7th Annual
Capitol Graduate Research Summit

ABSTRACTS

Featuring Graduate Students' Research From:

Kansas State University
The University of Kansas
The University of Kansas Medical Center
Wichita State University

March 25, 2010
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Docking Building (Basement Auditorium)

http://webs.wichita.edu/cgrs/

Kansas State University

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KANSAS STATE UNIVERSITY

LONG-TERM SALT SCALING DURABILITY OF CONCRETE CONTAINING FLY ASH

*Brandon Bortz**
Department of Civil Engineering, College of Engineering, Kansas State University

Fly ash is a by-product of coal-fired power plants. This material can be used as a partial cement substitute in Portland cement concrete. The use of fly ash is environmentally beneficial by making use of an industrial by-product that would otherwise be landfilled and improving the concrete durability. However, research on fly ash concrete has shown that in some cases concrete with a high volume of fly ash can have deicer salt scaling. Salt scaling is the flaking of concrete surface resulting in lower skid resistance and service life. In this study, concrete mixes with six types of fly ashes were tested in the laboratory using the ASTM 672 Standard. Curing compound, a waxy coating sprayed on the fresh concrete surface to reduce evaporation, was used to compare the effects of curing on salt scaling of concrete containing high volumes of fly ash. The different variables that were measured were type of fly ash, curing conditions, and cementitious content included in the mix. The preliminary results show that curing compounds will improve the salt scaling resistance of concrete containing a fly ash that only marginally exhibits. However, the salt scaling performance of concrete that contains fly ash from a source that performs poorly in ASTM C 672 is not markedly improved by the use of a curing compound. Experiments are ongoing to help better understand the mechanism of fly ash concrete resistance to salt scaling.

Benefit: In 1996, the United States produced approximately 60 million tons of fly ash per year. This fly ash can be reused however only about 16 million tons were recycled. The rest of the fly ash is generally placed into landfills. Kansas has sixteen operating coal-fired power stations producing approximately 5,500 megawatts. Currently, KDOT limits the inclusion in concrete pavement of fly ash to 25%. If the inclusion of more fly ash can be proven to be as durable as Portland Cement Concrete, the market will open greatly for the use of fly ash and give the coal-fired power plants of Kansas a market to sell its by-product to.

FLAMELESS CATALYTIC INFRARED RADIATION FOR DISINFESTATION OF STORED WHEAT DOES NOT AFFECT WHEAT QUALITY

*Moses Khamis**
Department of Grain Science and Industry, College of Agriculture, Kansas State University

Insect pests associated with stored wheat are primarily managed by grain protectants and the fumigant phosphine. Organic producers and grain managers have limited options for managing insects in their stored wheat. A bench top model of flameless catalytic infrared emitter (www.catalyticdrying.com), a “green” technology, was effective in disinfesting life stages of three species of stored-wheat insects. Wheat quality was assessed by varying the amount of wheat exposed to infrared radiation (113.5 and 227.0 g), distance from the emitter (8.0 and 12.7 cm), and exposure time (45 and 60 sec). Temperatures attained by wheat during infrared exposure were monitored continuously using a non-contact infrared thermometer connected to a laptop via a RS232 cable. The quality tests included test weight, kernel hardness, moisture content, milling yield, proximate analysis, rheological properties of flour, and baking quality. Exposure to infrared radiation resulted in a 0.6 to 1.7% drop in moisture of wheat relative to untreated wheat (11.5%) resulting in a slight increase in kernel hardness. Certain physical, chemical and rheological properties were statistically different among treatments, but the values observed did not exceed the ranges recommended for good quality wheat and flour and therefore these minor differences were not of any practical relevance. These results suggest that infrared radiation can be used to disinfest wheat of stored-product insects without affecting wheat quality.

Benefit: In 2006, Kansas harvested 9.5 million metric tons of wheat from 9.5 million acres with an estimated value of about US $ 1.2 billion. Wheat in storage is susceptible to spoilage by insects. The research reported focuses on exploring infrared radiation as a tool for managing insects in stored wheat as a replacement to grain protectants and phosphine which are no longer available for use (e.g., chlorpyrifos-methyl) or partially effective due to the development of insect resistance (e.g. malathion, chlorpyrifos-methyl, and phosphine). This work aims to develop new and innovative integrated pest management (IPM) strategies and tactics that can be implemented by end-users to reduce pesticide inputs while maintaining wheat quality.

PASSIVE IMMUNITY TO A COMMERCIAL E. COLI-SRP® VACCINE IN BEEF CATTLE COLOSTRUM FROM COWS GRAZING NATIVE RANGE

*Ben Wileman**
Department of Diagnostic Medicine/Pathobiology, Kansas State University

E. coli O157:H7 is a contaminant of beef and associated with food-borne illnesses in humans. Initial colonization of this organism can occur shortly after birth in cattle. The objective of this study was to determine if E. coli O157:H7SRP® specific antibodies from vaccinated cows can be passively transferred to beef calves in native range conditions. Cows (n = 20) were randomly assigned to treatments: SRP vaccine or placebo control. Vaccines were administered 60 & 30 days prior to projected calving date. Samples were collected at the time of calving from cows (fecal, blood and colostrum) and calves (pre-suckle blood sample). Blood samples were obtained from calves at 6, 12, & 24 hours and at 7, 14 & 21 days post-partum. Serum total protein (STP) and E. coli O157:H7 SRP® antibody levels were measured. Dam vaccine history had no effect on the calf STP level ($P > 0.05$). However, length of time post-partum had a significant effect on the calf STP levels ($P < 0.001$). A vaccine treatment by time post-partum interaction was observed for the calf serum E. coli O157:H7 SRP® antibody levels ($P < 0.01$). The results from this study show successful E. coli O157:H7 SRP® antibody passive transfer in beef calves under natural conditions & indicates that early immunization against E. coli O157:H7 could play a role in preventing animals from shedding the organism at harvest. Further research is needed to study possible cross protection of this vaccine in other cattle diseases.

Benefit: Beef production is one of the leading economic engines in the state of Kansas with approximately 55% of the $9 billion dollars in agricultural commodities coming from cattle. Every year between 20-25% of the fed-beef in the U.S. comes from Kansas feedyards. With this comes the responsibility of ensuring Kansas producers are leaders in the production of a safe, nutritious beef product. This study is unique because it seeks to try and address the E. coli O157:H7 earlier in the production cycle when the calf first comes in contact with the organism. If proven successful, it could significantly lessen prevalence of this organism in cattle and thus create a beef product that is safer for consumers.

USING WATERSHED MANAGER TO COST-EFFECTIVELY TARGET CROPLAND BEST MANAGEMENT PRACTICES

*Craig Smith**
Department of Agricultural Economics, College of Agriculture, Kansas State University

With sedimentation threatening the current and future utility of many of our state's reservoirs, it is particularly critical, especially in tight budgetary times, that conservation investments be targeted to projects that yield the most environmental improvements per dollar spent. This can be a challenging task considering the multitude of political, economic, and environmental variables involved in the local decision-making process. To aid in the development of cost-effective watershed scale management plans, agricultural economists at Kansas State University developed a user-friendly tool, Watershed Manager. Watershed Manager is a spreadsheet program that can support local technical-assistance outreach to enhance the development of cost-effective watershed-scale management plans. Using this program, watershed stakeholder groups and technical assistance providers can estimate, optimize, and compare the economic and environmental effects of alternative watershed management plans. Watershed Manager is a flexible program that accommodates watershed-specific data. This poster will offer a description of how Watershed Manager was used to analyze the cost-effectiveness of various watershed management plans in a Kansas watershed. Utilizing Watershed Manager, each plan was evaluated in terms of the amount of sediment, phosphorus, and nitrogen load reduction from cropland fields in the watershed. The results were presented to the local stakeholders for their input. This iterative process occurred over several months and concluded with the approval of a preferred BMP implementation plan.

Benefit: With sedimentation threatening the current and future utility of many of our state's reservoirs, it is particularly critical, especially in tight budgetary times, that conservation investments be targeted to projects that yield the most environmental improvements per dollar spent. This can be a challenging task considering the multitude of political, economic, and environmental variables involved in the decision-making process. To aid in the development of cost-effective watershed management plans, agricultural economists at K-State developed a user-friendly tool, Watershed Manager. This poster will offer a description of how K-State Watershed Manager was used to analyze the cost-effectiveness of various watershed management scenarios in the Tuttle Creek Lake watershed.

ANATOMICAL AND PHYSIOLOGICAL TRAITS AS INDICATORS OF DROUGHT TOLERANCE IN TALLGRASS PRAIRIE PLANTS

*Sally Tucker**
Department of Biology, College of Arts and Science, Kansas State University

Konza Prairie contains over 550 vascular plant species, of which, few have been closely studied. Predicted impacts of climate change on the tallgrass prairie region increase the importance of understanding how native tallgrass prairie species are likely to respond to future changes in water availability and increased air temperatures. Understanding which traits are the best predictors of relative abundance along a continuum of water availability will aid in the prediction of plant community structure under altered temperature-precipitation regimes. In this research, both anatomical and physiological measurements were taken on nearly 120 species of herbaceous tallgrass prairie plants grown from seed in a growth chamber. Gas exchange measurements including photosynthetic rate and stomatal conductance were taken under optimal light, temperature, and humidity conditions. All plants were exposed to a dry-down period and were monitored until conductance fell to zero. At this point, water potential (Ψcrit) was measured and the plants were harvested to measure root length, diameter, and volume, leaf area, leaf tissue density, root tissue density, and root: shoot ratio. Traits were compared using pair-wise bivariate analyses and principal component analyses (PCA). Clear differences were detected in the PCA between grass and forb functional groups. The rotated factor pattern suggested a dichotomy between dry-adapted plants with thin, dense leaves and roots, highly negative Ψcrit, and large size and hydrophiles which have the opposite profile. Using long-term abundance datasets from Konza will help determine which of these traits confer success in the tallgrass prairie ecosystem.

Benefit: As one of the most threatened ecosystems in the world, Kansas's tracts of unplowed tallgrass prairie are vital cultural, historical, and ecological resources. This region faces the uncertainty of changing climate which will undoubtedly impact the tallgrass prairie in profound ways. My study strives to understand the response of native plants to dryer conditions in an attempt to predict how the prairie community may change as local climate shifts. The inclusion of nearly 120 species provides better coverage of the prairie community than most other studies by more accurately representing its biodiversity and range of species responses. This research will inform decisions in both ecological and agricultural management of the remaining tallgrass prairie.

DEPOSITIONAL ANALYSIS OF THE TONKAWA SANDSTONE, OKLAHOMA

*Amanda Cashman**
Department of Geology, College of Arts and Science, Kansas State University

Hydrocarbon production throughout the continental United States has declined in past decades. New interpretations along with advanced recovery techniques can increase production in older fields. Re-examining these underdeveloped resources is a simple and cost effective tool that can be readily used to increase hydrocarbon production throughout the mid-continent. Pennsylvanian sandstones throughout Oklahoma and Kansas are known for their excellent reservoir qualities. The focus of this study is the upper Pennsylvanian Tonkawa Formation, a sandstone dominated unit. The Tonkawa has been loosely correlated to both the Stalnaker and Tonganoxie sandstones in Kansas. Previous publications do not present a unified understanding of the depositional environments that are seen across state borders. The interpretations vary from fluvio-deltaic to marine environments. A cohesive interpretation is necessary to understand paleo-processes and efficiently explore for hydrocarbons. The study presents a regional analysis covering an eleven county area in northwest Oklahoma. Analysis of core and well log data is used to determine the depositional environment of the Tonkawa sandstone. Sedimentary structures, mineral assemblages, and lithologies of selected cores are described and correlated with well log data. With this data, structural isopach maps are constructed using Petra software. Earlier interpretations have relied primarily on well log data, focusing on core data rather than geophysical logs, allows for a more detailed and accurate interpretation. Analysis of transitional sedimentary sequences, such as the Tonkawa, can be applied to sandstones deposited in similar environments throughout the mid-continent.

Benefit: Hydrocarbon production throughout the continental United States has declined in past decades. New interpretations along with advanced recovery techniques can increase production in older fields. Re-examining these underdeveloped resources is a simple and cost effective tool that can be readily used to increase hydrocarbon production. Analysis of the transitional sedimentary sequence seen in Tonkawa sandstone, an older play, will provide a foundation for similar underdeveloped hydrocarbon fields in Kansas.

DEVELOPING SITE-SPECIFICMONITORING STRATEGIES FOR MANAGING CORN EARWORM (HELICOVERPA ZEA) IN SORGHUM

*Alysha Soper**
Department of Entomology, College of Agriculture, Kansas State University

Corn earworm (Helicoverpa zea: Noctuidae) is an annual, late-season sorghum pest in Kansas. Predicting abundant or damaging populations is difficult due to landscape complexity at regional (adult migration events) and local scales (host-plant shifts to crops like corn or soybean). The sampling threshold for insecticide application is 2-3 corn earworm larvae per sorghum head, or the equivalent of up to 25% yield loss. Decisions regarding treatment will directly affect total grain production, profits, and may unintentionally affect non-target organisms. Therefore, it is imperative that user-friendly and cost-effective sampling methods exist to minimize the chance of making incorrect management decisions. Current management recommendations and monitoring practices include weekly, whole-field samples from the flowering stage to maturity using traditional sampling patterns. The objectives of this research are to 1) define reduced sampling area (field borders vs. whole-field) that can accurately estimate larval infestations based on geospatial distributions, and 2) test the efficacy of pheromone traps in identifying temporal sampling strategies based on adult migration and host phenology. Preliminary field data show that surrounding crop type (corn or soybean) along with regional variation in pheromone trap catches impact spatial and temporal colonization patterns at the field-level. Future research will continue to focus on larval spatial distributions along with adult flight activity in order to develop refined sampling recommendations and to understand the implications for site-specific management of corn earworm in sorghum.

Benefit: Kansas is historically an agricultural state and follows only Texas and Montana in total agricultural acreage. It is a leading producer of sorghum, which is sold as grain and silage feed for livestock and is increasingly used in the production of biofuels. Corn earworm is a common pest of sorghum across the state and can reduce yields by as much as 25%. Refinement of current sampling patterns holds great promise for maximizing yield potentials and reducing costs associated with unnecessary insecticide application. Understanding the spatial and temporal colonization patterns and the influence of alternative host-crops on the distribution of corn earworm moths can help us develop user-friendly and cost-effective site-specific management strategies for sorghum growers.

SOLARCHEMICAL PRODUCTION OF AMMONIA USED FOR FERTILIZATION

*Ronald Michalsky**
Department of Chemical Engineering, College of Engineering, Kansas State University

Ammonia ranks among the five most manufactured products of the chemical industry. In the U.S., 80% of ammonia produced is consumed as fertilizer. The Haber Bosch process producing ammonia industrially consumes up to 5% of all natural gas produced and 2% of the global energy production. Currently, 525 to 750 kg of natural gas consumed to produce 1000 kg of ammonia causes significant fossil based CO2 emissions. The investigation of a solarchemical and essentially fossil fuel free process to produce ammonia is presented here. Addressing the costly construction of furnaces operating at above 1500°C, a reaction network proceeding at ambient pressure and at 500 to 1500°C was developed. To estimate optimum operating conditions, a solar furnace was constructed to concentrate solar radiation into a tubular reactor. Using water as hydrogen source, ammonia and chromium oxide were formed by corrosion of chromium nitride. Utilizing a simple balance and atomic surface composition spectroscopy techniques, 35% conversion of chromium, heated in a nitrogen flow, to chromium nitride was obtained after less than 6min. Closing the reaction cycle proposed, use of reducing gas mixtures, based on solar biomass gasification, and solar radiation yielded chromium from its oxide. In future research, the influence of ultraviolet radiation and the potential to avoid the need for a carbon source will be investigated. Solarchemical ammonia might be produced in scalable and technologically simple plants. By utilizing solar radiation fossil fuel dependency and related CO2 emissions are avoided while costs for energy requirements are reduced concurrently.

Benefit: Large areas of Kansas account for a major part of the grain production in the central U.S., producing substantial amounts of the grain and soybeans consumed globally. Relative to other states of the U.S., Kansas' natural gas production is high, but steadily declining. The development of technologies which make use of the regional climate to produce a regionally required chemical fertilizer at low energy costs would support the growth of Kansas' economy. Kansas supporting fossil-fuel

free technologies to produce ammonia thermochemically could be an outstanding example demonstrating the evolving energy and environmental policies in the U.S.

THE SIGNIFICANCE OF OUTDOOR ENVIRONMENTS FOR DUAL SENSORY IMPAIRED PERSONS

*Kala Ade**
Department of Architecture, College of Architecture, Kansas State University

Experiencing nature, whether it is through gardening or a nature walk, elicits a calming or centering experience (Marcus & Barnes, 1999; Ulrich, 1986). Such therapeutically beneficial human responses to nature are observed in the very young to the very old and by those with sensory impairments (Rodiek & Schwarz, 2003). Ulrich showed that nature could have beneficial effects on the physical, emotional and spiritual well-being of people and the importance of views of nature in the healing process (Ulrich, 1984, 1986, 1992). Hobday suggested that natural light can have positive effects in creating a healthy living environment (2006). Horticultural therapy in a garden setting has been shown to be therapeutically beneficial for persons with visual impairment (Perkins School for the Blind, 1998). This project argues that well-designed outdoor environments can have significant therapeutic effects on dual sensory impaired persons. Successful outcomes of outdoor environments that foster the development of skills such as sensory training and stress management (Mattson, 1992; Marcus & Barnes) are presented. Based on existing research on 'nature-as healer' (Ulrich, 1984, 1986; Kaplan et al., 1998) design issues of site planning, accessibility, orientation and way finding are discussed (Perkins School for the Blind, 1998; Imrie, 2006) and leads to the development of recommendations for the design of supportive outdoor environments, which are intended to positively impact the well being of this population group by providing access to the numerous health benefits that have been found to be associated with nature interaction while also contributing to the design profession.

Benefit: Experiencing nature, whether it is through gardening or a nature walk, elicits a calming or centering experience. Such therapeutically beneficial human responses to nature are observed in the very young to the very old and by those with sensory impairments. While the focus of this research project led to the development of recommendations for the design of supportive outdoor environments for dual sensory impaired persons, these design recommendations can positively impact the well being of any population group that experiences a reduction in any sense (including visual or hearing) or someone with a diminished mobility capacity.

INHIBITORY ACTIVITIES OF SPICES ON HETEROCYCLIC AMINE FORMATION IN GROUND BEEF PATTIES

*Kanithaporn Puangsombat**
Department of Food Science Institute, College of Agriculture¸ Kansas State University

Heterocyclic amines (HCAs) are carcinogenic compounds that are formed during cooking of muscle foods. It has been reported that the level of HCAs in meat products can be reduced by addition of compounds with an antioxidant potential. Therefore, the search for natural sources of antioxidant has been greatly intensified in recent years. The objective of this study was to investigate the influence of spices on the inhibition of HCA formation in cooked beef patties. Materials evaluated included rosemary, galangal, fingerroot, coriander seeds, cumin, and turmeric in dried powder form. The spices were added directly to ground beef at a level of 0.2%. Patties were fried at 400 Â°F (204 Â°C) for 5 min per side. All of the patties contained IQx, MeIQx, and PhIP while IQ and MeIQ were not detectable in any samples. The result showed that the total HCA levels were significantly reduced when adding rosemary (43.5%), turmeric (39.3%), and fingerroot (33.6%). The addition of cumin, coriander seeds and galangal had no effect on reduction of HCA levels in cooked beef patties. The inhibiting effect of spices on HCA formation significantly corresponded to their total phenolic contents ($r2 = 0.80$) and antioxidant activity based on a DPPH scavenging assay ($r2 = 0.84$). The results suggest that some spices such as rosemary, turmeric, and fingerroot have good potential as a source for natural antioxidants to prevent free radical mediated HCA formation in cooked beef patties, and could be easily used to provide safer meat products.

Benefit: Kansas is ranked second nationally in total cattle numbers and cattle on feed. The Kansas beef cattle industry has national and international responsibilities for providing safe, affordable, and wholesome food. Epidemiological studies showed that dietary intake of heterocyclic amines through consumption of cooked meat products increased the risk of cancers in humans. According to our research we found that apply spices containing natural antioxidants on meat products before cooking can easily inhibit the carcinogens in cooked meat products. We strongly believed that this research can help to provide safer meat products and decrease the risk of cancers.

THE UNIVERSITY OF KANSAS

INSAR FOR 3-D ICE SHEET BASAL IMAGING

*William Blake**
Department of Electrical Engineering and Computer Science, The University of Kansas

Understanding the Greenland and Antarctic ice sheets' response to global climate change is key to predicting future sea level rise. Yet according to the latest Intergovernmental Panel on Climate Change (IPCC) report in 2007 it is the largest unknown and could have the greatest impact, displacing hundreds of millions of people. One of the most important aspects to predicting the ice sheets response is to understand the topography at the base of the ice sheets. A technique called interferometric synthetic aperture radar (InSAR) can be used to provide fine resolution 3-D images of the bed of the ice. These data can then be used to refine models to predict the impact of climate change on the ice sheets. InSAR images created from data collected around the North Eemian (NEEM) drill site in Greenland, through more than 1.5 miles of ice, will be presented showing the proof of concept to use the InSAR technique for fine resolution 3-D basal ice sheet mapping.

MERIDIAN: THE DEVELOPMENT OF AN UNMANNED AIRCRAFT SYSTEM FOR CRYOSPHERIC RESEARCH

*William Donovan**
Department of Aerospace Engineering, The University of Kansas

The integration of unmanned aircraft systems (UAS) into remote sensing applications is at the forefront of climate change research. Unmanned aircraft offer the capability to increase the spatial and temporal resolution of data collection, while reducing the costs associated with such endeavors. The University of Kansas has, under the NSF funded Center for Remote Sensing of Ice Sheets (CReSIS), developed a new unmanned aircraft system specifically for remote sensing in Antarctica and Greenland. The goal of this effort is to develop a UAS capable of accommodating a variety of payload systems, while meeting the requirements of operating in extremely harsh environment. The Meridian UAS offers innovative design attributes that reduce the time and cost of integrating and testing new payloads thereby increasing the efficiency of data collection, while decreasing the environmental impact of the system. Recent flight test results show that the Meridian uses approximately 30 times less fuel per hour than the manned aircraft currently used for similar missions, while offering increased range and endurance.

HIGH-PRESSURE VISCOSITY OF BIODIESEL FROM SOYBEAN, CANOLA, AND COCONUT OIL

*Andrew Duncan**
Department of Chemical and Petroleum Engineering, The University of Kansas

Viscosity is a significant physical property in the design of injection systems for diesel engines. Injectors often reach pressures greater than 1000 atmospheres. Determining the differences in viscosity of diesel and biodiesel fuels at elevated pressures may aid in the development of more efficient and environmentally friendly engines. The viscosity of #2 diesel and biodiesel from feedstocks of soybean oil, canola oil, used canola oil, high-stability soybean oil, and coconut oil was found for temperatures of 25,40 and 100 C at pressures, which ranged from 0 to 19,000 psig. Using non-linear regression, the data was fit successfully to a Tait-Litovitz equation. The Tait-Litovitz equation allows for the prediction of a particular fuel's viscosity as a function of temperature and pressure. The correlation was able to predict the viscosity with less than 1.5% absolute average relative deviation.

ENHANCING FATIGUE LIFE OF STEEL BRIDGES THROUGH COMMON RETROFIT TECHNIQUES

*Heidi Hassel**
Department of Civil, Environmental and Architectural Engineering, The University of Kansas

Steel bridges built prior to the mid-1980s were often constructed with fatigue susceptible connection details, which have resulted in bridge girders with localized cracking or at high risk of developing cracks due to distortion-induced fatigue. Bridge engineers throughout the county are working to implement repair and retrofit techniques in order to extend the fatigue life of such bridges. This research included an investigation of four commonly used retrofit techniques that modify or eliminate the problematic connection detail between girders and lateral bracing elements. Retrofits techniques consisted of positive attachment, back-up transverse stiffeners, slotted connection stiffeners, and interior cross frame removal. Extensive finite element analysis of an entire bridge was utilized to numerically predict effectiveness. Results are presented showing relative success of each technique as well as other changes observed in retrofitted bridges. The appropriateness of retrofit techniques under various conditions is also described. The research is intended to further guide bridge engineers with retrofit selection and implementation.

DEVELOPMENT OF A NEW MEDICAL IMAGING AGENT

*Mary Krause**
Department of Chemistry, The University of Kansas

We recently discovered a metal-binding tripeptide (NCC) capable of performing an important chemical reaction and that may be used for medical imaging. When NCC binds nickel, it acts as a model for the enzyme nickel superoxide dismutase (Ni-SOD). Superoxide, a reactive oxygen species, causes damage to biomolecules and consequently, promotes diseases. Ni-SOD neutralizes superoxide into less harmful compounds, but the exact details of how the enzyme works are unknown. Small model systems are useful for understanding the chemical reactions performed by enzymes. Ni-NCC serves as a Ni-SOD model to investigate this reaction and harness it for other purposes. Additionally, NCC coordinates other metals, and the resulting complexes have potential medical applications. Metal complexes are used to enhance contrast in magnetic resonance imaging (MRI), but existing compounds involve gadolinium, which causes severe side effects in many patients. NCC binds metals that provide MRI contrast but the complexes are far less harmful because these metals are normally found in the body. Metal-bound NCC is advantageous because it can easily be attached to a protein that specifically delivers the metal to an area of interest (tissue, tumor) rather than non-selectively flooding the entire body. Our initial studies determined the structure and stability of metal-NCC and are enabling development of a novel contrast agent to be used in the diagnosis, treatment, and evaluation of cancers and other diseases.

SOCIAL ORGANIZATIONS & AGING: THE BENEFITS OF VFW MEMBERSHIP

*Skye Leedahl**
Gerontology Center, The University of Kansas

The social capital that flows from connections among individuals benefits both communities and people. Civic engagement in social organizations is a way to gain social capital. However, in recent years, there has been a decline of active memberships in traditional organizations. The goal of this research was to understand peoples' active participation in social organizations, particularly as they get older. Using semi-structured, in-depth interviews, twenty active participants of a Veterans of Foreign War Post and its Women's Auxiliary (age range = 50-89) answered questions about their membership. Using standard procedures for the analysis of qualitative data, several themes emerged. The results show that members benefit in numerous areas. People's health and well-being is increased through added self-esteem, less loneliness, and assistance with mental disorders. Through intergenerational relations, people develop role models to guide them through the aging process. By being in a safe and secure environment, members develop a sense of camaraderie and purpose. Finally, the organization provides members a source of social engagement, which enables them to stay active in their communities. Communities should be focused on utilizing available resources, such as membership organizations, to increase civic engagement and the health of America's older population.

BIOENGINEERING TOOLKITS FOR 4TH AND 5TH GRADE TEACHERS

*Erin Lewis **
Department of Mechanical Engineering, The University of Kansas

"BET 4 Teachers" is an NSF Research Experience for Teachers (RET) program that is a collaborative effort between the University of Kansas Bioengineering (BioE) program and the Southeast Kansas Education Service Center- Greenbush, a K-12 science education resource. The program pairs 4th/5th grade science teachers with KU faculty and students to work on existing BioE research projects and translate the BioE concepts into interactive toolkits, while still meeting state education standards. The hypothesis of this study is that this exposure to BioE at the 4th/5th grade levels will positively impact students' perception of engineering before they have had time to adopt the negative stereotypic descriptions of scientists and engineers. We believe that this influence at the critical age will make students more likely to pursue careers in engineering or science. Six 4th/5th grade science teachers from a range of socioeconomic level schools worked with six faculty and students on existing research projects. Teachers participated in educational development at Greenbush to refine their toolkits and field-test lesson plans with select students prior to classroom implementation. Surveys were given to teachers and graduate students to gauge increase in knowledge and comfort with research and education. RET teachers are implementing the toolkit lessons in their school classrooms this year.

WNT SIGNALING PATHWAY AND THE APC/MSI DOUBLE-NEGATIVE FEEDBACK LOOP

*Erick Spears**
Department of Molecular Biosciences, The University of Kansas

Colorectal cancer is the second leading cause of cancer related deaths in the United States. Approximately 80% of all colon cancers are associated with a mutation in the adenomatous polyposis coli (APC) tumor suppressor gene. We study the intracellular functions of normal APC and how loss of APC leads to the formation of precancerous polyps in the intestines of mice and humans. We have identified a double-negative feedback loop between APC and a sequence specific RNA binding protein involved in stem cell maintenance, Mushashi-1 (MSI). We hypothesize that this feedback loop serves to maintain a critical balance of these proteins during symmetric stem cell division. To determine the mechanism by which APC regulates MSI, we first explored the canonical Wnt signaling pathway. Overexpression of transcriptionally active, stabilized beta-catenin in HCT116wt/- colon cancer cells leads to an increase in the level of MSI protein. However, MSI does not appear to be a direct transcriptional target for beta-catenin, the central transcriptional activator in the canonical Wnt signaling pathway. Unexpectedly, APC protein levels also increase in response to stable beta-catenin overexpression. We propose that deregulation of the double-negative feedback system by loss of APC may play a central role in the development of colorectal cancer.

THE UNIVERSITY OF KANSAS MEDICAL CENTER

EFFECT OF VOLUNTARY EXERCISE ON MECHANICAL ALLODYNIA AND GLIAL CELL LINE-DERIVED NEUROTROPHIC FACTOR EXPRESSION IN DIABETIC MICE

Kevin L. Farmer[1], Irina V. Smirnova[1], Janelle M. Ryals[2], and Doug E. Wright[2]*
[1]Department of Physical Therapy and Rehabilitation Science, [2]Department of Anatomy and Cell Biology,
The University of Kansas Medical Center

Diabetic neuropathy (DN) is the most common type of neuropathy and growth factor deficiency (e.g. glial cell line-derived neurotrophic factor [GDNF]) has been proposed as an important mechanism underlying DN. Aerobic exercise is beneficial for diabetics with neuropathy, perhaps by increasing neurotrophin production. However, many persons with diabetes fail to participate in physical activity due to complications associated with their neuropathy. The purpose of this study is to determine if diabetes affects GDNF production and whether voluntary exercise can attenuate increased pain sensitivity (mechanical allodynia) associated with DN. Twenty-one A/J mice were randomized into an exercise hyperglycemic (EX-H [n=7]), nonexercise hyperglycemic (SED-H [n=7]) and a non-exercise non-diabetic control (SED-C [n=7]) group. EX-H and SED-H received streptozotocin (STZ)-injections to induce diabetes. The exercised mice were housed in standard cages with access to voluntary running wheels. To quantify DN, mechanical allodynia was assessed via von Frey monofilaments prior to STZ-injections and weekly for 6 weeks. GDNF protein expression in the lumbar spinal cord was assessed using immunoblot analysis. Diabetic mice ran predominately between 6-12pm and averaged 3 Km/day throughout the 6-week study. After 6 weeks of diabetes, SED-H displayed a significantly higher mechanical allodynia compared to SED-C (1.6g vs. 2.8g, respectively), suggesting this strain develops a painful neuropathy. Our results also demonstrated that 6 weeks of voluntary exercisesignificantly attenuated mechanical allodynia in Ex- H mice compared to Sed-H mice (2.8g vs 1.6g, respectively). With regard to GDNF expression, SED-H mice displayed a significant decrease in GDNF expression compared to SED-C mice. However, 6 weeks of exercise increased GDNF protein expression in the EX-H group compared to their sedentary counterparts. These results suggest that voluntary exercise can decrease mechanical allodynia and this reduction may be due to an increase in GDNF, a known antinociceptive neurotrophin. Thus this study supports the use of voluntary exercise to complement current treatment strategies aimed at decreasing DN. [Supported by NIH P20 RR016475, NIH R01NS43314 and JDRF]

EFFECTS OF A HIGH FAT DIET ON INSULIN RESISTANCE AND NIGROSTRIATAL DOPAMINE DEPLETION FOLLOWING 6-OHDA

Jill K. Morris, Greg L. Bomhoff, Paige C. Geiger, and John A. Stanford*
Department of Molecular and Integrative Physiology, The University of Kansas Medical Center

Type 2 Diabetes (T2D) is characterized by insulin resistance and is often brought on by consumption of a diet high in fat. Several clinical studies have suggested a link between T2D and development of neurodegenerative diseases such as Parkinson's Disease (PD). PD pathology is also correlated with exposure to environmental toxins, such as pesticides. This likely occurs through an oxidative mechanism, as neurons of the substantia nigra, which degenerate in PD, are highly vulnerable to oxidative stress. We hypothesized that T2D, which increases systemic oxidative stress, may increase the susceptibility of the substantia nigra to toxin exposure. Using 6-hydroxydopamine (6-OHDA), a toxin commonly used to model PD in rodents, we investigated whether a high fat diet (60% calories from fat) and the resulting insulin resistance would exacerbate toxin mediated dopamine depletion compared to a chow diet (10% calories from fat). Although diabetes and PD do not invariably coincide, we hypothesized that toxin exposure and peripheral insulin resistance represent "multiple hits" that affect the symptomatic threshold for PD by making dopaminergic neurons more susceptible to 6-OHDA. We found that, on average, high fat feeding nearly doubled the amount of dopamine depletion in the substantia nigra compared normal chow feeding (61% depletion vs. 32% depletion, respectively; $p<0.05$) after the same dose of 6-OHDA. No significant difference in depletion was observed in the striatum or hypothalamus. This study supports previous findings that suggest a high fat diet may exacerbate toxin induced dopamine depletion, and extends these findings to a new model.

VITAMIN D DEFICIENCY INCREASES GROWTH OF PAIN-SENSING NERVES

Sarah E Tague and Peter G Smith*
Department of Molecular and Integrative Physiology, The University of Kansas Medical Center

Vitamin D deficiency is prevalent and has been linked to chronic musculoskeletal pain. However, it is not known whether vitamin D directly affects pain pathways of the nervous system. We set out to determine whether vitamin D acts on peripheral sensory neurons. We found that pain and temperature-sensing neurons contain vitamin D receptors (VDRs), and therefore have the machinery needed to respond to vitamin D. We further confirmed that muscle pain-sensing nerves in particular have VDRs. In culture, VDR localizes to the distal tip of nerve axons, called the growth cone, suggesting it may play a role in axon sprouting. When the biologically active form of vitamin D, 1,25-dihydroxyvitamin D3, was added to sensory neuron cultures, axon outgrowth from pain fibers was significantly increased at low concentrations that correspond to serum levels in vitamin D deficiency. This data led us to question whether vitamin D deficiency results in an increase in the density of muscle sensory fibers, as sensory nerve proliferation is known to occur in other painful conditions. Rats fed a vitamin D deficient diet have a 2.5 fold increase in the amount of muscle sensory nerve fiber protein, peripherin, suggesting that vitamin D deficiency leads to increased muscle sensory innervation. This study indicates that a deficiency in vitamin D causes an increase in the density of pain-sensing fibers within muscle, potentially leading to an increase in pain perception. Chronic musculoskeletal pain currently overloads our healthcare system and is a primary contributor to long-term disability. Appropriate vitamin D supplementation could be a safe, inexpensive, and effective preventative treatment for some types of chronic musculoskeletal pain. In addition, the vitamin D system is a potential target for the development of new pain treatment strategies.

SLEEP CHARACTERISTICS IN BREASTFEEDING AND FORMULA FEEDING MOTHERS

Libby Averill Rosen and Karen Wambach*
School of Nursing, The University of Kansas Medical Center

Background: New mothers are faced with biopsychosocial changes including sleep. Biologically, we need sleep to feel rested, to be alert and to function effectively. The birth itself often interrupts sleep, and the demand of an infant who needs frequent feedings exacerbates this change in early maternal sleep patterns. Sleep loss is a common concern expressed by new mothers and may contribute to early weaning from the breast in hopes of obtaining more sleep. This study's purpose was to investigate the difference between sleep architecture, descriptions and self-perception of sleep in breastfeeding and formula-feeding mothers, 4-6 weeks post-partum (N = 44).

Study Design: A convenience sample of first time mothers, 22 breastfeeding and 22 formula feeding participated in this descriptive replication study. Descriptive statistics were used for the subjective measures of sleep, including the St. Mary's Hospital Sleep Questionnaire (4 nights) as well as background sleep patterns, factors influencing sleep and demographic information. Objective measurement tools included 3 nights of wrist actigraphy and one night of home polysomnography. These measures were analyzed with MANCOVA comparing the sleep architecture characteristics of light sleep, deep sleep, and REM sleep while controlling for age, education and nicotine use. Total sleep time was compared by t-test.

Results: MANCOVA revealed no statistically significant differences between the two groups of new mothers on sleep architecture characteristics of light sleep, deep sleep and REM sleep. The two feeding groups were not significantly different in total sleep time measured by home polysomnography. Both groups averaged 2-3 sleep interruptions per night, primarily related to baby feeding. Total sleep time ranged from 4 hours 6 minutes to 9 hours and 11 minutes. No differences were noted across the nights on perception of sleep, which was important to confirm the assumption that the wrist actigraphy, home polysomnography and sleep questionnaire would not unduly burden the new mother. No differences were found on the subjective measures of sleep depth, quality, satisfaction and drowsiness upon awakening. The variance in sleep characteristics was greater within the formula-feeding mothers. There was a mean of 6.6 hours of sleep in both groups with overall sleep satisfaction. In contrast to the study being replicated, sleep architecture was not significantly different between groups. Wrist actigraphy data reflected more sleep than either polysomnography or self-report.

Conclusions: Method of infant feeding did not impact total sleep time, sleep characteristics, or sleep interruptions in this sample of new mothers. There was a wide range of sleep patterns between women and greater variation in the formula feeding group and more less variance among the breastfeeding mothers. The means of all sleep patterns were not significantly different between groups. Overall the mothers were fairly to very satisfied with their sleep.

LCPUFA INTAKE AND ITS RELATIONSHIP TO FATTY ACIDS IN BREAST, RED BLOOD CELLS AND SERUM LCPUFA IN WOMEN AT HIGH RISK FOR BREAST CANCER

Katherine Harvey, Shengqi Li, Debra Sullivan, Susan Carlson, Jennifer R Klemp, and Carol J Fabian*
The University of Kansas Medical Center

Introduction:
A higher ratio of omega-6 (n-6) to omega-3 (n-3) long chain polyunsaturated fatty acids (LCPUFA) in breast tissue triacylglycerol (TAG) has been correlated with increased risk of developing breast cancer. Before dietary recommendations can be made regarding n-3 PUFAs in relation to breast cancer risk reduction, a noninvasive biomarker must be identified so that further research can be done in larger populations.

Methods:
This pilot study compared LCPUFA intake to breast tissue, RBCs and plasma LCPUFAs in women at high risk for breast cancer. Breast tissue LCPUFA was also compared to that of RBC and plasma PUFA. The intent was to determine if, at usual intakes of n-3 PUFA, the RBC and plasma lipid LCPUFA are related to LCPUFA in breast tissue lipids.

Women were screened (n=260) at the University of Kansas Medical Center Breast Cancer Prevention Center high-risk breast clinic. Eighty-six were eligible and of these 50 (58%) completed and returned the diet history questionnaire (DHQ) (58% response rate).

Results:
The mean age of the subjects was 47 ± 9.9 years, and the mean BMI was 25 ± 4.4. The mean 5-year Gail risk was 2.7 ± 2.2%. Twenty-two (48%) of the subjects were premenopausal and 24 (52%) were postmenopausal. Fifteen (33%) were taking an n-3 PUFA supplement (fish oil or flaxseed). Mean intakes were 9.94 ± 4.9 g n-6/d and 1.26 ± 0.6 g n-3/d, with an n-6:n-3 ratio of approximately 9:1. Total phospholipid (PL) n-6 in RBC and plasma was 27.74 ± 3.44% and 33.92 ± 3.72%, respectively. Total PL n-3 in RBC and plasma was 5.59 ± 1.7% and 4.06 ± 1.19%, respectively. RBC PL n-3 was highly correlated with n-3 intake (r=0.42).

Conclusions:
Women at the University of Kansas Medical Center Breast Cancer Prevention Center consume an n-6:n-3 LCPUFA ratio typical of the US population. RBC PL n-3s were significantly correlated to n-3 adding to the validity of both intake and biomarker. Additional analyses will address whether breast tissue TAG n-3 or n-6:n-3 ratio reflects a blood biomarker of n-3 or n-3:n-6 ratio.

WICHITA STATE UNIVERSITY

COMPARATIVE BINDING STUDIES WITH A TETRAUREA PICKET PORPHYRIN RECEPTOR USING ^{1}H NMR AND ISOTHERMAL TITRATION CALORIMETRY.

Hong Wai Aw and Dennis H. Burns*
Department of Chemistry, Wichita State University

The determination of anion binding constants using ^{1}H NMR and Isothermal Titration Calorimetric (ITC) reveals the occurrence of several specific and unspecific binding steps. In general, ITC reports on all specific and unspecific binding processes of the whole system, whereas a typical NMR probe details the thermodynamic properties associated with the binding of the anion to the receptor. For example, the (α, α, α, α)-5,10,15,20-tetrakis (2-(4-fluorophenylurea)phenyl) porphyrin binds strongly ($K(M^{-1})>10^4$) to chloride anion, and close to 2-3 orders of magnitude less to acetate anion, in DMSO-d_6 as revealed by ^{1}H NMR titration studies. However, acetate anion showed stronger binding than chloride anion when ITC analyses were done. Thus, the binding studies' results vary with the use of instrumental method. Other significant differences observed in the behavior of anion binding with the porphyrin receptor when using the two probes will also be addressed in this report.

ANALYSIS OF DIFFERENTIAL GLYCOSYLATION PATTERNS OF HUMAN FSH

Carrie Chambers, Bin Shuai, and George Bousfield*
Department of Biological Sciences, Wichita State University

Follicle stimulating hormone (FSH) is a glycoprotein hormone with two subunits, ✔ and ✔, and is required for gamete development. In a process known as glycosylation, oligosaccharide branches are added to specific residues in the protein sequence, and occurs with FSH. Our data suggest that estrogen is responsible for inhibiting the glycosylation of FSHβ in reproductive-age women, thus producing a di-glycosylated FSH with higher biological activity than the tetra-glycosylated form. The difference in glycosylation of two subunits is suspected to be due to activity of different oligosaccharyltransferase (OST) isoforms. OSTs are responsible for the preliminary step in glycosylation. Factors including signal peptide hydrophobicity of α and β maybe contribute to selective usage of OST, and hence modulate glycosylation. Therefore our hypothesis is that glycosylation of FSH subunits is regulated by the differential interactions between OST isoforms and the signal peptides of each subunit, and the differential interaction is modulated by hormones such as estrogen. To test our hypothesis, we will genetically engineer chimeric hFSH subunits by swapping the signal peptide sequences of α and β. Constructs with the chimeric sequences will be introduced into immortalized gonadotrope cell lines. FSH glycoforms expressed in the cell lines will be examined using Western Blot, RIA, and immunoaffinity chromatography. If our hypothesis is correct, then we would expect to detect unglycosylated α subunit in the transfected cell lines. The cell lines will be treated with estrogen and differences in FSH subunit glycosylation will be examined.

SPREADING PATHOGENS VIA HEALTHCARE UNIFORMS

JoAnna Curl, Lindsay Garrett and Sue Nyberg*
Department of Physician Assistant, Wichita State University

It is relatively common to see healthcare employees in their uniforms (lab coats, scrubs, etc.) outside of the workplace in areas such as restaurants and grocery stores. Research has shown that microorganisms can be transmitted to employees' clothing when caring for patients, resulting in concern that pathogens on the uniforms may then be spread to other individuals. The purpose of this study was to investigate the practices and perceptions of physician assistant (PA) students and practicing PAs in Kansas regarding the manner of wearing medical uniforms outside the clinical setting. Methods: A survey was developed and distributed via email to PA students enrolled in the PA program at Wichita State as well as PA members of the Kansas Academy of Physician Assistants. Results: A total of 164 PA students and practicing PAs completed the survey. A majority of respondents (82%) admitted to wearing work attire in public after seeing a patient, and 74% of respondents said that their workplace did not have guidelines regarding uniforms worn outside the workplace. A majority (88%) agree that there is a potential risk of spreading pathogens from their clothing to healthy individuals. A majority (78%) also believe that education should be offered to healthcare employees regarding this topic. Conclusion: A majority of student and practicing PAs wear their uniforms outside the clinical setting. Professional organizations should consider the

development of educational programs to increase awareness of the possibility of disease transmission from clothing worn in the clinical setting.

A FUZZY MULTI-OBJECTIVE MODEL FOR A GREEN GENERATION EXPANSION PROBLEM

*Farnaz Ghazi Nezami *, Jose L. Ceciliano Meza, Mehmet B. Yildirim, and Abu. S.M. Masud*
Industrial and Manufacturing Engineering, Wichita State University

In this paper a comprehensive fuzzy multi-objective model is presented for generation expansion planning problem considering uncertainty in objective functions and demand constraints. The purpose of the model is determining the optimal generation amount in existing and new generation units along with calculating the transmission energy volume and required amount of imported fuel regarding emissions and environmental impacts. As the proposed model considers four fuzzy minimization objective functions, a fuzzy linear programming approach will be applied to solve the proposed model by transforming the fuzzy multi-objective model to a crisp single objective one. A case study is presented and sensitivity analysis is done on the model to illustrate the ability of the model to interpret real world problems.

SYNTHESIS OF HIGHLY ORDERED TITANIUM DIOXIDE NANOTUBES: IMPACT OF PROCESS PARAMETERS

Shifath Ikram Khan and Ramazan Asmatulu*
Mechanical Engineering, Wichita State University

Highly ordered arrays of Titanium dioxide nanotubes were synthesized from Titanium foil using the electrochemical anodization process in an etching solution consisting of Ammonium Flouride (NH_4F) and Ethylene Glycol. TiO_2 nanotubes have shown great potential in applications such as the new generation solar cells called the Dye Sensitized Solar Cells (DSSC). We examined the possibility of fabricating nanotubes of different lengths by varying the anodization parameters. The lengths and diameters of the synthesized TiO_2 were found to be governed by two main process parameters, current density and etching solution composition. The etching process was carried out in two different configurations. First, 55volts DC was used to drive the etching process. The anodic current in this case was found to be between 0.07 to 0.01 amperes. Secondly, 55 volts DC with 5 volts AC was employed to carry out the etching process. The average anodic current was found to be higher in the second case. The recorded anodic current was between 0.1 to 0.01 amperes. The characterization of the synthesized TiO_2 was carried out using the Atomic Force Microscope (AFM).

HARVESTING SOLAR ENERGY VIA ARTIFICIAL PHOTOSYNTHESIS

Eranda Maligaspe and Francis D'Souza*
Department of Chemistry, Wichita State University

Photosynthesis, the process of converting light energy into chemical energy, involves two major steps, absorption and transportation of light energy of appropriate wavelength by the antenna light harvesting molecules to the reaction center, and photoinduced electron transfer (PET) to generate charge separated entities by using the electronic excitation energy. Mimicking these functions using relatively simple synthetic molecules is of paramount importance since they can be directly used to build devices to convert light energy into electricity, like in photovoltaic devices and organic solar cells.

In the present study, we report electronic energy transfer (EET) in newly synthesized, covalently linked boron dipyrrin (BODIPY) and zinc porphyrin dyads in which the number of boron dipyrrin units is increased from 1 to 4. Both steady-state and time-resolved emission as well as transient absorption studies revealed occurrence of efficient singlet-singlet energy transfer from BDP to zinc porphyrin with the time scale of 28-48 ps. A decrease in time constants for energy transfer with increasing the number of BDP units is observed revealing better antenna effect of dyads bearing higher number of boron dipyrrin entities. Further, supramolecular triads to mimic the 'antenna-reaction center' functionality of photosynthetic reaction center have been successfully developed by coordinating fulleropyrrolidine appended with an imidazole ligand to the zinc porphyrin. The presentation will focus on the synthesis, characterization, and donor-acceptor assembly formation, and photochemical studies revealing occurrence of electronic energy transfer and electron transfer. Finally, organic photocells to harvest light energy into electricity will also be presented.

THE IMPLICATIONS OF GENDERING CHILDHOOD OBESITY PSAS

Pamela K. O'Neal and Deborah Ballard-Reisch
Elliott School of Communication, Wichita State University

The percentage of overweight and obese children is at or above 30% in 30 U.S. states [1], including Kansas which ranks 22nd with 31% of its children rated as overweight or obese [1]. Nationally, 15.1 % of girls vs. 16.4% of boys are overweight [1]. Due to the recent rise in the number of overweight and obese children, organizations throughout the U.S. have allocated millions of dollars for prevention efforts with the intention of lowering rates [2]. Most recently, Michelle Obama has introduced "Let's Move", a campaign whose goal is to eliminate childhood obesity in a generation [3]. One of the strategies organizations and campaigns like "Let's Move", employ is Public Service Announcements (PSAs). In marketing, gender is one of the leading variables often employed to tailor messages to audiences [4]. Because campaigns typically utilize PSAs and because they are often tailored to females or males specifically, it becomes crucial to examine the messages PSAs disseminate to their audiences. The Constant Comparative Method [5] was used to compare and contrast through content analysis, a criterion based sample of 20 childhood obesity PSAs found on YouTube and the 10 PSAs found on the "Let's Move" website. Analyses indicate that PSAs on YouTube, are gender biased, using twice as many male voiceovers as female voiceovers. 2) Males are more likely to be featured in PSAs than females. The PSAs on the "Let's Move" website are even worse. It is critical to effective strategies for managing childhood obesity that PSA messages be either gender targeted or gender neutral.

A FULLY BAYESIAN APPROACH FOR SAMPLE SIZE DETERMINATION

*Nasser Safaie**
Department of Industrial and Manufacturing Engineering, Wichita State University

Abstract. The sample size determination has a significant role in the design and analysis of many engineering problems and data sampling projects. There are a number of sampling techniques that can be utilized to quantify the impact of engineering efforts and verify their effect on performance of a process. These include both traditional as well as Bayesian techniques and only some of them consider the economical aspect. The objective of this paper is to offer an economic Bayesian approach for determination of sample size. Utilizing the sequential sampling, this method shows whether the changes were successful to affect on process performance or not. Illustrative example depicts that the economic Bayesian approach calculates a smaller sample size compared to traditional methods

BIOMIMETIC SOLAR CELLS

Navaneetha K. Subbaiyan and Francis D'Souza*
Department of Chemistry, Wichita State University

Eco friendly energy resources are becoming important due to the predicted oil depletion and soared CO_2 emission. Of available alternatives, solar energy finds special attention due to its vast availability and high power density of 1000 watts per square meter. Various mechanisms have been carefully employed to harvest the solar power including semiconductor silicon based photovoltaic, inorganic/organic dye sensitized or bulk heterojunction solar devices. Some of the latter devices utilize donor-acceptor supramolecular systems designed based on natural photosynthesis. Here, self-assembly of energy donor and acceptor is proved to be an important criterion.

In the present study, we demonstrate an elegant method of self-assembly to modify TiO_2 surface using coordinating ligands followed by immobilization of a variety of photosensitizers and dyads. This method, in addition of testing the photoelectrochemical behavior of simple zinc tetrapyrroles also allows us to introduce fairly complex structures involving more than one donor and/or acceptor entities. As will be demonstrated, of all macrocycles studied, a biomimetic zinc porphyrin-ferrocene dyad markedly improves the current-voltage performance of the photoelectrochemical cell due to an electron transfer-hole migration mechanism. Incident photon-to-current efficiency value up to 37%, highest value reported for this type of devices is obtained for the electrode modified with the dyad, highlighting the importance of photocells built based on biomimetic principles for efficient harvesting of solar energy.

ECOLOGICAL PERSPECTIVES OF LATINO/HISPANIC FAMILIES IN A RURAL SCHOOL COMMUNITY

Natalie Grant, Larry Callis, Doug Siemens, Lance Stout and Jo Bennett*
Department of Educational Leadership, Wichita State University

Immigration waves from Mexico, Central and Latin America have changed demographic landscapes and in some communities, native Spanish speaking people are the majority. In schools across the U.S., growing numbers of students need English language resources and cultural supports from their schools to break the cycles associate with being the least educated ethnic group in the country. This changing ecology creates the need for understanding Hispanic/Latino populations. This study seeks to understand the worlds that the Hispanic/Latino families negotiate as they move through the interconnected ecologies of their existence: family systems, cultural norms, communities, church and school. Through qualitative methodology, researchers gathered oral narratives and cultural data from families in a rural Midwestern community to understand how Latino/Hispanic parents support their children in schools and define their relationship to their children's education.

Index of presenters

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7th Annual CGRS Organizers

Kara Dillard	kdillard@ksd.edu
Megan Miller	mmmiller@ksu.edu
Daryl Lynn Dance	dldance@ku.edu
Bruce Blair	blair013@ku.edu
Kelly Dugan	Kelly.p.dugan@gmail.com
Amber Messmer	amessmer@kumc.edu
Lisa Lutz	lllutz@wichita.edu
Carol Marie Ellis	cmellis@wichita.edu
Naveen Anne	nxanne@wichita.edu