards as an educational tool to identify potential look-alike/sound-alike medication errors was well-received. Although data are limited from this pilot project, the nurses are enthusiastic about this resource.

**Shelton, Jessica L., Kelly Cook, Adam Ehrlich, Amin Irani, Kasey St. John, Laura Walker**  
**OU-TULSA SUSTAINABLE LANDSCAPES: DESIGNING FOR PLACE**

Our society is racing toward a healthier, more efficient future. Now, more than ever, our community values the benefits of a clean environment with vibrant spaces for gathering, socializing and recreation. The graduate students at OU-Tulsa's Urban Design Studio (OUUDS) are setting out to provide such outdoor experiences for the Tulsa campus. Five areas of focus are being addressed by a campus master plan, which proposes changes to our exterior environment and makes recommendations for future growth on campus. Research methods include various techniques of qualitative site analysis and the quantitative surveying of stakeholders via community workshops and outreach. The students of OUUDS have learned about the viewpoints of a wide variety of associates on campus by regularly meeting with a diverse constituent team composed of multiple disciplines and widely varying perspectives. Additional input is provided by the Patrick Henry neighborhood, represented by the Patrick Henry Association, which has a vested interest in the success of the University of Oklahoma and its role in midtown's success.

From our research, five major trends have emerged: (1) improving walkability, (2) creating a variety of outdoor spaces, (3) reducing resource use, (4) managing the car, and (5) accommodating future growth on campus. By developing recommendations for these five foci, OUUDS is prepared to create an implementation strategy for a well-articulated, sustainable landscape on OU-Tulsa's campus.

**Al Nairab, Salma Hammad**  
**TULSA REGIONAL FARMERS MARKET**

The Cherry Street Farmers' Market Association (CSFMA) is a non-profit organization that has grown in size and reputation during the last 14 years. It now represents the largest farmers' market in Oklahoma. To accommodate thousands of weekly visitors and the rise in demand for local, sustainable products, the market operates at two separate Tulsa locations; on Saturdays at Cherry Street and on

Wednesdays at Brookside. The markets provide a venue to raise economic success for more than 80 vendors from across the state. Many challenges have emerged and are now facing the CSFMA, including inconsistencies and limitations of space, operation days, and time. In addition, the Cherry Street location has no protection from the elements. Attendance is poor and sales are down in rainy weather and the winter farmers' market in Brookside does not have a secure location. A year-round covered farmers' market facility is needed to develop, promote, and expand the direct marketing of local farm products, and increase direct marketing revenue which is essential to the sustainability of small farms. For these reasons, Mr. Scott Swearingen, President of CSFMA, came to the University of Oklahoma Urban Design Studio and requested our assistance in researching alternative locations for a permanent place for the market and to help develop a concept plan and assess the feasibility of creating a Regional Farmers' Market. The Director of the Urban Design Studio, Dr. Shawn Schaefer, offered the project to me as my professional project requirement for the degree of Master of Science in architectural urban studies. The purpose of this project is to create a tool to evaluate possible sites for a relocated market. Using a multi-criterion approach, this project establishes criteria and evaluates potential sites for the relocation of the CSFM, creates a program for transitioning the CSFM from a Local Farmers' Market to a Regional Farmers' Market, and develops a conceptual design for the market. Working with non-profit organizations on this project allowed me to use my skills to serve the community and it required genuine involvement with local communities and the public.

**Wildermuth, Glena Gray**

**PAST, PRESENT AND FUTURE OF SOUTH ADAIR STREET IN DOWNTOWN PRYOR CREEK**

Researching the past, representing the present, and designing for the future are the elements of my project. I've chosen to update the street design of the first block of South Adair Street in Pryor Creek, Oklahoma to provide inspiration for the residents and city officials to strive for a walkable, vibrant block. To learn about the past, I've completed historical surveys using maps, photos and business owner interviews. A photographic panorama, Google Earth maps, a building inventory, personal interviews and Sketchup models illustrate the present situation of South Adair Street. A personal visit to the Institute for Quality Communities at the OU-Norman Campus, interviews with local business owners, and design standards learned at the OU Urban Design Studio have shaped my design interventions for the future of South Adair Street. The Leadership Class at Pryor High School input their ideas for my project, and will be helping prepare a presentation of my research for public viewing at an open house type meeting in April. This project may become a springboard for future redesigns of other areas of the City, and could be used as a basis for a "Better Block" event sometime in the future. A "Better Block" event is used as a demonstration tool to temporarily rebuild a block using volunteer and grassroots efforts. It acts as a living charrette and utilizes PopUp businesses to show the potential for revitalized economic activity. I've been coordinating this project with the City Planner, Mayor, and the Main Street Director of Pryor to include a "Better Block" event for South Adair Street in their Fiscal Year 2014-2015 plan.

*Biomedical Research*

**Gandhapudi,Siva K., Chibing Tan, and Kent Teague**

## **IL18 INDUCED ENHANCEMENT OF CD117 AND CD127 EXPRESSION ON EXPANDING THYMOCYTES**

T cells are essential for long term host defense against infections. Defects in T cell quality and quantity are major contributing factors for weakened immune responses during pathological conditions such as immune deficiency syndrome and during the normal aging process. Hence, therapies that can enhance the T cell repertoire and/or quality are highly desired for boosting immune responses during immunoablative conditions. Using a stromal cell (OP9-DL4) and immature T cell (ETPs) co-culture system that mimics T cell development in thymus; we found that expansion of ETPs can be greatly enhanced in the presence of IL7 and IL-18. In an attempt to understand the underlying mechanism for this effect, we explored the phenotypic differences among ETPs expanded in IL7 or IL18 alone or in conjunction. We found that culturing ETPs with IL18 increased the IL7 receptor (CD127) expression on expanded ETPs. Surprisingly, adding IL18 in conjunction with IL7 also significantly increased the expression of c-Kit (CD117) on thymocytes expanded in these cultures. Because IL7 and c-kit signaling pathways are known to enhance proliferation and survival of progenitor cells, we speculate that increased c-Kit and IL-7 receptor expression caused the enhanced proliferation of ETPs in the presence of IL7 and IL18. Future studies will focus on investigating the involvement of IL7 and c-kit pathways in expanding ETPs and dissecting the molecular pathways linking IL18 induction of c-Kit and IL-7 receptor expression. These studies will benefit in translation of this in vitro T cell expanding technique to in vivo applications.

## **Mallios, Alexandros, John Blebea, Ryan Messiner, Kevin Taubman, Harry Ma LASER ATHERECTOMY - LONG TERM CLINICAL RESULTS FOR THE TREATMENT OF PERIPHERAL ARTERIAL DISEASE**

**OBJECTIVE:** To investigate the long term clinical results of laser atherectomy in the treatment of peripheral arterial disease.

**METHODS:** Retrospective analysis of consecutive patients undergoing laser atherectomy at a single institution during a seven year period by vascular surgeons and interventional cardiologists in a tertiary university-affiliated hospital. Clinical data was retrieved from patient charts and hospital electronic medical records along with the associated arteriograms.

**RESULTS:** A total of 461 lesions in 343 limbs were treated in 300 patients with a mean age of 70 years. The indication was critical limb ischemia (CLI) of rest pain or tissue loss in 227 (66%) of interventions and claudication in 116 (34%). All procedures included an associated balloon angioplasty while stenting was performed in 33%. Technical success was achieved in 99% with only 2 (<1%) cases of an acute procedure-related complication requiring surgical intervention. At a mean follow up of 28 months, 156 patients (45%) achieved significant clinical improvement (resolution of tissue loss or rest pain) or became asymptomatic, 60 (17%) remained with CLI, 30 (9%) had a major amputation, and 18 (5%) had a minor amputation. Freedom from major amputation was 90% at five years by life table analysis. Diabetics and patients on hemodialysis were more likely to have a major amputation (RR: 2.8, 95% CI: 1.1-7.3 and RR: 2.7, 95% CI: 1.1-6.1, respectively; both  $P < 0.05$ ) while a combination of the two diseases conferred a sixfold increased risk of major amputation (RR: 6, 95% CI: 1.7 to 20.7,  $P = 0.005$ ). Tissue loss at initial presentation was three times more likely to result in major amputation (OR: 3.3 95% CI: 1.5-7.1,  $P < 0.005$ ) as compared to claudicants. There was no difference of major amputation rates between surgeons and interventional cardiologists (RR: 1.5, 95% CI: 0.8-2.8,  $P=0.1$ ) although it was three times more likely for the patients treated by surgeons to suffer from CLI (OR: 3.2, 95% CI: 1.9-5.4,  $P < 0.0001$ ).

**CONCLUSION:** Laser atherectomy is safe and efficacious in limb salvage. Diabetics and those on dialysis have much higher probability of requiring a proximal amputation. Surgeons treated patients with more advanced disease.

**Chanda, Rama Krishna, Rohitha Inturi, Montserrat Abadie Sole, Frances Wen, Julie Stearns  
PHYSICIAN INVOLVEMENT IN DECISION MAKING FOR CHOICE OF EPIDURAL  
ANALGESIA DURING LABOR**

**Introduction** Previous studies have established influences of sociocultural, economic, and ethnic disparities on epidural anesthesia (EA) utilization. The aim of this study was to determine factors that influence the use of EA during labor, specifically the roles of health care provider and ethnicity in a diverse patient population of Northeast Oklahoma.

**Methods** A 17-item cross-sectional survey conducted on 190 women in the immediate post-partum period who are above 18 years of age and delivered healthy babies by normal vaginal delivery, at urban community based teaching hospital. This study assessed factors influencing use of EA as pain relief during labor (PRDL) like provider-patient discussion, patient understanding and other sources of information, decision-making process and socio-demographic variables. Data was analyzed using descriptive statistics and Chi square analyses.

**Results** The majority of participants (85%) reported discussing PRDL with their health care providers. Women who received information from health care providers (62%) were not more likely to plan for EA compared to women who did not discuss options (56%). No significant associations were found between source of information (physician, midwife/nurse, prenatal class, family/friend, television and book/magazine) and type of analgesia chosen during labor. A significantly smaller proportion of Hispanic women (34%) planned for EA compared to nonHispanic women (71%), and a greater proportion of Hispanic women planned for no EA (66%) compared to nonHispanic women (29%). Women who understood their options (65%) were more likely to choose EA than women who did not (39%). Hispanic women (20%) were greater than nonHispanic (6%) among the ones who did not understand their options.

**Conclusion** Although health care providers provided medical information regarding pain management options in accessible ways to patients, PRDL decisions were not influenced by providers or other sources of information. The role of understanding options for PRDL was seen more strongly among non-Hispanic women than Hispanic women suggesting cultural factors played a role in making this decision.

We found that most Hispanic women did not opt for EA as their option, perhaps because of difficulties in understanding their options. Our study suggests women's choices may be influenced by extent to which they can understand their options in detail from health care providers. Future analyses will examine influences of language and culture preferences for natural childbirth on PRDL choice.

**Gkotsis, George, William Jennings, Alexandros Mallios, Kevin Taubman**

## **EVALUATION AND TREATMENT OF HIGH FLOW ARTERIOVENOUS FISTULAS AFTER SUCCESSFUL RENAL TRANSPLANTATION**

**Objectives:** Observation versus ligation of a functional AVF following successful renal transplantation (SRT) has been debated. Cardiac disease including congestive heart failure and pulmonary hypertension are common in dialysis patients and more common when access flows exceed 1200-1500 ml/min. Transplant failure may occur in up to 66% of patients after 5 years, so maintaining a moderate flow AVF appears warranted. We review SRT patients with high flow AVFs where a precision inflow banding procedure was used.

**Materials and Methods:** Patients referred for high flow AVF evaluation post SRT were identified. In addition to physical examination, each patient had ultrasound AVF flow measurement before and after temporary AVF compression (AVF-comp) of the access by digital occlusion for 2-3 minutes. Pulse rate and the presence or absence of cardiac murmurs were noted before and after AVF-comp. Pre and post-banding flow rates were included in the analysis.

**Results:** Twelve patients were identified. Eight (66%) were male, and one (8%) obese. Ages were 15-73 years (mean=42). The AVFs were established 24-86 months previously. The mean pulse rate declined after AVF-comp from 90/min to 72/min (range 110-78). Six patients had a pre-compression cardiac flow murmur that disappeared with temporary AVF-comp. One patient with poor cardiac function underwent immediate AVF ligation with dramatic improvement in cardiac status. All other patients underwent a precision banding procedure with real-time flow monitoring. Mean access flow was 2280ml/min (range 3320-1148ml/min) before access banding and was 598 ml/min (range 876-481) after flow reduction. All AVFs remained patent although one individual later requested ligation for cosmesis. Two patients had renal transplant failure and later successfully used the AVF. Follow-up post banding was 1-18 months (mean=12).

**Conclusions:** Hemodialysis vascular access patients with high flow AVFs had successful resolution of high cardiac output findings and maintenance of access patency using a precision banding procedure. Yearly examination of transplanted patients with access flow measurement seems warranted. Flow reduction in symptomatic patients or when AVF flow exceeds 1200-1500 ml/min is recommended. Further study is warranted to substantiate these recommendations.

**Braun, Sandra Emmy, Amanda Foster, Rashmi Kaul, Anil Kaul**

### **INCIDENCE OF CHLAMYDIA AMONG DIFFERENT AGE AND ETHNIC GROUPS**

*Chlamydia trachomatis* (CT) is the most frequently reported organisms causing Chlamydia, a sexually transmitted infection, in the United States and Oklahoma. CT can cause serious complications, including pelvic inflammatory disease, ectopic pregnancy and infertility. Chlamydia rates are also on the rise nationally and the rate among blacks is seven times higher than rates amount whites. It is important to identify populations at risk to plan for possible interventions to decrease prevalence rates.

Patient specimens were collected at Tulsa area clinics and tested by our laboratory for CT using nucleic acid amplification testing (NAAT). We analyzed the patient demographic data provided with the specimens submitted for testing. Data was limited to only non-pregnant female patients. We then determined the incidence rate per 100,000 individuals. We analyzed a total of 14,848 patient samples and broke them down by age and racial/ethnic group categories consisting of Black or African American; White, Hispanic or Latino; and White, Non-Hispanic or Latino.

Among the overall population, the under 20 age group had a rate of 15,867, 20-29 age group had a rate of 9,131, and 30-39 age group had a rate of 3,828 per 100,000 individuals.

Among racial/ethnic groups it was observed that African Americans had a rate of 13,835, Hispanic or Latino whites had a rate of 8,806, and Non-Hispanic or Latino whites had a rate of 7,044 per 100,000 individuals. In the under 20 age group, it was observed that African Americans had a rate of 25,965, Hispanic or Latino whites had a rate of 14,074, and Non-Hispanic or Latino whites had a rate of 6,810 per 100,000 individuals. In the 20-29 age group, it was observed that African Americans had a rate of 12,205, Hispanic or Latino whites had a rate of 8,877, and Non-Hispanic or Latino whites had a rate of 8,151 per 100,000 individuals. In the 30-39 age group, it was observed that African Americans had a rate of 4,121, Hispanic or Latino whites had a rate of 4,268, and Non-Hispanic or Latino whites had a rate of 4,047 per 100,000 individuals.

A trend was observed among all populations that as age increased, incidence rates decreased and eventually leveled out to similar rates among all racial/ethnic categories. Within racial and ethnic groups large disparities were observed between county, state and national trends with some groups representing a 10-fold difference between one another.

**Braun, Sandra Emmy, Amanda Foster, Rashmi Kaul, Anil Kaul**  
**GNORRHEA INCIDENCE AMONG VARIOUS AGE AND ETHNIC GROUPS**

*Neisseria gonorrhoea* (GC) is the organism that causes gonorrhea, a very common sexually transmitted infection (STI). GC is the second most frequently reported STI, in the United States and Oklahoma. Pelvic inflammatory disease, cervicitis, ectopic pregnancy and infertility are some of the serious complications that can arise from GC. The Centers for Disease Control and Prevention (CDC) estimate that over 570,000 young people are infected with GC annually. Nationally, gonorrhea rates have increased since 2009 and in the 2011-2012 time period gonorrhea rates showed a small decline for young people aged 15-19. Progress must be made to reduce the rate of gonorrhea before it becomes untreatable; elucidating target populations to design intervention measures should help with a rate reduction of the STI.

Specimens were collected from non-pregnant women at Tulsa area clinics and tested by our laboratory for GC using nucleic acid amplification testing (NAAT). We analyzed the patient demographic data between 2010 and 2013, and determined the incidence rate per 100,000 individuals. A total of 14,848 patient samples were analyzed for age and racial/ethnic distribution.

Among the overall population, the under 20 age group had a rate of 1,979, 20-29 age group had a rate of 1,545, and 30-39 age group had a rate of 671 per 100,000 individuals.

Among racial/ethnic groups - African Americans had a rate of 4,834, Hispanic or Latino whites had a rate of 718, and Non-Hispanic or Latino whites had a rate of 983 per 100,000 individuals. In the under 20 age group, we observed that African Americans had a rate of 9,556, Hispanic or Latino whites had a rate of 741, and Non-Hispanic or Latino whites had a rate of 939 per 100,000 individuals. In the 20-29 age group, this rate was 4,116 among African Americans, 749 among Hispanic or Latino whites and 1,068 per 100,000 among Non-Hispanic or Latino whites. In the 30-39 age group, we observed that African Americans had a rate of 1,333, Hispanic or Latino whites had a rate of 610, and Non-Hispanic or Latino whites had a rate of 809 per 100,000 individuals.

Our results indicate that all population groups, as age increased the incidence rates of GC decreased and eventually leveled out to similar rates among all racial/ethnic groups. Within these ethnic groups,

large disparities were observed between county, state and national data with some groups representing a 13-fold difference between one another.

**Jaiswal, Deepna, Matt E Dauterive, Fred S Lee**

### **SURVEYING RESIDENT PHYSICIANS KNOWLEDGE AND PRACTICE OF THE 2013 UNITED STATES PREVENTIVE TASK FORCE GUIDELINES ON HEPATITIS C SCREENING**

**Background:** The USPSTF estimates 3.2 million people in United States have chronic hepatitis C with the highest prevalence of infection among “baby boomers” those born between 1945 and 1965. It is projected that greater than 50% of the infected “baby boomers” are currently undiagnosed, predisposing them to long-term complications such as cirrhosis, hepatocellular carcinoma, and death. We proposed that resident physicians are unaware of the USPSTF guideline offering one-time screening for hepatitis C infection to adults born between 1945 and 1965 and have not implemented screening recommendations.

**Methods:** Participants in this quality improvement project included a total of 37 PGYI-PGYIII Internal Medicine residents-in-training at University of Oklahoma School of Community Medicine. Residents completed a survey to evaluate their general knowledge and awareness of hepatitis C screening guidelines. The survey was formulated as a 5-point Likert Scale to assess resident’s current practices ranging from 1-5 describing the frequency of screening with 5 representing the “always screen”. Statistical analysis was performed using Microsoft Excel to obtain mean scores and standard deviations.

**Results:** 37 internal medicine resident physicians completed the surveys. Only 13% of residents reported being familiar with hepatitis C screening guidelines. In a comparison between PGY I, PGY II, and PGYIII resident level the average scores in correctly identifying indications for hepatitis C screening were 76%, 88%, and 97%, respectively. However, only 56% of all residents correctly identified screening the 1945-1965 birth cohort for hepatitis C. It is interesting to note that 41% of participants will either rarely or never screen for the disease. But, when presented with a patient with a known diagnosis 81% of residents will refer for treatment.

**Conclusion:** Hepatitis C remains prevalent within the “baby boomer” demographic. Studies have shown that the birth-cohort testing strategy will reduce morbidity and mortality and improve quality of life. Residents can appropriately treat patients with a known diagnosis, but there is a knowledge deficiency on identifying the appropriate patient subset to screen. With new healthcare reform, more effective risk identification of patients with Hepatitis C is necessary to decrease future health care expenditures.

**Pack, Christopher Carl, Jeremy L Johnson, Katherine O'Neal**

### **EVALUATION OF THE BARRIERS TO PATIENT USE OF GLUCOMETER CONTROL SOLUTIONS**

The importance of diabetes management cannot be over emphasized. One of the most important factors in controlling diabetes mellitus is self-management of blood glucose monitoring (SMBG). Manufacturers of glucometers recommend routine use of control solution to ensure accuracy of SMBG readings. A California study found that 58% of patients with diabetes are not using control solution according to manufacturer recommendations. This idea is important considering a 2001 study indicated glucometer readings can have a bias up to 20%. The purpose of this study is to confirm similar findings

in Tulsa and identify potential barriers to control solution use from multiple perspectives including patient, pharmacy, and provider.

A prospective, observational survey design is being used in this study. Qualitative and quantitative methods have been employed for data collection. First, 25 randomly selected pharmacies, including both chain and independent pharmacies in the Tulsa metro area, have been audited by the investigators for control solution accessibility. These same pharmacies are currently being used to survey pharmacists, via telephone, regarding control solution inventory and perception of importance of use. Next, all providers that participate in the care of patients with diabetes, within the OU Physicians Tulsa group, will be surveyed regarding their routine practice regarding control solution. Up to sixty patients having either type 1 or 2 diabetes will be randomly selected from the OU Physicians Tulsa clinics (pediatric, pediatric diabetes, family medicine and internal medicine) for telephone survey on use and perceptions of control solution for glucometers.

From completed pharmacy audits and surveys, observational data indicates that 24 pharmacies (including chain and independent pharmacies) lack control solutions that are visually available to patients. However, 64% of pharmacists, surveyed to date, in the community describe this knowledge as important for patients with diabetes to know. In addition, 7 pharmacies reported stocking control solutions even when this assertion is contradicted by visual inspection of the site. This inconsistency could be due to stocking control solutions in a method that is not visually apparent to patients.

Future Directions of this study include completing pharmacy, provider, and patient surveys. Data from these surveys will be analyzed to identify potential barriers concerning glucometer control solutions. Finally, it is hoped that this study will produce applicable recommendations for providers and pharmacies to increase the utilization glucometer control solutions to manufacturer recommended levels.

## **SOCIAL AND BEHAVIORAL RESEARCH**

### **Rabbani, Affan, Abdullah Dar, John Tipton, Frances Wen, Julie Stearns OBSTETRIC CARE IN RURAL AND URBAN OKLAHOMA**

**Introduction** With recent healthcare reforms, the emphasis of healthcare has been diverted to disparities even more. Obstetrics care in rural Oklahoma has been discussed previously, but a more detailed county wise analysis has not been done.

The objective of this study was to determine the distribution of obstetric care relative to the female population in rural and urban counties in Oklahoma.

**Methods** The population and spatial data are from the Oklahoma State Department of Health (OSDH) OK2SHARE Service databases. OK2SHARE was used to identify levels of adequacy of obstetric care for Oklahoma counties and birth records from 2011 were downloaded and entered into SPSS V20 for geospatial and statistical analysis. Adequate obstetric care were defined as prenatal care during the 1<sup>st</sup> trimester and >9 visits (OK2SHARE). Inadequate care were defined as either no, late (care starting in 3<sup>rd</sup> trimester), or little (care starting in 1<sup>st</sup> or 2<sup>nd</sup> trimester and 1-3 visits) care. Geospatial analyses were run on counties of residence and occurrence based on rates of adequacy of care. Chi-square tests of proportions were conducted to examine differences between rural and urban counties on adequacy of care measures.

**Results** The percent of women receiving adequate care across counties was used in a geospatial analysis and a lower percent of adequate care appeared to be received in counties in central western Oklahoma as well as in central eastern Oklahoma. Women residing in counties in western Oklahoma in particular, as well as in central parts of eastern Oklahoma received lower levels of obstetric care. A chi-square analysis showed an association between rural/urban status and level of services available, with women in rural counties more likely to experience no services than those in urban counties,  $\chi^2 (4, N=77) = 9.74, p=0.045$ . When examined by county of occurrence, the distribution of low levels of obstetric care notably widens across the state. Women in rural counties were no more likely to experience low levels of services than those in urban counties,  $\chi^2 (4, N=77) = 2.28, p=0.685$ .

**Conclusion** In the light of results of this study a formal re-evaluation of factors contributing to inadequacy of obstetric care in Oklahoma is needed. There are ample factors, i.e., lack of opportunity for physicians, socioeconomic status, lack of public awareness, and skewed distribution of healthcare budget allocations that can lead to such disparity.

**Buck, Amy, Megan Foster, Chelsie McKee, Heather Odle, Mary Isaacson, EdD, OTR/L, ATP  
EXAMINING OUTCOMES OF SERVICE DOG PLACEMENT FOR INDIVIDUALS WITH  
MOBILITY CHALLENGES**

**Background:** The utilization of service dogs with people with disabilities is growing. The impact that these dogs may have on an individual's life are multifaceted. It is important to identify how service dogs influence an individual's life and examine any barriers that may prevent a positive interaction between the person and the dog. **Purpose:** The purpose of this study was to deepen the understanding of the impact of service dogs on individuals with mobility challenges using a mixed methods approach. **Methods:** Six Therapeutics of Oklahoma clients participated in this study and range in age 14-65. Three tools were utilized in the data collection process including Photovoice with interviews, the Canadian Occupational Performance Measurement Tool (COPM), and the Psychosocial Impact of Assistive Devices Scale (PIADS). Data was collected within 3 months of the individual first receiving a service dog and 12 to 18 months after receiving the service dog. **Results:** Results indicate that the role of the service dog is comprehensive and complex. The service dog plays a significant role in assisting individuals with mobility impairments emotionally, psychosocially and physically. The dog provides this assistance in the home, at work, at school and in the community.

**Discussion/Conclusions:** Findings of the project help improve the understanding of the duties of service dogs, the physical, emotional, and social impact of service dogs, the importance of the trained and untrained tasks that these service dogs may perform, and the overall quality of life of the individual who has the service dog, as well as some of the challenges that a service dog may impose.

**Implications:** The use of service dogs for a multitude of disabilities is growing. The bond between the service dog and the service dog partner is powerful and requires commitment by both the service dog partner as well as the service dog. The project has brought to light the many questions still to be answered about service dogs, the needs of service dog owners, the challenges in service dog placement, the special bond that occurs between the person and the service dog, and how to further measure the impact of service dogs. As future health care professionals, it is important to recognize the impact that a service dog may have on an individual's life and be prepared to educate other health care professionals, patients, and the community about service dogs.

**Nwokenkwo, Stanley**

**DIAGNOSIS AND MANAGEMENT OF ANXIETY IN A RESIDENT CLINIC**

**Introduction:** Anxiety disorders account for up to 20% of office visits to primary care physicians. Management in the primary care setting is complicated by the multiplicity of disorders with similar and overlapping clinical features as well as the presence of co-morbidities. Current evidence suggests that antidepressants are first line for management of anxiety and there is little evidence that suggest that the use of benzodiazepines chronically is appropriate in the management of any anxiety disorder. This study compares the primary pharmacologic management of anxiety in a resident primary care clinic.

**Methods:** Using the *Reports* function of the Centricity® Electronic Medical Record(EMR), inquiries were made to obtain a count of active patients seen by residents in a three month period. The EMR was then queried for a count of patients with a diagnosis of Anxiety (ICD-300.00) and Generalized Anxiety disorder (ICD-300.01) as well as their treatment, grouped into one of 4 categories - antidepressants, benzodiazepines, both (antidepressants + benzodiazepines) and other (untreated or treated with other modality than antidepressants and benzodiazepines). Finally the EMR was queried to obtain an age and gender distribution of these patients. Using the query results the prevalence of anxiety disorder was then calculated and using IBM SPSS Statistics, histograms and pie charts were created to illustrate the percentage distribution of treatment among our patients with anxiety. The setting was the University of Oklahoma Internal medicine Clinic.

**Results** 3031 patients were seen in the Resident clinic between December 1,2012 and March 1, 2013. Of these 603(20%) had an active diagnosis of Anxiety (ICD 300.00) and another 242(8%) had an active diagnosis of Generalized anxiety disorder (ICD 300.02). Combined 21% were male and 31% female.

Out of 845 patients with an Anxiety diagnosis (ICD 300.00 or ICD 300.02), 42% were treated with antidepressant alone, 11% treated with benzodiazepines alone and 15% treated with both antidepressants and benzodiazepines. 32% of patients were either not treated or received a different treatment other than antidepressant and benzodiazepines.

The greatest proportion of patients managed for anxiety females between the age of 45 and 59.

**Conclusion:** There is a relatively high prevalence of Anxiety disorders in primary care. It is important for primary care physicians to appropriately diagnose these disorders in order to properly treat. This helps minimize the risk of mismanagement of patients with anxiety.

**Bragg, Jedediah Eugene and Julie Miller-Cribbs**

## **VIEWS ON SOCIAL WORK POST INTERPROFESSIONAL EDUCATION AT THE UNIVERSITY OF OKLAHOMA**

The need for Interprofessional Education (IPE) is clearly evident, with research documenting that improved teamwork leads to improved patient outcomes, greater satisfaction, and the potential to lower costs across the health care continuum (World Health Organization 1988; Institute of Medicine 2012). However, research also demonstrates societal, institutional, and individual barriers to IPE (Kezar & Elrod 2012; Anderson, Thorpe, & Hammick 2011). One such barrier is related to knowledge and experiences of the various professions that comprise the health care team. One outcome of IPE is to break down those barriers, of which the least complex is on the individual level. Research has demonstrated that the stereotypes held about other professions, specifically social work, prior to collaboration change significantly after being involved in IPE (Lidskog 2008; Hean 2006). Results from this study indicate that the Summer Institute (SI) successfully exposed students to different professions; gaining knowledge and understanding of the role of those professions within an interprofessional (IP) team.

Data from 2010-2012 was analyzed and included questions about the expectations of the Summer Institute (SI), knowledge of other professions, and personal commitment to the practice of community medicine. This data was collected at pre-SI, mid-SI, and post-SI and was approved by the university's IRB. The data revealed that SI participants learned from and valued the experiences of the other professions that were included in the institute. Outcomes were related to learning from and appreciating the strengths of other professions involved, experiencing interprofessional conflicts while being able to resolve and learn from them, and understanding the value and need of interprofessional collaboration to solve the complex nature of a 21<sup>st</sup> century health care system. The importance of social work within IP teams became evident at the conclusion of this study.

**Bull, Lauren, Dhara Sheth, Sara Gower, Eric Engstrom, Ric Munoz, J.D., M.S.W, Mark Fox, M.D., Ph.D., M.P.H., Chan Hellman, Ph.D.**  
**COMANCHE PARK RESIDENT HEALTH SURVEY**

**Background:** The Comanche Park Health Survey was developed to explore the relationship between Adverse Childhood Experiences (ACEs), Trust in the Medical Profession, and Hope for good primary care among residents of a low-income housing project in north Tulsa. We hypothesized that 1.) higher ACE's predicted lower trust in the medical profession; and 2.) the identification of a health care provider would predict higher hope for good primary care.

**Methods:** A cross-sectional survey of adult residents of Comanche Park was conducted during July 2013. Residents were invited to complete a de-identified paper survey. The study was approved by the Institutional Review Board of the University of Oklahoma Health Sciences Center.

**Results:** Ninety-two respondents completed the survey, representing approximately 25% of the adult residents of Comanche Park. Females comprised of 74% of respondents. Forty-eight percent of respondents were African-Americans, 31% Caucasian, and 7% Hispanic.

An Analysis of Variance (ANOVA) test revealed a significant difference in trust in the medical profession based on ACE scores, ( $F = 4.48$ ,  $df = 4, 67$ ,  $p < .01$ ). The effect size was large ( $\eta^2 = .211$ ), suggesting 21% of the variance in trust in the medical profession scores is accounted for by differences in ACE score. Using the 0 ACE group as a control indicated that the group with 0 ACEs had significantly lower trust in the medical profession than the group with 4 or more ACEs. Contrast tests also revealed a significant linear trend ( $p < .01$ ) indicating that as ACE scores increased, trust in the medical profession decreased. A hierarchical regression analysis was conducted to compare participants' hope for good primary care based on their report of having a regular primary care provider. Contrary to our hypothesis, participants who identified a provider had less hope for good primary care when controlling for chronic illness ( $\Delta R^2 = .09$ ,  $p < .01$ ). In short, participants had less hope for good primary care once they had an identified provider whether or not they had a chronic illness.

**Conclusions:** This study demonstrates the impact of ACEs on trust in the medical profession among a vulnerable population, which in turn may affect car-seeking behavior and hopes for good care. The study suggests the need for new engagement approaches by health care providers for members of at risk populations like those sampled in our study.

**Fry-Geier, Lindsay M.**  
**SCHOOL AGE CHILDREN OF INCARCERATED PARENTS: THE EFFECTS OF ALTERNATIVE CRIMINAL SENTENCING**

Recent research suggests that children of incarcerated parents are at risk for a range of adverse outcomes throughout life. While researchers and practitioners have aimed to understand and mitigate these risks, no previous study has examined if parental alternative sentencing affects child outcomes. The purpose of this study was to examine if maternal alternative criminal sentencing affected children's behavior, parent-child attachment, and level of hope. This study was based on survey and utilized causal-comparative (ex post facto) research design. Children ages 8-14 whose mothers were recently released from an alternative criminal sentencing program were compared with children whose mothers had been recently released from prison. Both mothers and their children participated in this study. One-way ANOVA results revealed statistically significant differences between the groups of children in externalizing behavioral problems, total behavioral problems, parental trust, parental alienation, parental communication, and total parent-child attachment. Though further research is needed, maternal alternative sentencing appears to positively affect children of incarcerated parents' behavior and attachment. The results of this study present a case for continued commitment to alternative sentencing for non-violent mothers in the state of Oklahoma.

**Regouby, Daniel Dwight**

#### **FACTOR ANALYSIS OF NEW MEASURE OF ORGANIZATIONAL CULTURE**

For as long as organizations have existed, organizational leaders and managers have attempted to measure, maintain, and modify organizational culture. For more than 5 decades, organizational experts have assessed many aspects of organizational culture using many different methods and instruments. This study uses the Organizational Self-Assessment Tool (OSAT), a 40-item measure pilot designed by the researcher to assess 8 dimensions of organizational culture. Each item is designed to tap one of the eight dimensions at one of four levels of cognitive knowledge described by Quinn, Anderson, and Finkelstein (1996). The purpose of this study is to test the factor structure of the OSAT instrument to determine whether the data fits the theorized framework. Archival data from more than 400 employees representing healthcare and food manufacturing industries will be used in the factor analysis. Results of the analysis will be presented. Suggestions for modification of the instrument will be presented as well as the practical organizational applicability.

**Estevis, Eduardo, Michael R. Basso, Roderick Purdie, Dennis Combs, Douglas Whiteside, Brad Roper**

#### **DIFFERENTIAL PATTERNS OF NEUROPSYCHOLOGICAL FUNCTIONING AMONG DEPRESSED INPATIENTS**

**Objective:** Neuropsychological deficits occur often among depressed inpatients but , few studies have determined the factors that contribute to such impairment. Recently, Basso et al. (2013) showed that agitated features and general negative affect predict impairment in depressed inpatients. Other clinical features may also coincide with impairment, and this study examined whether melancholic and atypical features correspond with neuropsychological impairment in depressed inpatients.

**Participants and Methods:** 12 unipolar depressed inpatients and 11 controls were administered a structured diagnostic interview, a brief neuropsychological battery and measures of emotional distress to assess symptom severity. Demographically corrected scores were analyzed, precluding the need to statistically control for such factors.

**Results:** Correlations revealed significant relationships between melancholic features and concept formation tests (WCST and VCAT), but not with other measures. In contrast, atypical features correlated significantly with measures of ideational fluency/flexibility (Stroop and Fluency Measures)

and verbal memory (CVLT-2) but not with measures of concept formation. Poor grooved pegboard performance correlated with both melancholic and atypical features.

**Conclusions:** Patients with melancholic depression are apt to experience difficulties involving reasoning and concept formation, whereas those with atypical features display dysfunction involving mental flexibility, ideational fluency, and new-learning. Both correspond with poor dexterity. Consistent with theory and neuroimaging research, these data imply frontal lobe dysfunction in depression. However, these findings are unique, because they imply that distinct neural substrates exist for each symptom cluster, each suggesting the involvement of different aspects of the frontal lobes.

**Frazier, Julian T., Timothy B. Meier, Rashmi Singh, Patrick S.F. Bellgowan**  
**"LONGITUDINAL ASSESSMENT OF INFLAMMATION, COGNITIVE PERFORMANCE**  
**AND MOOD REGULATION DURING COLLEGIATE ATHLETIC SEASON."**

Extended periods of prolonged athletic training are associated with increased levels of both peripheral and neural inflammatory markers including C-reactive protein (CRP). Prolonged exposure to inflammation has been shown to have a negative impact on cognitive function and mood state. To date, no studies have longitudinally investigated the effects of CRP levels on cognitive and psychiatric performance across an athletic season. Here we investigate whether there is a correlation among inflammatory state, cognitive decline and mood regulation in collegiate women's soccer players across the course of a season. All dependent measures were collected at multiple intervals during and shortly after the competitive season. CRP levels were assayed from each participants blood samples and cognitive performance measures (including working memory, spatial memory, attentional measures and reaction time) using the Automated Neuropsychological Assessment Metrics (ANAM) were concurrently collected. Mood state was assessed at each time point using the Hamilton Anxiety Rating Scale (HAM-A) and Hamilton Depression Rating Scale (HAM-D). We tested two hypotheses: (1) Later in the season student-athletes will self-report more mood symptoms and show decreased cognitive performance; (2) Both the increase in mood symptoms and decreased cognitive performance will correlate with higher levels of CRP.

**Gaus, Tom, Kaier, E., Cromer, L. D., Davis, J. L., & Strunk, K.**  
**A COMPARISON OF DEPRESSION SYMPTOMS AND COPING STRATEGIES AMONG**  
**ATHLETES AND NON-ATHLETES**

Studies show that depression rates among college students exceed that of the general public (Voelker, 2003). Student-athletes may be resilient because they are less likely than their non-athlete peers to report depressive symptoms (Armstrong & Oomen, 2009). While the reason behind this finding is unknown, one possibility is that student-athletes' coping strategies may be less maladaptive than those of non-athletes. Studies show that those who use more maladaptive coping strategies, more frequently report high levels of depressive symptoms (Raja et. al., 2012). With these considerations in mind, the present study compared athletes and non-athletes' symptoms of depression and their coping strategies. We hypothesized that based on previous research (Armstrong & Oomen, 2009) athletes would report fewer depression symptoms, fewer maladaptive copings skills, and more adaptive coping skills. Athletes ( $N=140$ ) were NCAA Division I athletes representing sixteen different teams at a private Midwestern University. Both athletes and non-athletes completed a questionnaire on depression and coping strategies. Athletes who consented to participate, completed questionnaires before or after practices and weight-lifting sessions. Non-athletes ( $N = 70$ ) were through an anonymous online survey system. Results indicated that, consistent with epidemiological research, females reported significantly more symptoms of depression than did males ( $M = 3.5$  versus  $M = 2.3$ ,  $t(198) = 2.1$ ,  $p = .03$ ; Kessler et

al., 1993). Also in-line with previous research (Armstrong & Oomen, 2009), results showed that athletes reported fewer symptoms of depression ( $M = 2.3$ ) than did non-athletes ( $M = 4.5$ ), as well as less adaptive coping ( $M = 35.7$  versus  $M = 42.0$ ) and less maladaptive coping ( $M = 19.4$  versus  $M = 22.4$ ) than non-athletes. When we examine correlations of coping and depression within the groups, we found that for the athlete sample adaptive coping ( $r = .231$ ) and maladaptive coping ( $r = .516$ ) were both significantly positively correlated with depression; within the non-athlete sample, only maladaptive coping was significantly correlated to depression ( $r = .613$ ). These results are consistent with previous research findings (Raja et. al., 2012); those who experience depressive symptoms utilize more maladaptive coping strategies. However, the findings on athlete coping and depression suggest a more complex picture. Although athletes reported fewer adaptive coping strategies in total, they appear to utilize more adaptive coping strategies the more depressive symptoms they endorse. This adaptive coping may explain the relative low levels of depression in this group of athletes.

**Jordan, Montega, Kaier, E., Vanasse, R., Cromer, L. D., Davis, J. L., & Strunk, K.**  
**THE IMPACT OF GENDER ON THE RELATIONSHIP BETWEEN MENTAL TOUGHNESS AND ATHLETE STRESS IN A SAMPLE OF ELITE**

Mental toughness (MT) is important for athletic performance (Middleton, Marsh, Martin, Richards, & Perry, 2004). Participating in sports, especially at an elite level, can be a stressful experience (Nicholls, Polman, & Levy, 2012). Kaiseler, Polman, and Nicholls (2009) found that higher levels of MT were associated with lower levels of stress intensity and higher levels of perceived control. Research also shows that males may have higher levels of MT than females, although it is not clear if this is due to differences in how males and females display MT, or if it is the way MT is defined socially for each gender (Nicholls, Polman, Levy, & Backhouse, 2009). The current study sought to replicate and extend previous research by exploring three research questions. Specifically we explored whether: 1) male or female athletes reported more MT, 2) MT was related to reported athlete stress, and 3) the relationship between MT and stress differed between female and male athletes. Participants ( $N = 140$ ; 80 females, 60 males) were National Collegiate Athletic Association (NCAA) athletes at a Division I University. The participants were asked to fill out a series of questionnaires as part of a larger study examining stress and health among athletes. Contrary to Nicholls and colleagues (2009) findings, the results revealed that male athletes reported lower levels of MT ( $M = 161.64$ ,  $SD = 20.13$ ) than females ( $M = 164.46$ ,  $SD = 18.87$ ), although this difference did not reach statistical significance. Male athletes reported significantly lower stress ( $M = 23.24$ ,  $SD = 16.59$ ) than females ( $M = 26.59$ ,  $SD = 16.24$ ). Among the entire sample, MT was negatively associated with reported athlete stress ( $r = -.37$ ,  $p < .001$ ) indicating that more MT was related to less athlete stress. When this was investigated by gender, among female athletes, MT was significantly correlated with stress, such that more MT was related to less athlete stress ( $r = -.50$ ,  $p < .001$ ). Interestingly, male athletes' MT was not statistically significantly related to stress ( $r = -.21$ ,  $p = .258$ ). Results indicate that the relationship between MT and athletic stress differs between female and male athletes. For female athletes, MT may serve as a protective factor against stress. These findings are preliminary as the relationships are correlational; therefore we cannot infer causality.

**Simonet, Daniel V. and Anupama Narayan**  
**PLEASURE WORKING WITH YOU: PERSONALITY, STRESS, AND SATISFACTION IN DYADIC TEAMS**

Using a variant of the input-process-output model, we examine both intra- and inter-personal effects of the Big Five on team satisfaction in via emergent stress in dyads working on a creative task. The sample consisted of 146 undergraduates working in 73 dyads on a freshman orientation idea generation and consolidation task. Using the Actor-Partner Interdependence Mediation Model, we found the effects of the stability cluster (neuroticism, agreeableness, and conscientiousness) on team satisfaction were fully

mediated by actor stress; partner's conscientiousness, neuroticism, and openness had indirect effects on team mate's satisfaction; and conscientiousness had both actor and partner effects. Conclusions will be discussed.

## **EVIDENCE –BASED CLINICAL REVIEWS**

**Scholz, Amy Cathleen**

### **HOW EFFECTIVE IS A GLUTEN-FREE CASEIN-FREE DIET: A CRITICALLY APPRAISED TOPIC**

**Background:** Clinicians diagnose Autism Spectrum Disorder (ASD) by functional limitations in effective communication, social participation, social relationships, academic achievement, occupational performance, and repetitive patterns of behavior. The prevalence of ASD is increasing, and ASD now affects 1 in 88 children and 1 in 55 boys. Although the cause of ASD is still unknown, some researchers believe that certain symptoms of ASD may result from opioid peptides formed from incomplete breakdown of foods containing gluten and casein entering the blood stream affecting the nervous system. Many caregivers are experimenting with a gluten-free and casein-free diet (GFCF) as an intervention for individuals diagnosed with ASD.

**Purpose:** The purpose of this critically appraised topic (CAT) was to investigate the effectiveness of a GFCF diet at decreasing symptoms of ASD in children diagnosed with ASD after six weeks of implementation.

**Methods:** The authors performed an exhaustive search of the existing evidence. Study inclusion criteria was evidenced-based studies that examined the effectiveness of a GFCF diet after at least six months of implementation, studies whose participants were children aged 17 years old and younger diagnosed with ASD, and studies that reported the effect of the dietary intervention on the child's ASD symptoms. If the inclusion of a study was questioned by the first author, it was discussed with the second author until a consensus about appropriateness was reached.

**Results:** A single-blinded RCT conducted over 24 months with 72 participants found that a GFCF diet may positively affect developmental outcome for some children diagnosed with ASD. A double-blind RCT conducted over 12 weeks with 15 participants concluded that group data indicated no significant findings to support a GFCF diet for children diagnosed with ASD. A single group non-randomized retrospective study with 387 participants found that children with ASD might respond positively to implementation of the GFCF diet.

**Discussion:** Collectively, the results from the studies conclude that a GFCF diet may decrease symptoms of ASD for some children with ASD and the children may respond to the diet at varying times. The existing evidence has conflicting results to support or refute the effectiveness of a GFCF diet to decrease symptoms of ASD in children diagnosed with ASD.

**Relevance:** It is important for healthcare providers to be knowledgeable about the latest evidence regarding a GFCF diet so that we can be a resource to our patients and their families and provide them with sound evidence-based recommendations.

**Odle, Heather LeAnn and Mary Isaacson**

## **CONSTRAINT-INDUCED MOVEMENT THERAPY APPEARS TO BENEFIT CHILDREN WITH HEMIPLEGIC CEREBRAL PALSY**

**Background:** People with hemiplegic cerebral palsy (CP) have strength, coordination, and/or sensation deficits occurring on one side of the body. These deficits affect the individual's ability to perform Activities of Daily Living (ADLs). ADLs consist of self-care tasks, which are essential for living independently. Constraint-Induced Movement Therapy (CIMT) consists of restricting the uninvolved upper extremity (UE) while completing training of unimanual tasks with the involved UE.

**Purpose:** The purpose of this critically appraised topic (CAT) was to investigate the following clinical question: Does CIMT improve performance of ADLs for children ages 14 or under diagnosed with hemiplegic CP?

**Methods:** A literature review was performed using Embase, PsycINFO, PubMed, AMED, Cochrane Database of Systematic Reviews and Center Register of Control Trials, OTseeker, CINAHL, and MEDLINE using the key search terms: *constraint-induced, CIMT, cerebral palsy, hemiplegic, self-care, activities of daily living, and ADL*. Study inclusion criteria: studies included in this CAT investigated the effectiveness of CIMT to improve ADL performance in participants ages 14 or under diagnosed with hemiplegic CP.

**Results:** We were able to locate three studies (a randomized controlled trial, a single subject design, and a 1 group, pretest-posttest design) that showed CIMT results in improved ADL performance in children diagnosed with hemiplegic CP. All three studies utilized the Pediatric Evaluation of Disability Inventory as an outcome measure for ADL performance. The 1 group pretest-posttest design study found group-based CIMT to be as effective in improving ADL performance as the results of individual-based CIMT from other studies. The randomized controlled trial compared CIMT to bimanual therapy and found the two interventions to be equally effective in improving ADL performance. The third study examined the effectiveness of CIMT for a preschool-aged boy. Two of the studies contained follow-up measures showing CIMT to have either lasting or even improved self-care performance results 3 months postintervention. The studies contained methodological flaws weakening the external and internal validity. In addition, the studies contained small sample sizes (16 participants or less) and varied in the amount of intervention intensity, duration, and length.

**Discussion:** CIMT is effective in improving ADL performance in children ages 14 or under diagnosed with hemiplegic CP. However, the generalizability of the studies' results are limited due to the methodological design. Rigorous studies with a long follow-up period, examining function based outcomes, including participants of wide age ranges, and determining the optimal duration and intensity of CIMT are needed.

**Upton, Leah, Megan Wilson, Barbara H Miller, Karen Sanders**

## **WHAT CONSTIPATION MANAGEMENT APPROACHES ARE MOST EFFECTIVE FOR CHILDREN OVER 3 YEARS?**

**Introduction** Laxatives are frequently used to manage constipation in children. This review attempts to analyze the evidence for the most effective treatment of constipation in children.

**Statement of Methods** PubMed and Cochrane databases were searched in November 2012 for systematic reviews and randomized controlled trials published from 2008 through November 2013 for

studies comparing the efficacy of laxatives in children 18 years and younger. Search terms used were “constipation” and “children”.

**Summary of Results** A 2012 systematic review of 18 randomized control trials (N=1643) compared Polyethylene Glycol (PEG) or PEG plus electrolytes (E) with placebo, lactulose, milk of magnesia, and liquid paraffin. PEG or PEG plus E was significantly better at increasing frequency of stooling per week compared to lactulose (4 trials; N=328, MD 1.1, 95% CI, 0.02-2.2), milk of magnesia (3 trials; N=211, MD 0.7, 95% CI, 0.5–0.9), and placebo (2 trials; N=101, MD 2.6, 95% CI, 0.2–4.1). There was no significant difference when compared to liquid paraffin (1 trial; N=80, MD 0.7, 95% CI, -0.4–1.8). A 2008 systematic review of 21 randomized controlled trials, 1 case controlled trial, and 6 crossover trials (N=1912) compared several different interventions. Patients were given PEG plus E versus placebo, PEG 3350 or PEG 4000 versus lactulose, and PEG 3350 versus other laxatives (mineral oil, milk of magnesia). Compared to placebo, PEG plus E was more effective at increasing defecation frequency per week (1 trial; N=51, MD 1.6; 95% CI, 0.99–2.3). Compared to lactulose, PEG 3350 or 4000 was more effective (5 trials; N=544, RR 1.63; 95% CI, 1.40–1.90); PEG 3350 or 4000 was more effective in comparison to other laxatives (8 trials, N=708, RR 1.47; 95% CI, 1.23–1.76; NNT=4.0). A 2010 double-blind randomized placebo-controlled trial (N=102) compared outcomes in 3 treatment groups: liquid paraffin and placebo; synbiotics (probiotic strains and a prebiotic) and placebo; and a combination therapy of liquid paraffin and synbiotics. All groups experienced an increase in weekly stool frequency (1.81 to 6.75 liquid paraffin group, 2.19 to 5.22 synbiotic group, 1.83 to 7.49 combination therapy group). However, only the combination therapy group experienced a statistically significant greater increase in stool frequency ( $P=.03$ ).

**Conclusions** PEG was more effective in treatment of constipation than lactulose and other laxatives based on consistent systematic reviews. Synbiotics also appear to be effective particularly in combination with liquid paraffin based on a single double-blinded randomized placebo controlled trial.

**Fast, Peter, Emily Cooper, LaMont Cavanagh, Karen Sanders**

## **WHEN SHOULD MUSCULOSKELETAL ULTRASOUND REPLACE MRI IN DIAGNOSING ACUTE MENISCAL TEARS?**

**Introduction:** Magnetic Resonance Imaging (MRI) is used to confirm the diagnosis of meniscal tear but is expensive and not always readily accessible. Alternatively, ultrasound is less costly and can be performed in the office setting. This review evaluated the evidence-based literature on the accuracy of ultrasound as compared to MRI and arthroscopy for diagnosing meniscal tears.

**Statement of Methods:** Ovid MEDLINE, PubMed, Cochrane and TRIP databases were searched in November 2012 for studies published between 2008 through November 2013 that evaluated the accuracy of ultrasound and MRI as compared to arthroscopy in patients with suspected meniscal tears. Search terms used were “ultrasound” and “meniscal tears”. Eleven articles were retrieved, three selected for review.

**Summary of Results:** A 2012 prospective study compared ultrasound and MRI in patients less than 30 years old and greater than 30 years old. Seventy-four patients underwent ultrasound, MRI and arthroscopy. Ultrasound was as sensitive and specific as MRI in patients less than 30 years old (sensitivity 100%, 95% CI 88-100; specificity 89%, 95% CI 52–99 for both ultrasound and MRI) as compared to arthroscopy. MRI was more sensitive (97%, 95% CI 83–98) and specific (86%, 95% CI 42–99) than ultrasound (83%, 95% CI 65–94; and 71%, 95% CI 29–96 respectively) when compared to arthroscopy in patients over 30 years old. For MRI, the LR+ was 6.77 and the LR- 0.04. For ultrasound, LR+ was 2.92 and LR- was 0.23.

A 2011 prospective study compared accuracy of ultrasound to arthroscopy. One hundred sixty menisci in 80 patients were examined with ultrasound. Ultrasound had a sensitivity of 85% (95% CI 76–96) and specificity of 86%, (95% CI 79–92) LR+ 6.1; LR- 0.17 as compared to arthroscopy.

A 2008 prospective comparative study examined the accuracy of ultrasonography by radiographers without formal meniscal ultrasound training in detecting medial or lateral meniscal tears (n=35). The presence of meniscal tear was confirmed by MRI and arthroscopy. The study found that ultrasound had a sensitivity of 86% (95% CI 75–98) and specificity of 69% (95% CI 54 to 85) with LR+ 2.7 and LR- 0.2.

**Conclusions:** Musculoskeletal ultrasound for meniscal tears has a sensitivity ranging from 85-100% and a specificity ranging from 69-97%. Ultrasound is sufficiently specific for ruling in meniscal tears but MRI may be needed if ultrasound is negative and clinical exam is suspicious for tear, based on consistent comparative studies.

**Gilmore, Jesicah, John Bui, Douglas Ivins, Karen Sanders**

## **WHEN SHOULD YOU CONSIDER IMPLANTED NERVE STIMULATORS FOR LOWER BACK PAIN?**

**Introduction:** Spinal cord stimulation (SCS) is used to treat chronic pain, but has associated adverse events. This review evaluated the evidence for using SCS in treating chronic low back pain.

**Statement of Methods:** Ovid MEDLINE, Cochrane and TRIP databases were searched in September 2013 for studies assessing the use of spinal cord stimulation for the treatment of back pain. Search terms used were “back pain” and “spinal cord stimulation.” Studies published from 2009 through 2013 were reviewed. Fourteen articles were retrieved, three were selected for review.

**Summary of Results:** A systematic review of 74 studies (68 case series, 4 RCTs, 2 nonrandomized comparative studies; N=3025) analyzed factors predicting the effectiveness of SCS for chronic back and leg pain (CBLP). Sixty-three studies reported 58% of patients achieved pain relief after SCS (95% CI, 53% to 64%). Thirty-two studies reported 53% of patients experienced pain relief (95% CI, 47% to 59%). Eleven studies showed a mean reduction in pain score (scale 0-10) of -3.3 (95% CI, -3.9 to -2.7). No patient or technology factors affected pain relief. In patients with a longer mean duration of pain, each 12 month increase reduced the level of pain relief by approximately 2.0% ( $p=0.011$ ).

A prospective, randomized, controlled multicenter trial, compared CMM plus SCS (N=52) to CMM alone (N=48) for the outcome of at least 50% pain relief (scale 0 to 100). Subjects consisted of adults with leg-predominant radicular neuropathic pain. CMM plus SCS compared to CMM was 48% vs. 9% respectively (OR 9.23, CI 95% 1.99-42.84,  $p<0.001$ ) in achieving pain relief.

A prospective, multicenter trial measured improvements in pain and quality of life after high-frequency SCS in patients with failed back surgery syndrome (N = 57) and back pain without prior surgery (N = 15). There was a 78% median reduction in back pain compared to baseline (8.4 to 2.7) and an 83% reduction in leg pain from 5.5 to 1.4 (scale 0-10)  $p < 0.001$ , mean Oswestry Disability Index values decreased from 55 to 37 (scale 0-100)  $p < 0.001$ , and mean sleep disturbances decreased from 3.7 awakenings per night to 1.3 ( $p<0.001$ ).

**Conclusions:** SCS is effective for patients with CBLP. However, patients with a longer duration of pain may experience less pain relief. In patients with leg-predominant radicular neuropathic pain, SCS in

addition to CMM is more effective than CMM alone. Patients with back-predominant pain may experience relief with high-frequency SCS.

**Ghosh, Sonali, Harith Qureshi, James Millar, Karen Sanders**  
**WHAT IS THE BEST TREATMENT FOR TINEA CAPITIS IN AN ADULT?**

**Introduction:** Tinea capitis is a dermatophyte fungal infection of the hair and scalp, most commonly caused by Trichophyton and Microsporum. The aim of this review was to evaluate the evidence for the most effective antifungal agents in the treatment of tinea capitis in adults.

**Statement of Methods:** PubMed database was searched in November 2013 for meta-analyses, randomized controlled studies (RCTs), case series, guidelines, and case reports published between 2007 through 2013 that evaluated the treatment of tinea capitis in adults. Search terms used were “tinea capitis adult” and “tinea capitis treatment”. Five articles were retrieved; two meta-analyses and a practice guideline were selected for review. No studies were found in the adult population.

**Summary of Results:** A 2013 meta-analysis of three RCTs (N=272, age 1-16 years) compared the effectiveness of eight weeks of griseofulvin to four weeks of terbinafine. There was no statistically significant difference between the two interventions when analyzed overall for tinea capitis irrespective of causative organism (3 trials; N=272; OR 0.94; 95% CI 0.58–1.54;  $P=.81$ ). However, there was a significant difference when specific causative organisms were analyzed. Griseofulvin was superior to terbinafine (2 trials; N= 34; OR 6.39; 95% CI 1.09–37.47;  $P=.04$ ) for treating Microsporum, whereas griseofulvin was less effective than terbinafine (2 trials; N=160; OR 0.5; 95% CI 0.26–0.98;  $P=.04$ ) for treating Trichophyton.

A 2008 meta-analysis of 7 RCTs (n=438) was conducted to determine griseofulvin's efficacy rate for treatment of tinea capitis caused by Trichophyton and Microsporum. The mean efficacy of Griseofulvin at 4-6 weeks post treatment was 74% + 7% and cure rates were higher for Microsporum (2 studies; n= 42; 88% +5%) than for Trichophyton (5 studies; n=396; 67% + 9%). Higher doses of griseofulvin (>18 mg/kg/d) resulted in higher cure rates than lower doses (<12 mg/kg/d).

A 2007 consensus guideline recommends the administration of an oral agent in conjunction with a topical antifungal. Oral agents include: griseofulvin, terbinafine, itraconazole, and fluconazole. Adjunctive local treatment with a topical antifungal is recommended daily for one week, as well as the use of an antifungal shampoo twice a week.

**Conclusions:** Both griseofulvin and terbinafine are effective but griseofulvin is superior for treating the causative organism Microsporum, whereas terbinafine is superior for treating Trichophyton extrapolated from studies in the pediatric population. Griseofulvin, terbinafine, itraconazole, and fluconazole are effective in adults and should be used in conjunction with topical antifungal agents.

## NATURAL SCIENCES

**Banjade, Bharat**

**GEOCHEMISTRY OF ATOKA SANDSTONE AND MUDROCK FROM THE SOUTHERN OUACHITAS OF OKLAHOMA: IMPLICATION FOR PROVENANCE**

Atoka Formation consists of sandstone and mudstone deposited in the rapidly subsiding Carboniferous Ouachita trough, formed during the final stages of Rheic Ocean closure. Mudrock geochemistry,

identification and geochemical analysis of heavy minerals, and mineralogical study of mudrock and sandstone are key for the provenance analysis of the Atoka Formation to evaluate or limit the possible plate tectonic configuration between southern Laurentia and Gondwana during the closure of the Rheic Ocean.

From preliminary results, geochemistry of mudrocks from Boktukola syncline suggests both mafic and felsic igneous provenance. NASC normalized REE plots demonstrate 1.5 to 2.0 enrichment, and Eu anomaly is very slightly negative. Plots of REE vs Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> imply that LREE are associated with clays either by absorption or ultrafine heavy minerals. REE trends are consistent with both mafic and felsic sources. Environment of deposition is changing from oxic to dysoxic to suboxic toward younger strata indicated by transition element ratios [V/(V+Ni) vs Ni/Co, V/Cr vs Ni/Co, and Mo vs Ni/Co].

Decreasing pattern of CIA is observed towards younger strata. Cross-plot of CIA vs. ICV also indicates mixing of mafic and felsic sources. Plot of Zr/Sc vs Th/Sc shows stratigraphically the Zr/Sc is increasing more rapidly than Th/Sc, which indicates zircon enrichment towards the younger strata. Plot of Cr/V vs Y/Ni indicates possible ultramafic source. These results will be further evaluated using trace element analysis of zircon, rutile, magnetite, and garnet detrital grains.

Sandstone framework composition varies from subarkose to sublitharenite to quartz arenite, with altered framework grain restoration. Lithic grains found in sandstone include Metamorphic, volcanic, and lesser sedimentary rocks. Heavy mineral fraction includes zircon (variety of shapes, angularity and color including distinctive volcanic elongate bipyramidal grains) as dominant grain, with significant amounts of magnetite in some sandstones, and minor tourmaline, rutile, and garnet (ugrandite group).

**Bellovich, Ian and Mark A. Buchheim**

#### **DIVERSITY OF *HAEMATOCOCCUS PLUVIALIS*: MULTIGENIC LINES OF EVIDENCE**

Recent investigations of variation among different geographic isolates of the green alga, *Haematococcus pluvialis*, revealed considerable intraspecific diversity. As part of an ongoing effort to expand the database of geographic isolates for *H. pluvialis*, a new strain was identified and collected (spring 2013) from a “trap” located along the south wall of an atrium (Oliphant Hall) on the campus of the University of Tulsa. Light microscopy indicated that juvenile motile stages of this “South Atrium” isolate generally lacked demonstrable cytoplasmic bridges that traverse the periplasmic space between protoplast and cell wall. The latter is regarded as a key feature of the species. On the other hand, older motile cells could be seen with these cytoplasmic bridges. These cells were shown to produce the bright red akinetes (dormant stage) that are also typical of all other isolates of *H. pluvialis*. In order to test the idea that the South Atrium isolate could be distinctive, DNA was extracted from cultures for use in PCR reactions targeting the 18S rRNA, 26S rRNA, ITS2 and *rbcL* genes. Results from phylogenetic analyses of this multigenic dataset indicate that the South Atrium isolate is distinctive compared to other strains. Nonetheless, these same data clearly link the South Atrium isolate with all other isolates of *H. pluvialis*. These results confirm earlier assertions that intraspecific molecular variation is comparatively large (e.g., in contrast to intraspecific variation in *Chlamydomonas reinhardtii*) in *H. pluvialis*. Thus, these organisms have high potential to provide new insights into microbial dispersal.

**Castaneda, Maria, Michael Nguyen, Ashley Johnson, Matthew Vuong, Kun Miao, Erika Lopez, Alex Chong, Nisha Rajagopal**

#### **SYNTHESIS OF ENAMINONES UTILIZING COPPER CATALYSTS**

The synthesis of enaminones is of particular interest as enaminones are good synthetic intermediates that are widely used in the development of pharmaceuticals. The goal is to develop a more general and efficient method for their synthesis. The synthetic reaction of enaminones begins from diazo and thioamide reactants. Three different diazo compounds; a ketoester, diketone, and a diester have been chosen as well as specific thioamide compounds. The main thioamide compound is chosen based on the characteristics in its structure that could impact the formation of enaminones. In this case a cyclic thioamide with an electron donating group is chosen in order to observe the effects of an electron donating group, as well as ring strain in the final formation of an enaminone. The synthetic reaction of the enaminones is carried out utilizing copper catalysts. Copper catalysts have been chosen for their efficiency in the formation of copper carbenoids. The specific catalyst of interest in this case is Copper (I) thiophene carboxylate. In a general reaction the catalyst has been shown to work well at 90° C in less than 24 hours. Other catalysts have been screened within the research group. The future work of the project will focus on the synthesis of various enaminones from different thioamide starting materials that contain various structural characteristics. There are currently many limitations on enaminone formation; the goal is to develop a reaction that is more general and efficient from those reported in literature.

**Kasmani, Moujtaba and Marissa Schmauch**

### **INVESTIGATION OF RECOMBINANT PROTEIN SYNTHESIS UNDER OXIDATIVE CONDITIONS**

Recombinant gene expression is a major technique used in biochemistry to allow cells to produce proteins by introducing an inducer molecule to the media in which the cells are cultured. Currently, the most prevalent artificial inducer is isopropyl- $\beta$ -D-1-thiogalactopyranoside (IPTG). However, this molecule is oxidized and possibly rendered inert by reactive oxygen species (ROS) made in cells under oxidative stress conditions. This condition has been linked to diseases such as Alzheimer's, Parkinson's, and cancer. My project is focused on studying the oxidation of IPTG and developing a mimic of IPTG called isobutyl-C-galactoside (IBCG) that is resistant to oxidation. Furthermore, I wish to use this molecule to induce protein synthesis in bacterial cultures under stress to test its effectiveness.

In order to synthesize IBCG, I performed a series of reactions on galactose and then purified the products of those reactions. I first performed a protection reaction followed by an addition that resulted in an acetylated sugar bonded to a bromine atom at the anomeric position. In the key step, the Grignard reagent isobutylmagnesium bromide attached the eponymous carbon functional group to the ringed structure. Deprotection with sodium methoxide afforded the final product. Each major product in the reaction sequence was characterized by  $^1\text{H}$  and  $^{13}\text{C}$  NMR as well as by high-resolution electrospray ionization mass spectrometry. After purifying IBCG, I attempted to use it to induce gene expression under controlled oxidative conditions in *E. coli* and compare the amount of protein made using IBCG, IPTG, and the IPTG sulfoxide both in a normal cell state and under oxidative conditions. This was done by comparing the amount of green fluorescent protein (GFP) various cell cultures could make while they were influenced by the inducer molecules.

During the course of my research, I performed oxidation experiments involving IPTG to simulate oxidative stress. In these, IPTG was only ever oxidized once to a sulfoxide, never twice to a sulfone. This was the case even when the experiment was run at 37 °C for 24 hours with 5 molar equivalents of hydrogen peroxide. This suggests that IPTG is only oxidized once in living organisms and that the sulfone is not a factor in IPTG induction under stress. Furthermore, I was able to synthesize IBCG and introduce it into cells. I am currently running further *in vivo* trials using a strain of *E. coli* transformed with GFP to quantify the effectiveness of IPTG, the IPTG sulfoxide, and IBCG.

**Xin, Lai**

## **UPPER ALBIAN CHEMOSTRATIGRAPHY OF COMANCHE SHELF INTERIOR WASHITA GROUP, SOUTHWEST TEXAS**

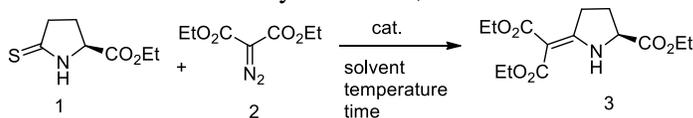
The objectives of this research are to 1) test for petrographic, geochemical evidence of OAE1c, OAE1d at the base and the top of Fort Lancaster Formation, 2) reconstruct the paleoenvironment of the interior shelf, and 3) identify the processes at the Albian/Cenomanian sequence boundary.

Two stratigraphic sections at Fort Lancaster and East Iraan were measured and 51 samples were collected for petrographic and isotopic geochemical analyses. By examining thin sections, the lithofacies at the lower part of East Iraan section and upper part of Fort Lancaster section are characterized by mudstone, wackestone with echinoids, mollusks, interpreting as low-energy open marine environment. By contrast, the stratigraphically higher samples are dominated by bivalve-echinoid wackestone-packstone, bioclastic peloid grainstone associated with shallow, normal marine with high energy. Mudstone, wackestone with sparsely distributed bioclast are common at the lower part of Fort Lancaster section. In addition, one endemic benthic foraminiferal biozone- *Paracoskinolina coogani* was recognized, which can be correlated with Devils River Limestone along the Pecos River and is time-equivalent with the middle Upper Albian. These data will also be used to define the shoaling-up cycles bounded by hiatal or iron-stained erosional surfaces. As to the isotopic analyses,  $\delta^{13}\text{C}_{\text{carb}}$  and  $\delta^{18}\text{O}_{\text{carb}}$  whole-rock data are indicators for the presence of OAEs. An obvious negative  $\delta^{13}\text{C}_{\text{carb}}$  shift in the uppermost part of the East Iraan section suggests the possibility of OAE1d. Also, cross-plots of  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  reflect the diagenetic change based on the stable isotope trends in response to the different diagenetic circumstances.

**Lopez Quiroz, Erika**

## **COPPER CATALYZED SYNTHESIS OF ENAMINONES**

Enaminones are compounds that contain the N-C=C-C=O functional group and are synthetic intermediates in organic synthesis. These compounds are also used in the development of pharmaceuticals. Although the biological activity of enaminones is not well-documented, enaminones have currently come under investigation because of their therapeutic potential. Recently, the research in our group has found a ruthenium catalyzed method for the synthesis of enaminones, but the yields are low and the conditions are harsh. This project uses a copper catalyzed method for the synthesis of enaminones. Copper(II) triflate was investigated by the first author for the coupling of a particular thioamide (**1**) and ethyldiazoacetate (**2**). Temperature, time and solvents were screened and the catalyst was found to give 100% conversion of the thioamide into the corresponding enaminone (**3**) at 90 °C in three different solvents. Eight other commercially available copper catalysts were screened in the group. The formation of different enaminones will also be described through the use of the most effective and economical copper catalyst. By using a copper catalyzed method, the reaction time for enaminones has not only decreased, but this method is also more general, mild, and economical.



#

**Rajagopal, Nisha**

## **SYNTHESIS OF ENAMINONES USING COPPER CATALYSTS**

Enaminones function in organic synthesis as synthetic intermediates and are utilized in the development of pharmaceuticals. These compounds have recently come under study due to their ameliorative

potential. Although several methods have been developed for the manufacture of enaminones, more efficient methods to manufacture these compounds are being sought after. The goal upon completion of the current project is to have found a mild method for synthesizing enaminones. The synthesis of three enaminones using a thioamide and diazo compound will be described.

Catalyst Screened:  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  in dichloromethane at  $50^\circ\text{C}$

Other copper catalysts are also screened within our group. The use of the most suitable catalyst for the formation of different enaminones will also be described.

**Rightler, Amanda**

### **INVESTIGATING THE TOXICITY OF NANOPARTICLE QUANTUM DOTS**

Due to the rapid expansion of nanoparticle applications in the fields of engineering, biomedical research, imaging diagnostics, and disease therapeutics, occupational exposure to nanoparticles has grown significantly. With this increase in contact, a need has developed to determine the toxicity of nanomaterials. Our research examines various aspects of the mode of action of toxicity of CdSe/ZnS quantum dots. On a cellular level, it has been suggested that the size, shape, and surface chemistry of quantum dots determine the extent of endocytosis and cytotoxicity. On a molecular level, it is probable that nanoparticles bind to proteins, lipids, and DNA causing inhibition of metabolic function. Quantum dots are also susceptible to oxidative breakdown within cells which can yield toxic byproducts. Initial cell viability assays were performed comparing quantum dot size, surface chemistry, and concentration with three different cell lines. The larger 650 nm amine quantum dots exhibited the highest toxicity and were used in further experiments. Western blot immunoassays tested for expression of heat shock protein, which indicates stress in the cell. Intracellular degradation of quantum dots was analyzed using inductively-coupled plasma mass spectrometry to detect levels of free ions in different cell parts. Fluorescence microscopy monitored intracellular localization of quantum dots and the mode of toxicity in a whole organism. The chemical and biochemical results from the cell assays indicated toxicity of the CdSe/ZnS quantum dots.

**Schmauch, Marissa, Moujtaba Y. Kasmani, Matthew C. Bardeaux, Justin M. Chalker**

### **INDUCER SYNTHESIS AND ASSAY**

Oxidative stress in cells occurs when the concentrations of reactive oxygen species in the cell are elevated. Since these reactive oxygen species can act as cellular messengers, cell signaling can be disrupted under oxidative stress. Disruption of cell signaling can, in turn, impact gene transcription. To study these processes, it is useful to be able to induce the biosynthesis of a desired protein or proteins. The most common inducer of gene transcription, isopropyl  $\beta$ -D-1-thiogalactopyranoside (IPTG), has a sulfur atom that reacts under oxidative conditions. To circumvent this issue, we have synthesized the C-glycoside mimic of IPTG, isobutyl-C-galactoside (IBCG). This study aimed to shorten the traditional synthesis of IBCG by skipping the final protection and deprotection steps to afford relatively pure product in two fewer steps. Another goal of this study was to assess the effectiveness of IPTG, IPTG oxidation products, and IBCG as inducers of protein production. Using BL21(DE3) *E. coli* that have been transformed with the wild-type GFP production gene, we assayed the effectiveness of each inducer through relative fluorescence due to GFP production. This assay will shed light on inducers that are suitable for protein biosynthesis under oxidative conditions which, in turn, facilitate the study of oxidative stress and associated disease states.

**Wang, Yulun**

**CHEMOSTRATIGRAPHY OF UPPER ALBIAN (LOWER CRETACEOUS) COMANCHE SHELF MARGIN**

This study targets the Lower Cretaceous Upper Albian Fort Lancaster and Devils River formations on the Comanche Shelf in south Texas. In order to conduct facies, biostratigraphic, and cyclostratigraphic research, two outcrop sections were measured and sampled in detail. In the nearly 70m-thick Pandale section, analysis of outcrop and thirty-five thin sections allows the definition of four lithofacies associations and twelve depositional cycles, revealing a depositional environment of slightly restricted inner-shelf. Particularly, in the nodular Burt Ranch Member at the base of this section, a micrite-rich wackestone interval distinctively shows positive  $\delta^{13}\text{C}$  excursion and relatively low taxa abundance. Bracketed by uppermost Middle Albian ammonite biozonation, this interval possibly corresponds to the depositional records of OAE 1c. In the nearly 28m-thick Pecos River Hwy 90 bridge section, based on outcrop and nineteen thin sections, five lithofacies associations and ten depositional cycles are defined, and the depositional environment is interpreted as high-energy shelf-margin. In addition to these high-frequency cycles, subaerial exposure surfaces in both sections suggest relative sea-level fall. By ranges of biostratigraphically significant benthic foraminifera and bivalves, these cycles are further correlated with the six third-order depositional cycles of the north Texas Trinity River Composite section within a mixed carbonate-siliciclastic intra-shelf basin setting, revealing different sea-level histories between different depositional settings upon the Comanche Shelf. Diagenetic elements of cementation and porosity data have revealed sequences of diagenetic events associated with early marine and meteoric (eogenetic), burial (mesogenetic), and later subaerial (telogenetic) diagenetic environments. Different cementation patterns and porosity distributions of the two outcrop sections further reflect their different depositional environments within the Comanche Shelf.