College of Sciences and Health Professions
ABSTRACTS
Research Day 2011

001 SELECTING POLYMERS FOR RESPIRATORY-RELATED MEDICAL DEVICES FOR LONG-DURATION SPACE MISSIONS

Matthew J. Ourednik, A.A.S., R.R.T.[1]; Alan T. Riga, Ph.D.[2]; M. Ellen Matthews, M.A.[3]
[1]School of Health Sciences, Cleveland State University;
[2]Department of Chemistry, Cleveland State University;
[3]Buckeye Diagnostics

Medical devices used in respiratory care are formed from a variety of biocompatible polymers selected based on their performance under earth's normal atmospheric conditions. With the potential for long-duration space missions, including long-term stays on the space station and missions to new frontiers such as Mars, there is a need to understand how these atmospheric conditions could affect the properties of these materials. This project will present an overview for selecting polymers for respiratory medical devices focusing on polymer materials, properties and performance under a variety of atmospheric compositions and pressures. Bio-compatible polymers to be studied include olefins, nylon, polyacetals, polyvinyl chloride and polyesters. An improved understanding of thermoplastics and thermoset properties is accomplished by thermal analysis for device applications. The project will cover the medical applications and requirements as well as the oxidative and mechanical stability of currently used polymers in devices are discussed. Polymers will be ranked using thermal analysis techniques, including Pressurized Differential Scanning Calorimetry (PDSC), Thermogravimetry (TG), Thermal Mechanical Analysis (TMA) and Dynamic Mechanical Analysis (DMA) as well as ASTM polymer tests.

002 COMBINED HETEROZYGOCITY IN TWO PREVIOUSLY-UNIDENTIFIED CARBOXYLASE MUTATIONS CAUSES SEVERE VITAMIN K-DEPENDENT CLOTTING DEFICIENCY

Aisulu Usubalieva, B.S.[1]; Kevin W Hallgren, B.S.[1]; Mark A Rishavy, Ph.D.[1]; Dhouha Darghouth, Ph.D.[2]; Jean-Philippe Rosa, M.D.[2]; and Kathleen L Berkner, Ph.D.[1]
[1] Department of Molecular Cardiology, Lerner Research Institute, Cleveland Clinic;
[2] U770, INSERM, Le Kremlin-Bicetre, France

The gamma-glutamyl carboxylase activates vitamin K-dependent proteins, which are essential for functions that include hemostasis, arterial calcification, signal transduction, bone development. Naturally-occurring carboxylase mutations result in two distinct diseases: severe clotting deficiency or pseudoxanthoma elasticum that is associated with mild bleeding and mineralization of soft connective tissue. The reason why naturally-occurring mutations cause two diseases is unknown. The gene for the carboxylase is autosomal, and we identified a patient with severe bleeding who is compound heterozygous for two mutations: Trp493Cys and Arg704stop. The parents of the patient with either the Trp493Cys or the Arg704stop mutation and one wild type carboxylase gene are unaffected, indicating that combination of these two mutations results in the disease. We have expressed the mutants in insect cells, which lack endogenous carboxylase but express fully active recombinant enzyme. Functional analysis indicated that the Trp493Cys had poor carboxylase activity, which might be the reason for the defective hemostasis in the patient. In contrast, the Arg704stop mutant that is truncated in the C-terminal 55 amino acids had wild type carboxylase activity. However, the Arg704stop mutation must contribute to defective carboxylation because the parent with one copy of Trp493Cys and one copy of wild type carboxylase is unaffected. This defect may be decreased protein stability, as the expression level of the Arg704stop mutant was lower in insect cells than that of wild type carboxylase. We are currently testing this possibility using immortalized lymphocytes derived from the patient and his parents' blood. By characterizing these mutants, we hope to better understand the carboxylation mechanism and find an approach for the treatment of patients with hemostatic disorders and pseudoxanthoma elasticum.

003 URBAN ARTHROPODS: DIVERSITY AND ABUNDANCE IN VACANT LOTS AND COMMUNITY GARDENS IN CLEVELAND, OHIO

Klaire E. Freeman, B.S.[1]; Sarah E. Cutteridge, B.S.[1]; Thomas Pucci, M.S.[2]; and B. Michael Walton, Ph.D.[1]
[1]Biological, Geological and Environmental Science, Cleveland State University;
[2]Invertebrate Zoology, Cleveland Museum of Natural History

Insects are important features of urban ecosystems. In particular, wasps are important in community gardens as a form of agricultural pest control and occasionally as pollinators. This study examines insect diversity and abundance at community gardens and vacant lots in Cleveland, Ohio. Sixteen sites were selected, matched in pairs of garden vs. vacant of roughly the same size. The preliminary assessment included site area and perimeter, approximate distance to adjacent green space, garden vs. no garden, age of garden (when available), vegetation height complexity, and an initial assessment of insect diversity and abundance. This initial insect assessment was made at each site a minimum of two times throughout the duration of the project, using beat nets. These samples were identified to order and counted to show that the vacant lots had greater diversity and abundance than the garden sites.

004 THE PARASYMPATHETIC NERVOUS SYSTEM IN HUMAN HEART FAILURE

Jessica A. French, B.S.[1, 2]; Wendy E. Sweet, M.S.[2]; Christine S. Moravec, Ph.D.[1, 2]
[1]Department of Biological, Geological and Environmental Sciences, Cleveland State University;
[2]Department of Cardiovascular Medicine, Cleveland Clinic

Heart failure (HF) affects 5.8 million Americans and is characterized by an inability of the heart to pump blood throughout the body. Contractility and cardiac output can be regulated through acts of the sympathetic (SNS) and parasympathetic nervous systems (PNS). The SNS has a positive chronotropic and inotropic effect on the heart while the effect of the PNS is negative. Actions of the PNS on the cardiovascular system are mediated via the vagus nerve, releasing acetylcholine which binds to nicotinic receptors on post ganglionic neurons and inflammatory cells and muscarinic receptors (M) on cardiomyocytes. Under non-diseased conditions, the PNS has a greater influence on the heart than the SNS. The SNS has been found to be over stimulated in HF, with the role of the PNS in HF unclear. We hypothesized that the PNS is dysregulated in HF, resulting in a change of M receptor densities. We measured total M receptor density on non-failing and failing human heart samples, and determined if demonstrated differences were reversed through mechanical unloading with a left ventricular assist device (LVAD). Through radioligand binding assays, we found a significant increase in M receptor density in failing human heart samples compared to control, along with an increase in receptor density in failing with LVAD support samples. We also measured M_1-M_4 receptor subtypes on a subset of these samples. While the percent of M_1, $_2$, and $_4$ M subtypes did not significantly change between non-failing, failing, and failing with LVAD support samples, the percent of M_3 was significantly decreased in failure and increased back to non-failing percents in the failing + LVAD group. Muscle function analysis was also performed. Acetylcholine and isoproterenol were used to determine if a change in M receptor density in groups related to a change in functional response on fresh trabecular muscles.

005 BIOFEEDBACK IN HEART FAILURE PATIENTS AWAITING TRANSPLANTATION

Dana L. Frank, B.S.[1,2]; Christine S. Moravec, Ph.D.[1, 2]; Michael G. McKee, Ph.D.[3]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University;
[2]Department of Cardiovascular Medicine, Cleveland Clinic;
[3]Department of Psychiatry and Psychology, Cleveland Clinic

Biofeedback training can be used to alter the balance of autonomic input to the cardiovascular system. Studies have shown that heart failure is accompanied by over-activation of the sympathetic nervous system, and that decreasing this activation (for example, with a beta blocker or left ventricular assist device) not only has a positive impact on clinical status, but also reverses cellular and molecular alterations associated with the failing myocardium. In this study, we hypothesized that biofeedback-mediated stress management could also be used to remodel the failing myocardium in the direction of normal cardiac muscle function. This hypothesis was tested using end-stage heart failure patients who were listed for heart transplantation at the Cleveland Clinic over a two-year period. All patients were subjected to the same protocol, which

included an initial assessment of physiological reactivity to mental stress, six sessions of training with a certified biofeedback therapist, and a final assessment of physiological reactivity to mental stress. Patients also completed the SF-36 and Kansas City Cardiomyopathy questionnaires before and after the biofeedback protocol. A measurement of plasma norepinephrine and six minute walk distance were also collected at these times, in outpatients only. At the time of heart transplantation, each explanted heart was obtained and transported to the laboratory. Trabecular muscles were dissected from the endocardial surface of the heart and hung in an oxygenated bath to study the inotropic response to sympathetic stimulation. Changes in developed tension were measured after exposing the muscles to isoproterenol, a synthetic norepinephrine analogue. Beta adrenergic receptors on the myocardial cell membranes were also assessed. Data from this study demonstrate that biofeedback-mediated stress management training can decrease sympathetic nervous system activity and produce positive remodeling of the myocardium in patients with end-stage heart failure, similar to what has been previously observed for other more invasive therapeutic options.

006 AUTONOMIC CARDIAC CONTROL OF SUBJECTS WITH EPILEPSY AND PSEUDOSEIZURES

Leila Muhieddine[1]; Rebecca O'Dwyer, M.D.[2]; Ulrich Zurcher, Ph.D.[1]
[1]Department of Physics, Cleveland State University
[2]The Neurological Institute, Epilepsy Center, Department of Neurology, Cleveland Clinic

We use methods from nonlinear analysis of EKG time series to characterize and quantify the heart rate variability. We find that the coupling to the respiratory system is critical for understanding heart rate variability. The coupling leads to variation of the heart rate within a breathing cycle [so called respiratory sinus arrhythmia]. We develop methods to characterize heart rate fluctuations that take into account RSA variability. We use our methods to characterize the nonlinear cardiac dynamics that gives rise to the very low frequency (VLF) peak in the power spectrum.

007 ORIENTATION AND DENSITY CONTROLLED GLYCO-MACROLIGAND ARRAY

Satya Nandana Narla, B.S.P.S and Xue-Long Sun Ph.D.*
Department of Chemistry, Cleveland State University

Glycan arrays have become powerful tools for the analysis of carbohydrate–biomacromolecule interactions such as the specificities of lectins, antibodies, cells, and viruses. We report here an oriented and density controlled glyco-marcroligand array formation, which was demonstrated by end-point immobilization of glycopolymer imprinted with boronic acid ligands in different sizes. Briefly, *O*-cyanate chain-end functionalized glycopolymer was pre-modified by phenylboronic acid-lysozyme, BSA and polyacrylamide ligands and then immobilized onto amine-functionalized glass slide *via* isourea bond formation at pH 10.3, followed by releasing the phenylboronic acid ligands at pH 7.4, respectively. Glycoarray and SPR results confirmed the same trend of density-dependent binding of lectins. Imprinted glyco-marcroligand showed more lecting binding than non-imprinted one, and the phenylboronic acid-polyacrylamide imprinted glyco-marcroligand showed highest lectin binding. This glycoarray platform presents multivalent glycans in defined orientation and density configurations that are critical for glycan recognition. It is, thus, uniquely useful tool for probing the ligand specificities of glycan-binding molecules and for molecular and cellular proteomic applications.

008 SYNTHESIS AND CHARACTERIZATION OF GLYCO-FUNCTIONALIZED AND LIPID-COATED MAGNETIC NANOPARTICLES

Pratima Vabbilisetty, M.S. and Xue-Long Sun, Ph.D.
Department of Chemistry, Cleveland State University

Nanoparticles such as magnetic nanoparticles have been showing great potential to revolutionize biological imaging and drug delivery, but their use has been limited by difficulties in obtaining nanoparticles that are biocompatible. To address this problem, surface modification of nanoparticles has been widely explored. Among them, lipid coating, micelle and liposome encapsulation have been demonstrated to enhance their compatibility with the biological milieu *in vitro* and *in vivo*. In this

report, carbohydrate/lipid–coated magnetic nanoparticle hybrid systems are described. Particularly, magnetic nanoparticles were synthesized by the thermal-decomposition of iron oleates in high–boiling solvents containing surfactants in order to obtain monodiserse nanoparticles. Lipid–coated magnetic nanoparticles were prepared by standard thin-film hydration method and sonication process. Chemically selective glyco-functionalization of lipid–coated magnetic nanoparticles was conducted *via* Staudinger ligation. The structural characteristics of the nanoparticles were confirmed by IR, TEM and DLS techniques.

009 RECOMBINATION AND CHROMOSOME DYNAMICS DURING YEAST MEIOSIS

Neeraj Joshi, M.Sc.; Marta Makuszewski; G. Valentin Börner, Ph.D.
Center for Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University

Meiosis, a specialized cell division that involves pairing of homologous chromosomes, interhomolog recombination, results in the formation of haploid gametes. Without crossover formation, chromosome mis-segregation ensues formation of gametes with a chromosome surplus or deficit. Aneuploid gametes are one of the major contributing factors of birth defects and other genetic anomalies. Previous studies from our lab identified a link between meiotic recombination process and meiotic chromosome axes via the meiosis specific yeast protein Pch2. During early meiotic prophase (i) chromosome axes are selectively modified at crossover active regions, (ii) domainal installation of axis ensemble Hop1/Red1 occurs at future crossover sites and is independent of completion of crossover formation. In this study, we uncover novel roles of Pch2 and other chromatin modifiers in response to a global reduction in double strand breaks. We demonstrate that Pch2 specifically promotes interhomolog recombination by slowing down intersister recombination via acting as a meiosis specific sensor of DNA damage. Current studies, directed at dissecting its role under wild type and mutant conditions, will shed light on temporal relationship between chromatin architecture and meiotic recombination.

010 MATHEMATICAL MODEL OF THE HONEY BEE NEST-SITE SELECTION PROCESS

Partha Srinivasan, Ph.D.[1]; Andrew Nevai, Ph.D.[2]; Kevin Passino, Ph.D.[3]
[1] Department of Mathematics, Cleveland State University;
[2] Department of Mathematics, University of Central Florida;
[3] Department of Electrical and Computer Engineering, Ohio State University

The process by which honey bees choose their nesting site is a democratic one. The success of the process is dependent on whether the participating individuals form a quorum at a particular site. We present mathematical models which describe this process. If the swarm has just one site to choose from, the viability of this site is based on its quality. In this case, we show the analogy between our model and standard epidemic models, and present some analytical results. If the swarm has two sites to choose from, then there are some interesting dynamics that depend on the quality of these sites, as well as their discovery times. We present some numerical results in this case.

011 READINESS TO CHANGE AS A PREDICTOR OF INTERVENTION COMPLETION FOR FAMILY CAREGIVERS OF INDIVIDUALS WITH DEMENTIA

Lachaka A. Askew; Katherine S. Judge, Ph.D.
Department of Psychology, Cleveland State University

Prior research studies have identified psychosocial interventions that can reduce the negative effects associated with caring for a family member with dementia (Zarit and Femia, 2008). Presently, caregiver's readiness to become involved with intervention protocols has not been measured or addressed, which is critical because family caregivers are crucial to their success. The purpose of the current study is to apply Prochaska and DiClemente's (1992) Transtheoretical Stages of Change model to examine the relationship between caregiver readiness to change and successful implementation of a dyadic intervention for family caregivers of individuals with dementia. Caregiver readiness to change is hypothesized to predict the

likelihood of dyadic intervention protocol completion, with lower scores indicating a reduced probability of intervention participation and completion. Using an expanded version of the questionnaire developed by Chee and colleagues (2007), an analysis of caregiver's readiness to change scores will be used to examine significant group differences between completers (n = 29) and non-completers (n = 14) of the intervention. Discussion will focus on the implications of using the SOC model to determine if caregivers are ready to initiate behavioral change before starting an intervention protocol.

012 AVIAN SPECIMEN COLLECTIONS: BENEFITS OF A GLOBAL, LONG-TERM SCIENTIFIC DATA COLLECTION

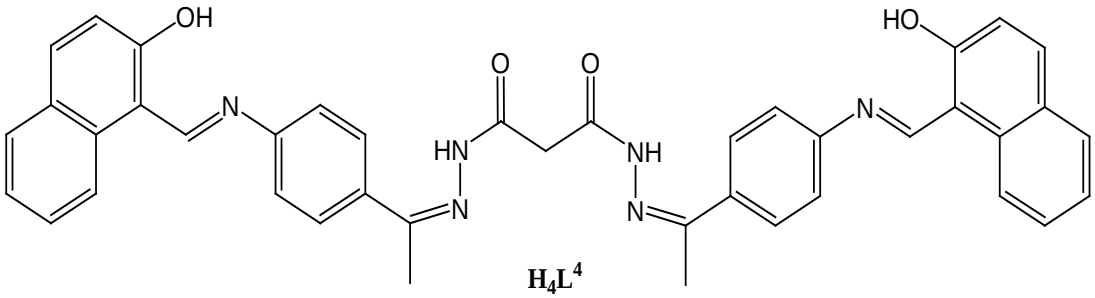
Courtney L. Brennan[1]; Andy Jones, Ph.D.[2]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University
[2]Cleveland Museum of Natural History

Kevin Winker (2005) from the University of Alaska Museum states that bird specimens document life in three different dimensions: "geographic space, biodiversity, and time". Specimen collections serve as a historical window of avian populations, and show how geographic avian diversity has changed over the years. Avian specimen collections provide data for a strong analytical approach to understand change that can be applied today in conservation efforts. Birds can be used as unique biomonitor. Population density and distribution of species, and how that changes over time can be used to determine the human impacts of habitat destruction and land use change. Collections can be used to show how population densities are changing, and this information can be used to implement conservation efforts to protect avian fauna. Avian specimen collections also serve as a unique tool for research and education. Specimens themselves can be used to study genetic diversity, population biology, parasites, disease, structural diversity, and evolution. Specimen collections are an economical treasure trove of scientific information with little direct impact on the bird communities. As growing human populations encroach upon and destroy avian habitat, it is important to continue bird specimen collections in order to preserve information that can be used for future research and discovery.

013 NOVEL METAL-ORGANIC FRAMEWORK: PREPARATION, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY

Haitham F. Kalil, M.Sc.[1,2]; Shehab A. Sallam, Ph.D.[1]; Adel S. Orabi, Ph.D.[1]; Mekki Bayachou, Ph.D.[2]
[1]Department of Chemistry, Faculty of Science, Suez Canal University, Ismailia, Egypt
[2]Department of Chemistry, Cleveland State University

Novel organic linker was synthesized by the reaction of malonic dihydrazide with 4-aminoacetophenone; the reaction product was condensed with naphthaldehyde in EtOH. The purified ligand was characterized by elemental analysis, differential scanning calorimetry (DSC), gas chromatography coupled to mass spectrometry (GC-MS), proton NMR, as well as UV and IR spectroscopy, Scheme 1.



H_4L^4

(N'^1Z,N'^3Z)-N'^1,N'^3-bis(1-(4-((*E*)-(2-hydroxynaphthalen-1-yl)methyleneamino)phenyl)ethylidene)malonohydrazide

Scheme 1. Structure of the H_4L ligand

Complexes of Co(II), Fe(III) and Zn(II) with the synthesized ligand were prepared. The complexes were in the form of solid powders that are air-stable, and soluble in DMF and DMSO. We characterized the complexes by elemental analysis, conductivity measurements, IR, UV-Vis., electron spin resonance (ESR) spectroscopy, and magnetic susceptibility measurements. The ligand showed deprotonation of its phenolic protons during complexation. On the basis of electronic spectral and magnetic moments data an octahedral geometry has been proposed for all complexes. Magnetic susceptibility measurements indicate anti-ferromagnetic interaction between metallic centers. Thermogravimetric and differential thermal analyses (TGA/DTA) confirmed the proposed chemical formulation of the complexes and their thermal decomposition and thermodynamic parameters were evaluated. The molar conductance values of these complexes showed that the non-electrolytic nature of Co(II) and Zn(II) complexes indicated the absence of counter ion while the iron complex showed the behavior of a 1:3 electrolyte, and highlighted the presence of nitrate ions outside the coordination sphere. The Mössbauer spectrum of the iron complex consists of two well-resolved asymmetric doublets bands, which confirm the high spin Fe(III) octahedral environment.

The ligand and metal complexes were also screened for their antimicrobial activity against the microorganisms *staphylococcus aureus* and *pseudomonas aeruginosa* as well as for antifungal activity against the fungi *candida albicans* and *aspergillus niger*. The varying extents and efficiency of the antimicrobial activity of all complexes prepared will be presented and discussed.

014 DIELECTRIC ANALYSIS AND DSC OF PHARMACEUTICAL SALTS

Omprakash. N, B Pharm; Manik Pavan. Maheswaram**,** B. Pharm.; Dhruthiman. Mantheni, M.S.; Shravan Singh Thakur, B. Pharm.; Hareesha Venumuddala, B. Pharm.; Lakshmi. Kaza, B. Pharm.; Indika Perera Naullage, Ph.D.; Alan. Riga, Ph.D.
Department of Chemistry, Cleveland State University

DSC of drug melting measures the quality of the drug typically the melting temperature and peak melting temperature range is typically 2-7oC,DSC identifies the melt and decomposition temperatures those salts which are out of typical DSC temperature are not suitable for the dielectric analysis(DEA).DEA of FluoxetineHcl fits our prediction. DEA measures the ionic conductivity of the chemical species, drug salts are more conductive than drug bases. LidocaineHcl had shown conductivity 10 times more than the conductivity of Lidocaine. So, drug salts of melt conductivity less than ten thousand pS/cm (LOG CONDUCTIVITY) quality of the drug is plausible.

015 GESTURE-SPEECH MISMATCHES AND LANGUAGE PROCESSING

Natasha Gibson, B.A.; Monica Gordon Pershey, Ed.D., CCC-SLP
School of Health Sciences, Cleveland State University

This review of the literature on gestural communication explores a dichotomous question: Are gestures considered part of a spoken message, or are gestures considered a separate communicative act? Does gesture enhance the meaning conveyed by words, or does gesture supply unique meaning?

Researchers agree that gesture reveals the cognitive processes at work during speaking and listening. Some gestures allow speakers to illustrate an abstract thought; some help speakers become more organized during the act of speaking. Researchers have identified so-called symmetrical and asymmetrical gestures. Symmetrical gestures allow a speaker to clarify information. Asymmetrical gestures signify that the speaker is having difficulty being clear and expressing his/her intents. Some asymmetrical gestures involve gesture-speech mismatch. Gesture-speech mismatch occurs when gesture and speech convey different messages. Therefore, if gesture and speech can convey two different meanings, gesture can supply unique information -- which means that gesture is not part of the spoken message, but is a separate message in and of itself.

The receiver of a message where gestures and speech do not match is faced with an interpretive burden. How do listeners process gesture-speech mismatches? More importantly, the question of how gesture-speech mismatches are processed has implications for the field of speech-language pathology. There is currently very little information on how persons with speech-language disorders process gesture-speech mismatches. Relatedly, the speech-language pathology literature has not

yet addressed whether persons with speech-language disorders produce asymmetrical gestures and/or fail to produce symmetrical gestures. This study explores whether there is potential for "gesture therapy" for persons with speech-language disorders.

This research was supported by an Engaged Learning: CSU Undergraduate Research and Creative Achievement Award.

016 DESIGNING AN AUGMENTATIVE AND ALTERNATIVE COMMUNICATION LAB

Daniel R. Barnes; Monica Gordon Pershey, Ed.D., CCC-SLP; Taya M. Neuman, M.A., CCC-SLP
School of Health Sciences, Cleveland State University

Augmentative and Alternative Communication (AAC) is an area of specialization within the field of speech-language pathology. When individuals are unable to meet their daily communication needs through speech or writing, AAC devices may aid their communication. These electronic devices are individually programmed for a user's needs and have a voice output which allows the user to "speak" with others. The CSU Speech and Hearing Clinic owns a number of AAC devices and provides speech-language therapy services to children and adults who use AAC devices. The purpose of this project was to assess the Clinic's AAC capacities and research how to attract the revenues to enhance its inventory of devices and expand the client services it can provide.

The student researcher inventoried the Clinic's AAC devices and documented how the devices can be used to help different types of clients. The student researcher reviewed the literature on best practices in AAC therapy. Current AAC research suggests that an AAC lab offer clients a naturalistic environment where they can practice functional skills applicable to everyday life. Based upon this review, the student researcher drew a floor plan for an AAC lab and developed a rationale for the selection of AAC devices that the Clinic should aspire to acquire. Finally, the student researcher explored funding sources for AAC devices. Therefore, this project has resulted in an evidence-based rationale for a sustainable AAC lab, a proposal for a list of AAC devices that would benefit different types of clients, and a targeted list of potential funding sources.

This research was supported by an Engaged Learning: CSU Undergraduate Research and Creative Achievement Award.

017 EXAMINING THE DESIGN AND DELIVERY OF ENVIRONMENTAL LITERACY COURSES

Scott H. Winograd, B.A., J.D.
College of Urban Affairs, Cleveland State University

Basic or introductory environmental science courses are presented in a variety of ways and connected to a university's overall curriculum in various ways. A basic environmental science course can be integrated into a college's core class requirements, or just be a course for major students and those wishing for an elective. Some institutions give students the option to take an environmental course that will count toward a general education requirement. Environmental courses are considered such if they promote environmental literacy, often defined as a basic understanding of the concepts and knowledge of the issues and information relevant to the health and sustainability of the environment (Wolfe, 2001). Many different approaches can be taken in an environmental literacy course. Beyond straight forward lectures, constructivism is based upon the notion that students learn best through using past experiences, peer interactions and personalized constructs to internalize and expand their knowledge (Wright, 2008). Many courses incorporate some field experience, which seems to be beneficial (Alagona, 2010; Havlick 2005; Hughes, 2004; Lei, 2010). Another option is a problem-based approach that focuses on a specific environmental problem in detail to increase environmental literacy (Langen, 2006). Any effective course should certainly strive to engage the students beyond simply asking them to memorize facts and concepts (Tessier, 2006). One way to do this is to incorporate some sort of writing assignment into the curriculum (Tessier, 2006). Another course format is to integrate technology through online courses, which has been shown to increase attendance and participation in an undergraduate environmental science course (Riffell, 2004). Examining a variety of methods for integration of courses into college curriculums and exploring a variety of methods for course delivery can be a fruitful exercise towards designing an environmental literacy course.

018 THE INFLUENCE OF TIME-OF-DAY PREFERENCE ON PERFORMANCE AND ATTENTION IN YOUNG ADULTS.

Cindy Rohde, Benjamin Wallace, Ph.D.
Department of Psychology, Cleveland State University

Our society predominantly structures around daytime schedules for work and schooling posing challenges for evening oriented individuals. Technology is now shifting this dynamic through advances such as telecommuting and online classes creating flexibility and, as a result, the possibility for evening oriented individuals to find a better fit to their preference. Preferences for performing tasks either in the daytime or nighttime ("morningness" or "eveningness") is a biological function related to the time of day a person is born (Wallace & Fisher, 2001), and is influenced by several variables including body temperature, food consumption, hormone levels and age (e.g. Besoluk et al., 2011). Studies evaluating performance during preferred times have found that individuals perform better during one's preferred time of day (Matchock & Mordkoff, 2009). The current study seeks to replicate these findings in a sample of college students, one group for whom this match between time orientation and task performance is particularly salient. Previous studies have examined performance and attention through self-report, surveys, laboratory-based attention-oriented tasks, and final course grades. We propose novel use of in class clicker technology to measure attention and the use of grades to measure performance from multiple time points. Participants will be recruited from classes offered in the morning and evening. Participants will be given the Morningness-Eveningness Questionnaire to determine time of day preference. Significant findings would indicate that matching one's diurnal orientation to time of task could positively affect performance and attention and should be considered when scheduling, working, teaching or testing.

019 AN ANT-APOPTOTIC BCL-2 FAMILY EXPRESSION INDEX PREDICTS THE RESPONSE OF CHRONIC LYMPHOCYTIC LEUKEMIA TO ABT-737

Sayer R Al-harbi, M.Sc.[1,5]; Brian T. Hill, M.D.[2]; Suparna Mazumder, Ph.D.[1]; Jennifer DeVecchio[1]; Lisa A. Rybicki[3]; Matt Kalaycio, M.D[2]; Jaroslow P. Maciejewski, M.D[4]; Janet A. Houghton, Ph.D.[1]; and Alexandru Almasan, Ph.D.[1,2]
[1]Department of Cancer Biology, Lerner Research Institute, Cleveland Clinic;
[2]Department of Hematologic Oncology and Blood Disorders, Taussig Cancer Institute, Cleveland Clinic;
[3]Department of Quantitative Health Sciences, Lerner Research Institute, Cleveland Clinic;
[4]Department of Translational Hematology and Oncology Research, Taussig Cancer Institute, Cleveland Clinic;
[5]Cellular and Molecular Medicine Program; Department of Biological, Geological and Environmental Sciences; Cleveland State University

The anti-apoptotic Bcl-2 proteins regulate survival of lymphocytes and are overexpressed in lymphoid malignancies, including chronic lymphocytic leukemia (CLL). The small molecule inhibitor ABT-737 binds with high affinity to Bcl-2, Bcl-xl, and Bcl-w but with low affinity to Mcl-1, Bfl-1, and Bcl-b. The active analog of ABT-737, navitoclax (ABT-263) has shown a high therapeutic index in lymphoid malignancies, and developing a predictive marker for it would be clinically valuable for patient selection or choice of drug combinations. Here we used quantitative RT-PCR as a highly sensitive and quantitative assay to compare expression of anti-apoptotic Bcl-2 genes that are known to be targeted by ABT-737. Our findings reveal that the relative ratio of Mcl-1 and Bfl-1 to Bcl-2 expression provides a highly significant linear correlation with ABT-737 sensitivity ($r=0.6$, $P<0.001$). In contrast, anti-apoptotic transcript levels, used individually or in combination for high or low affinity ABT-737-binding proteins could not predict ABT-737 sensitivity. The (Mcl-1 + Bfl-1)/Bcl-2 ratio was validated in a panel of B-cell leukemic cell lines. Changes following ABT-737 treatment included increased expression of Bfl-1 and Bcl-b that may contribute to treatment resistance. This study defines a highly significant Bcl-2 expression index for predicting the response of CLL to ABT-737.

020 IN VITRO AND IN VIVO EFFECTS OF A CYCLOOXYGENASE-2 INHIBITOR NIMESULIDE ANALOG JCC76 IN AROMATASE INHIBITORS-INSENSITIVE BREAST CANCER CELLS

Bo Zhong, Ph.D., Bin Su, Ph.D
Department of Chemistry, Cleveland State University

Third generation aromatase inhibitors (AIs) are more effective than tamoxifen in the treatment of estrogen receptor (ER) positive breast cancer. However, long-term use of AIs commonly results in resistance. We examined whether compound JCC76{ Cyclohexanecarboxylic acid [3-(2,5-dimethyl-benzyloxy)-4-(methanesulfonyl-methyl-amino)-phenyl]-amide}, an analog of Cyclooxygenase-2 (COX-2) inhibitor nimesulide, can inhibit the growth of AI-insensitive breast cancer cells and the mechanisms by which the compound affects cell proliferation. LTEDaro (long term estrogen deprived MCF-7aro cell) cells, which are a model for AI resistance, were used in this study. JCC76 effectively inhibited LTEDaro cell proliferation with an IC_{50} of 2.75 ± 0.31μM. Further investigations reveal that the compound significantly induced apoptosis in LTEDaro cells by decreasing pAKT, BCL-2 and pBad protein levels, which were all up regulated in the cells after long term estrogen deprivation. LTEDaro tumor size and weight were decreased in ovariectomized nude mice treated with the compound, and cell apoptosis in the tumor tissue was increased compared to the control. The animal weight remained almost unchanged which indicated the low toxicity of the compound. These results suggest that JCC76 overcame AI resistance by inducing cell apoptosis as illustrated in the in *vitro* and in *vivo* models. Collectively, results from this study provide data to support that nimesulide analog JCC76 may be a new drug candidate to treat AI-resistant breast cancers. It could be also used as a lead to design and synthesize more potent derivatives.

021 DIFFRACTION OF WAVES AS AN ORBITING PHENOMENON

James A. Lock, Ph.D.
Department of Physics, Cleveland State University

When a normally incident plane wave is scattered by an infinitely long dielectric cylinder, the diffracted portion of the total scattered wave can be obtained exactly using the Debye series expansion of the Rayleigh-Mie partial wave scattering amplitudes. The Poisson sum formula is then applied to the diffracted portion to convert the infinite series over partial waves into an infinite series of analytically soluble integrals, each of which may be interpreted as describing propagation of the diffracted wave after having orbited the cylinder a given number of times in both the clockwise and counterclockwise directions. Further, upon examining the radial dependence of the diffracted wave in the scattering near-zone, one can interpret the diffracted wave as orbiting a small distance above the cylinder surface.

022 SYNTHESIS AND BIOLOGICAL EVALUATION OF NOVEL INDOMETHACIN ANALOGS AS ANTIPROLIFERATIVE AGENTS FOR CANCER

Snigdha Chennamaneni, B.S.P.S.; Bin Su, Ph.D.
Department of Chemistry, Cleveland State University.

A growing body of experimental and epidemiological evidence indicates NSAIDs (Non-steroidal anti-inflammatory drugs) has anticancer effects such as decrease of the incidence of mammary cancer, tumor burden and tumor volume. Numerous NSAIDs were tested as anticancer drugs in clinical study. Indomethacin, a non-selective COX inhibitor, shows anticancer potential by inducing apoptosis and causes a reduction of cell number in several cancer cell lines. In the present study, the molecular structure of Indomethacin was used as a starting scaffold to design novel Indomethacin analogs with improved anticancer activity. A series of Indomethacin-amides were synthesized by coupling Indomethacin with different substituted aromatic and aliphatic amines. Their anti-cell proliferation activity was evaluated with human colon cancer cells. Furthermore, replacement of 4-chlorobenzoyl moiety in Indomethacin-amides with different substituted benzoyl group affords the second generation of Indomethacin analogs. This synthetic work and biological assay are ongoing.

023 CHANGES OVERHEAD: A LOOK AT ALTERNATIVE ROOFING

Nicole M. D'Alessandro, B.F.A.
Department of Environmental Studies, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

Population growth and industrial expansion adversely affect the environment and resource consumption in many ways. As human housing and commercial development spreads, impervious surfaces replace natural areas, bringing with it an increase in the urban heat island effect and storm water runoff issues, both of which have numerous consequences for individuals and communities. A considerable percentage of impervious surfaces in cities and towns is rooftops. Additionally, improperly insulated roofs and generic, rather than site-specific, building techniques lead to an increased use of fuel and energy to seasonally heat and cool buildings. Sustainable development and green engineering can focus on a single building's effect on these environmental concerns. Whereas traditional roofing has detrimental effects on the urban heat island effect, storm water runoff and a building's energy efficiency, other roofing options are more beneficial from an environmental point of view. Two promising alternative roofing options are green, vegetated roofs and cool, reflective membrane roofs.

024 NANOPARTICLE ENTRAPMENT INCREASED ANTITUMOR EFFECTS OF NOVEL GALLIUM (III) COMPOUNDS THROUGH TRANSFERRIN INDEPENDENT ROUTE IN LUNG CANCER

Daniel Wehrung, B.S; Moses O. Oyewumi, Ph.D.
Department of Pharmaceutical Sciences, College of Pharmacy, Northeastern Ohio Universities Colleges of Medicine and Pharmacy (NEOUCOM), Rootstown, OH 44272.

The widespread application of gallium in cancer therapy has been greatly hampered by lack of specificity as well as poor tumor uptake, accumulation and retention. To address the challenge we have synthesized two novel gallium compounds (Gallium hexanedione; GaH and gallium acetylacetonate; GaAcAc) for subsequent entrapment in stable, tumor-targeted lipid nanoparticles. Gallium compounds were characterized by NMR, mass spectroscopy and differential scanning calorimetry. Solid nanoparticles (NP) were prepared at various concentrations (2-5 mg/ml) of Ga compounds included at 60^{o}C to the NPs matrix prepared via microemulsions. Solid nanoparticles were purified by gel permeation chromatography and characterized by size and morphology. The effects of various process variables on the size and stability of nanoparticles as well as Ga entrapment efficiencies were studied. EGF was conjugated to the surface of nanoparticles for tumor targeting by linkage of thiolated EGF to DSPE-PEG $_{(2000)}$-Mal-grafted nanoparticles. Both GaH and GaAcAc were synthesized and purified with a yield of about 92%. At 2 mg/ml concentration of Ga compounds, the average size of nanoparticle was 110 ± 10 nm (GaH) and 115 ± 5.7 nm (GaAcAc). Up to 4 mg/ml of GaAcAc and 6 mg/ml of GaH was entrapped in nanoparticles. The entrapment efficiency at a concentration of 2 mg/ml of Ga compounds was 98%. Nanoparticle sizes were stable on storage at room temperature and upon incubation with biological simulated media such as 10% fetal bovine serum and 10 mM phosphate buffer saline. NP-based delivery afforded a transferrin-independent route for Ga cell uptake with associated increased antitumor effects as demonstrated in human lung adenocarcinoma cells (A549). The studies demonstrated the antitumor effects of the newly synthesized gallium compounds and the potential of NP-mediated delivery of Ga in achieving increased tumor specificity and retention with reduced side effects.

025 GLYCO-LIPOSOME MICROARRAY FOR STUDYING INTERACTION BETWEEN GANGLIOSIDE AND PROTEIN

Yong Ma, Irena Sobkiv, Hailong Zhang, Rui Jiang, and Xue-Long Sun*
Department of Chemistry, Cleveland State University

Carbohydrate arrays have become important tools for the analysis of carbohydrate–biomacromolecule interactions such as the specificities of lectins, antibodies, cells, and viruses. However, the critical limitations of glycan array applications are restricted epitopes available from both synthesis and isolation and less mode of glycan presentation on the array surface. Particularly, features of glycan presentation on array surface such as density and orientation of glycans can have a major impact on recognition related to both affinity and specificity. In general, two dimensional (2D) surface chemistries for covalent immobilization of glycans result in low signal intensity and substantial non-specific binding of target proteins because of an insufficient number of binding sites and the presence of surface-protein interactions. We present here a

cytomimetic glycan microarray based on immobilized intact glyco-liposome. Specifically, liposome carrying ganglioside and lipid-triphenylphosphine as anchor lipid was printed onto azide-modified glass slide via Staudinger ligation in PBS buffer (pH 7.4). Specific lectin and toxin binding to GM1 and GM3 were confirmed by florescence scanning. Furthermore, microarray of liposome carrying triphenylphosphine onto azide-modified glass slide and its further glyco-modification with azide-containing carbohydrate *via* Staudinger ligation will be reported. The reported technique will provide a novel potential glycoarry platform to study carbohydrate-binding properties of a variety of proteins such as lectins, antibodies as well as mammalian cells, pathogens and viruses.

026 FACTIORS CONTRIBUTING TO ATTRITION IN A LONGITUDINAL STUDY OF TRAUMA AND PTSD

Martha Golubski; Lisa Stines Doane, Ph.D.
Department of Psychology, Cleveland State University

Longitudinal studies are necessary to understand the effects of time on trauma-related difficulties, including posttraumatic stress symptoms. However, the attrition rate in many longitudinal studies is high and may not happen at random (Peleg & Shalev, 2006). If participants are lost due to some systematic variables, the internal and external validity of studies may be drastically affected. Longitudinal studies dealing with trauma and posttraumatic stress disorder (PTSD) have found varied results as to whether attrition is due to the influence of specific factors, such as depression, trauma severity, PTSD severity and sociodemograpahic factors (Young, Powers & Bell, 2006; Ginzberg, 2004). If we can determine factors that contribute to attrition in this type of research, we may be able to predict participants who may become lost to follow-up and develop better ways of retaining them, thus improving generalizability of results. The current study will evaluate attrition in an ongoing longitudinal study in which trauma, PTSD and behavioral risks are measured at two time points. The proposed exploratory study will examine the following variables in relation to attrition: sociodemographic variables, history of psychotherapy, history of trauma, PTSD, time since traumatic event, depression, social reactions and trauma related cognitions. We hypothesize that participants who were lost to follow-up will differ significantly from those who were not on key variables and, if supported, this will inform study retention strategies in trauma research.

027 CHEMOPREVENTION OF HEPATOCELLULAR CARCINOMA WITH ANTHOCYANIN-RICH BLACK CURRANT (*Ribes nigrum* L.) EXTRACT

Anupam Bishayee, Ph.D.[1,2]; **Roslin J. Thoppil, B.S.[1]**; Altaf S. Darvesh, Ph.D.[1]; Deepak Bhatia, Ph.D.[1]; Judit Hohmann, Ph.D.[3]
[1]Cancer Therapeutics and Chemoprevention Group, Department of Pharmaceutical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy, 4209 State Route 44, Rootstown, OH 44272, USA;
[2]Department of Internal Medicine, Northeastern Ohio Universities Colleges of Medicine and Pharmacy, 4209 State Route 44, Rootstown, OH 44272, USA;
[3]Department of Pharmacognosy, University of Szeged, Eötvös u. 6, 6720 Szeged, Hungary

Primary liver cancer, mostly hepatocellular carcinoma (HCC), represents the fifth most common malignancy and the third most common cause of cancer-related death worldwide. In view of the severity of the disease and the limited treatment options available, a critical need exists for novel chemopreventive strategies which reduce the current morbidity and mortality associated with HCC. Anthocyanins, a group of phytochemicals, are known to possess anticarcinogenic properties against several cancers, demonstrating potential for cancer prevention. Black currant (*Ribes nigrum* L.) fruits, recently termed *"superfruits"*, have high anthocyanin content. Although health benefits of black currant are known, limited evidence on antitumor effects of black currant exists with virtually no information on prevention of experimental carcinogenesis. The objective of the present study was to evaluate the potential antihepatocarcinogenic effects of anthocyanin-rich black currant skin extract (BCSE) against HepG2 human liver cancer cells as well as chemically-induced rat liver tumorigenesis. BCSE exhibited a potent cytotoxic effect on HepG2 cells. Treatment of rats with BCSE (100 or 500 mg/kg), started 4 weeks prior to and continued for 18 weeks following diethylnitrosamine (DENA)-initiated hepatocarcinogenesis, dose-dependently decreased the incidence, total number, multiplicity, size, and volume of preneoplastic hepatic nodules. Immunohistochemical analysis of proliferating cell nuclear antigen and DNA fragmentation revealed BCSE-mediated inhibition of abnormal cell proliferation and induction of apoptosis in DENA-induced rat liver tumorigenesis respectively. BCSE also exerted an up-

regulation of Bax and down-regulation of Bcl-2 expression at the translational level compared to DENA control. The results of the present investigation demonstrate, for the first time, that an anthocyanin-rich extract from black currant exerts a striking chemopreventive effect against experimental hepatocarcinogenesis by inhibiting abnormal cell proliferation and inducing apoptosis through modulation of Bax/Bcl-2 ratio. These results along with a safety profile of BCSE encourage the development of black currant bioactive constituents as chemopreventive agents for HCC.

028 TRANSDERMAL DRUG DELIVERY EFFICACY BY DIELECTRIC THERMAL ANALYSIS

Lakshmi S Kaza[1], M.S.[1]; Ellen Matthews, M.S.[2]; Ken Alexander, Ph.D.[3]; Alan T. Riga, Ph.D[1,2,3]
[1]Department of Chemistry, Cleveland State University
[2]Buckeye Pharmaceuticals LLC, Beachwood OH
[3]College of Pharmacy Practice, University of Toledo, Toledo, OH

Transdermal drug delivery has many benefits over systemic oral therapies, in which clinically sufficient quantities of the active pharmaceutical ingredient do not reach the intended organ and/or use of the drugs result in serious side effects. However, existing transdermal platforms are limited to drugs of small size, ionic nature and low molecular weight. An optimally-tuned low-voltage applied AC electrical field has been found capable of inducing polarization and delivering micro and macromolecules through a biological membrane. In this study, insulin and Diphenhydramine were transported by AC electrokinetic's through animal models, including pig skin and shedded snake skin at body temperature. A factorial design was used to establish experimental parameters for the insulin solution evaluating variables of voltage, frequency, time, temperature, drug dose, and membrane thickness. Pre- and post-test conductivity measurements of the pig skin samples are taken as an indicator of drug permeation and changes in conductivity are correlated with experimental variables to assess the relative importance of each variable to drug transport. Dielectric Analysis was used to modulate the drugs delivery response measured by a change in the log conductivity vs. log frequency curve at lower frequency of 500Hz and a higher frequency of 1000 Hz for insulin at 37ºC. Proof of concept for the drug transport was confirmed by examining a residue on the electrode by Ultra Violet Spectroscopy. A clear result of the experimental design for insulin was that the low frequency was significant in enhanced drug delivery.

029 DETERMINATION OF CONNECTION BETWEEN NATIONAL RECREATION AREAS AND THEIR TARGET AUDIENCE

Brady W. Bourquin, B.S.
Department of Environmental Studies, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

National Parks in the United States of America have been set aside and preserved as the property of the people. These places have been established to protect the places and stories that have helped build this country into the product that is seen on the world stage today. These stories and places are a valuable tool in educating the public on their collective history and the value of preservation for generations to come. In order for national parks to maintain their stature and uniqueness, they must continue to be supported by the tax payers, not just through tax dollars, but through visitation as well. What, after all, is the point of remembering a story if no one cares to listen? The National Park Service has been working since its inception in 1916 to connect all people to the places it manages, regardless of where these people live or the backgrounds that they come from. In recent years National Recreation Areas (NRA) have been established in urban areas to provide traditionally underserved audiences with the opportunity to experience firsthand what the National Park Service has to offer and more importantly, what their tax dollars are going to support. Through these NRA's, the National Park Service hopes to truly fulfill their mission to provide for all people through all time. Through a variety of program offerings, NRA's have successfully met their purpose in many ways. This study examines how these programs have been successful and what the National Park Service can continue to do to ensure saliency to future generations.

030 INTRODUCTION TO PHARMACEUTICAL THERMAL ANALYSIS: A TEACHING TOOL

Shravan S. Thakur, M.S.[1]; Alan Riga, Ph.D.[1]
[1]Department of Chemistry, Cleveland State University

Significant Thermal Analysis-physical chemical data needs to be acquired by the new analyst whether an entry level chemist or a new function for the experienced pharmaceutical scientist. This teaching tool describes the introductory use of

Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) for characterizing pharmaceuticals. Optimum Experimental conditions for DSC and TGA will focus on collecting the best results and interpretations. Does the sample contain volatiles? Evaporation creates endothermic peaks, 2% water or solvent can lower the glass transition temperature (T_g) by up to 100^{o}C and affect the crystallization temperature on cooling, The decomposition temperature can be determined by DSC and TGA. Decomposition, not volatilization, can result in 5% weight loss and render no meaningful DSC data. The upper DSC temperature for practical use is based on the decomposition temperature. Identical materials can look totally different based on their storage temperature and time, cooling rate from a temperature above the T_g or above the melting temperature (T_m). The heating rate, an essential feature of DSC and TGA can cause multiple variations in transitions. Thermal history of chemicals can affect the ultimate thermal analysis results. TGA cam provide information about bound and unbound (free) water due to evaporation, desorption and dehydration. Calibration of DSC and TGA are vital in establishing the precision and accuracy of these unique methods: You must learn and follow the standard protocol ASTM E968 for the heat of fusion and heat capacity as well as ASTM E967 for the determining the transition or phase temperatures of pharmaceuticals. DSC can determine the Tm, crystallization temperature T_c, T_g and the their heats of transition, e.g., fusion and crystallization.

031 IMPROVING CLINICAL OUTCOMES WITH PHARMACIST COLLABORATION IN AN AMBULATORY CARE OFFICE SETTING

Michelle L. Cudnik, Pharm.D.[1]; Michael Rich, M.D.[2]; Ronald Jones, M.D.[2]
[1]Pharmacy Department, Summa Health System and Department of Pharmacy Practice, NEOUCOM
[2]Department of Medicine, Summa Health System

In an era with healthcare reform on the horizon, health care providers need to be financially responsible. The Institute of Medicine has identified the importance of improving medication safety and preventing medication errors. Integrating allied health care members, such as pharmacists, into direct patient care is a viable option to ensure that the best medication safety practices are utilized. Medication reconciliation was named as 2005 National Patient Safety Goal #8 by the Joint Commission. The Joint Commission's announcement called on organizations to accurately and completely reconcile medications across the continuum of care. Integration of a pharmacist within our clinic helped ensure the completion of the medication reconciliation process, and ultimately improve patient care. Criteria was developed that would prompt physicians to utilize the pharmacist. They included: a patient with greater than 10 medications, recent hospitalization or ED visit, or admits to non-adherence with medication regimen. The pharmacist provided counseling to the patients to improve the chance for success of physician's action plans by addressing medication adherence barriers. Direct and indirect clinical outcomes have been measured since the addition of a pharmacist. They include: 100% compliance during a Joint Commission visit on the goal of completing medication reconciliation, a 5% improvement in HgA1c goals reached, 6% improvement in LDL goals reached, and 6% improvement in BP goals reached in diabetic patients seen by the pharmacist, $55,000 in billing for pharmacy services in one year alone, and the development of better strategies to capture medication adherence rates in the clinic (a small patient survey in the IM center in 2009 showed a 40% incidence of non-adherence). In addition, ongoing education to staff and physicians, and enhancements of policies/procedures as it relates to medication safety, efficacy and cost is completed by the pharmacist.

032 GENERATION OF RECOMBINANT THROMBOMODULIN CONJUGATES BY USING SORTASE-MEDIATED LIGATION

Rui Jiang and Xue-Long Sun
Department of Chemistry, Cleveland State University

Thrombomodulin (TM) is an endothelial cell membrane protein and is a critical regulator of the protein C pathway and represents a major anticoagulant mechanism that is operative under physiological conditions. The extracellular region of human TM consists of three tentative domains, an N-terminal domain, a domain involving six continuous epidermal growth factor (EGF1-6) -like structures, and an 0-glycosylation-rich domain. Previous studies have shown a TM fragment which containing last three EGF-like structures (TM456), is the minimum functional domain for protein C activating cofactor activity. In order to site-specifically introduce any unnatural molecule into TM456, sortase A-mediated enzymatic reaction was applied. Sortases are transpeptidase enzymes found in most Gram-positive bacteria. In *Staphylococcus aureus*, the sortase isoform SrtA cleaves a short C-terminal recognition motif (Leu-Pro-X-Thr-Gly, where X is any residue) on the target protein followed by the formation of an amide bond with a molecule which contains N-terminal glycine. In our report, TM456 derivative with a C-terminal LPETG motif, and the recombinant SrtA, were expressed in *Escherichia coli*,

respectively. Moreover, by using SrtA-mediated ligation, TM456 was conjugated to fluorescent probe or be immobilized on the surface of diglycine-functionalized glass slide, these conjugations were subsequently confirmed by SDS-PAGE and fluorescent imaging technique. We have demonstrated this highly selective protein engineering technique permits the unique attachment site on the protein for numerous applications such as immobilization and polymer conjugation.

033 PROTEASOMAL INHIBITION MODULATES PLATELET FUNCTION

Nilaksh Gupta, M.Sc[1, 2]; Wei Li, Ph.D.[1]; Thomas McIntyre, Ph.D.[1].
[1]Department of Cell Biology, Lerner Research Institute, Cleveland Clinic;
[2]Department of Regulatory Biology, Cleveland State University

Introduction: The major role of ubiquitination is targeting cellular proteins for degradation via a large multi-catalytic complex, the proteasome. Velcade, a proteasomal inhibitor, is in clinical practice for multiple myeloma, but what limits therapy is associated thrombocytopenia (low platelet count). However, this is not because of megakaryocyte (platelet precursors) toxicity, suggesting a direct effect on platelets. Platelets are small, short-lived anucleated cells involved in hemostasis and upon activation undergo rapid aggregation, shape change, degranulation and release thrombotic microparticles. Persistent or aberrant platelet activation is associated with acute arterial thrombosis, vasculogenesis and tumor growth. **Hypothesis:** Since platelets are short lived and have proteasome, we hypothesized that proteasome-dependent degradation of platelet proteins modulates platelet function. **Methods:** Western blotting and mass spectrometry was used to identify proteins modulated after proteasomal inhibition. Effect of proteasomal inhibition on platelet morphology and occlusive thrombosis was studied using electron microscopy and *in vivo* thrombosis model respectively. For Clot retraction, platelets were treated with thrombin and were monitored over time. Flow cytometery was used to assess surface expression of CD42a (Gp IX) and for microparticle quantification. Real time PCR was used to detect IL-1β message and IL-1β protein levels were determined by ELISA. Ristocetin induced aggregation was used to study Von Willebrand factor (vWF) binding to its receptor, gp1b-IX-V. **Results:** Our data showed that platelets have ubiquitinated proteins and their levels change after proteasomal inhibition. Proteasomal inhibition caused changes in platelet morphology, increased time to occlusive thrombosis and clot retraction and increased ristocetin induced aggregation. Proteasomal inhibition reduced stimulated microparticle release and LPS induced IL-1β splicing and protein expression. **Conclusion:** Protein turnover regulates important platelet functions.

034 EVALUATING THE LINK BETWEEN VALPROIC ACID THERAPY AND AUTISM

Prabha S. Awale, B. Pharm; Werner J. Geldenhuys, B. Pharm, Ph.D.; Richard T. Carroll, Ph.D.
Pharmaceutical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy

Autism, a neurodevelopmental disorder is a complex disorder the cause of which is not exactly known. There is considerable evidence showing that prenatal exposure to valproic acid (VPA) is associated with higher risk of autism. Valproic acid most commonly used as an antiepileptic drug is also known to be an immunomodulatory agent through its ability to inhibit histone deacetylase (HDACi). However, the immunomodulatory and HDACi effect of these drugs has not been fully explored. The literature describing HDAC inhibitors is controversial as reports show both proinflammatory and anti-inflammatory activities from these compounds. To gain a better understanding on how the HDACi are capable of such diverse activity, we created a cell based model comparing the effect of two structurally unrelated HDACi on LPS and IFN-gamma activated RAW 264.7 macrophages. The compounds used were Valproic acid (VPA) and Trichostatin-A (TSA). The production of two major cytokines (IL-1β and TNF-α) was evaluated as well as the induction of the inducible nitric oxide synthase (iNOS). The two HDACi altered TNF-α release differently. The release of TNF-α after activation was either enhanced or inhibited depending on the time of activation and/or the compound and dose used. However, both VPA and TSA showed an inverted U-shaped dose response curve for the inhibition of iNOS induction. Most interesting was that both compounds substantially increase the release of IL-1β, up to 21-fold over control, from activated macrophages. These results indicate an altered immune response in spite of them being known as anti-inflammatory agents. This altered immune response could have unknown consequences on microglia during brain development which could participate in the development of Autism.

035 THE SUSTAINABILITY OF AQUACULTURE IN URBAN ENVIRONMENTS

Robert P. Howerton, B.S.; Sandra Kaufman Ph.D,;
Maxine Goodman Levin College of Urban Affairs, Cleveland State University

Fisheries around the world have all become concerned about the future as they work harder and produce less. In all but two of the worlds fishing regions the catch rate has fallen, or fishing has been banned. Governmental policies, better equipment and the use of advanced fishing techniques have lead to a major decline in fish stocks worldwide. In the Great Lakes Region, catch rates of yellow perch have been in a steep decline since the early 1980's. The fisheries in the great lakes have declined due to outside factors that include better equipment and the use of advanced fishing techniques. The main cause of the decline of yellow perch populations within the great lakes is due to the introduction of invasive species into the Great Lakes Region and the onset of global climate change. This paper examines that the potential for small local aquaculture farms to produce yellow perch to supplement the growing need for protein, without the side effects of depleting the local aquatic populations for feed stock.

036 RADIATION DERMATITIS GRADE 2: ALOE VERA GEL VERSUS CUREL® LOTION DURING WHOLE BREAST IRRADIATION

Jennifer Archambeau, MSHS, PT[1]; **Mary K. Milidonis, Ph.D., PT[2]**; Ana Begovic-Juhant, Ph.D.[2]
[1]Fairview Hospital,
[2]School of Health Sciences, Cleveland State University

The purpose of this study is to measure the difference between grade 2 skin reactions in patients using aloe vera gel versus Curel® lotion while undergoing radiation treatments for breast cancer. The study involved 28 women; 14 using aloe vera gel and 14 using Curel® lotion. This was a prospective cohort study. A baseline skin grade was documented at the time of consent and then weekly by a radiation oncology nurse. Each subject in the study received simultaneous radiation therapy for breast cancer and skin lotion. On average subjects were 61 years old, Caucasian and had medium skin type. The mean age of subjects, ethnicity and skin type ere similar between groups that received either Curel® or aloe vera gel. No statistical difference was found between groups at five weeks of radiation and use of skin cream. An interaction effect was found at higher radiation levels with skin cream type. Aloe vera gel was found to be more protective of the skin in week 5 with the higher doses of radiation. Increased pain was found to be associated during week five of radiation with subjects who had larger bra cup sizes. The study supports in part the hypothesis in that there is no difference in grade 2 radiation dermatitis. There is evidence that skin cream type is important for women at the higher doses of radiation during the fifth week of treatment. Clinical considerations are needed to treat increased pain as the fifth vital sign during radiation therapy for women with larger cup sizes especially as their radiation treatment course comes to an end.

037 THE EFFECT OF THE NUMBER OF BUFFER COMPONENTS ON SEPERATION OF PROTEINS IN HIGH-PERFORMANCE GRADIENT CHROMATOFOCUSING ION-EXCHANGE USING LINEAR pH-GRADIENTS

Harini Jogiraju, M.Sc.; Kiran K.Pedada, M.Pharmacy; David J. Anderson, Ph.D.
Department of Chemistry, Cleveland State University

Gradient chromatofocusing (GCF) utilizing linear pH gradients provide unique capabilities in pI based protein separation when compared with the conventional ion-exchange and conventional chromatofocusing chromatography. By exploiting the advantages of GCF technique, the present work demonstrates the comparison of chromatograms of proteins chromatographed on a DEAE weak anion-exchange column employing the same descending linear pH- gradient with two buffer systems which differ in number of buffer components. These linear pH-gradients over 6.5-3.5 pH range generated by the mixing of high pH application buffer with low pH acidic elution buffer via a gradient HPLC pump system. Also reported is a new way of generating linear pH-gradients that eliminates non-linear drops in pH that are problematic in current gradient HPLC techniques by introducing the bridging buffer components between application and elution buffers. Experiments compared chromatography of five standard proteins for pH gradient generated by buffer system I (less buffer components with spacing of buffer pKa of approximately 1 pH unit) compared with employing the exact same pH gradient using buffer system II (more buffer components with spacing of buffer pKa of approximately 0.5 pH units).Results showed that proteins were focused into narrow bands and improved resolution with more component buffer system II compared to buffer system I.

038 SYNAPTONEMAL COMPLEX AND THE PROTEASOME MEDIATE RECOMBINATION DURING MEIOSIS

Jasvinder Singh, M.S.; Rachel Soucek; Hanna L. Morris; G. Valentin Börner, Ph. D.
Center for Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University.

Proper segregation of chromosomes during meiosis is central to formation of healthy egg and sperm. Therefore, meiotic defects are the largest genetic cause of infertility, pregnancy loss, still births and severe birth defects. Meiosis is a highly conserved mechanism in all eukaryotes from yeast to humans and involves one round of DNA replication followed by two rounds of cell divisions. In meiosis I, homologous chromosomes (homologs) are juxtaposed by structurally conserved, coiled coil transverse filament protein (ZIP1 in *Saccharomyces cerevisiae* & SYCP1 in *Homo sapiens*) in a structure called the synaptonemal complex (SC). SC connects the axes of homologous chromosomes while they are undergoing recombination. Meiotic recombination is a process whereby induced double strand breaks (DSBs) are repaired using the homologous chromosome as template via Single end invasions (SEI) and double Holliday junctions (dHJ) which are resolved to form Crossovers (CO). These events are essential for bipolar orientation of chromosomes. This bipolar orientation ensures that the homologs segregate to opposite spindle poles. Although *ZIP1* is polymerizes along the juxtaposed homologous chromosomes forming the SC. Direct role of *ZIP1* in SEI formation or dHJ resolution has not been established yet. In this study, 1) we analyzed ZIP1 mutants for recombination and report that *ZIP1* mediates SEI formation and is essential for dHJ resolution. 2) We also performed a transposon mediated random mutagenesis screen and identified novel *ZMM* like mutants. *ZMM* mutants are defective for recombination. Novel mutations identified have been validated using targeted gene disruptions. The mutants thus identified display meiotic segregation defect. One such mutant has unpaired chromosomes at prophase of meiosis-I, is defective in processing of DSBs and exhibits extended S-Phase. Efforts are underway to determine the specific defect conferred by the mutations and to identify the particular step in recombination for which they are required.

039 TO VOLUNTEER OR NOT TO VOLUNTEER: INDEPENDENT STUDY, INQUIRY BASED LEARNING AND UNDERGRADUATE RESEARCH

Tobili Sam-Yellowe, Ph.D.
Department of Biological, Geological and Environmental Sciences; Cleveland State University

Undergraduate students curious about laboratory research will often inquire about volunteer research opportunities. Students familiar with independent study will inquire about enrolling for independent study while those familiar with the requirements and expectations of honors research will enroll in honors programs. Three target candidates for undergraduate research were identified by Kinkead (2003); the honors student, the at risk or underrepresented student and preservice teachers. With renewed interest in improving opportunities for students in science, technology, engineering and mathematics (STEM) disciplines, there is a need to ensure that undergraduate students are properly trained in research methods that are transferable to graduate and professional programs as well as to jobs in STEM careers. Students inquiring about research opportunities often lack knowledge about the research process, lack skills to initiate and conduct independent research and lack an understanding of research and scholarship. What is the role of the faculty mentor? What are the avenues for institutional support? How should research skills be taught in the context of individual and collaborative research, and the development of critical thinking skills? How should scholarship be taught? How can the undergraduate research experience be made meaningful to students with a wide range of research experiences (no research experience, vague ideas about research, prior research training)? Some students see undergraduate research as a volunteer experience that only has the benefit of providing letters of references for professional or graduate school. A very small number of students understand the role that the "discovery experience" will play in their future training or careers. Using research in parasitology as a model for mentoring undergraduate research students, I present case studies and recommendations for short and long term training of undergraduate students in research and scholarship that seeks to examine the role that independent study can play in the education of students.

040 RELATIONSHIPS BETWEEN NEGATIVE COGNITIONS, NIGHTMARE FREQUENCY, AND SLEEP DYSFUNCTION IN TRAUMA SURVIVORS

Michael D. Scur, B.A.; Lisa Stines Doane, Ph.D.
Department of Psychology, Cleveland State University

Sleep disturbances, such as nightmares, are one of the several arousal symptoms associated with PTSD and can have a debilitating effect on overall health and functioning. Previous research indicates that nightmare frequency is moderately correlated with subjective distress of nightmares (Krakow et al., 2002). Cognitive models theorize that PTSD symptoms and maintenance are influenced by negative trauma-related thoughts, which include beliefs about self-blame, trust, and dangerousness of the world (e.g. Foa, Ehlers, Clark, Tolin, & Orsillo, 1999). The purpose of this study was to examine the relationship between negative cognitions and nightmare frequency. We hypothesized that more negative trauma-related cognitions would be associated with increased nightmare frequency and general sleep dysfunction. Results suggest that, for those without PTSD but not for those with PTSD, negative cognitions about the self are related to both nightmares $r(55) = .389$, $p < .01$ and sleep dysfunction $r(55) = .536$, $p < .01$. Self blame ($r(55) = .276$, $p < .02$) and negative cognitions regarding the world ($r(55) = .245$, $p < .03$) were also related to sleep dysfunction. Clinical and theoretical implications will be discussed.

041 IMPACT OF A COMBINED DIDACTIC AND EXPERIENTIAL CLINICAL LEARNING EXPERIENCE ON DOCTOR OF PHYSICAL THERAPY STUDENT PERCEPTIONS OF THE PHYSICAL THERAPIST – PHYSICAL THERAPIST ASSISTANT RELATIONSHIP

Karen E. Vitak, DPT; Karen A. O'Loughlin, DPT; Susan S. Bazyk, Ph.D.
School of Health Sciences, Cleveland State University

Background and Purpose: The relationship between the physical therapist (PT) and the physical therapist assistant (PTA) continues to be poorly defined, and misperceptions may lead to inappropriate utilization and affect patient care. Inadequate educational preparation may be a contributing factor. The purpose of this qualitative study was to explore the impact of a combined didactic and clinical learning experience on DPT student knowledge, skills, and attitudes regarding the PT-PTA relationship. **Participants:** Eight second-year Cleveland State University Doctor of Physical Therapy (DPT) students were randomly selected from volunteers who completed an informed consent. **Methods:** The experience included didactic classroom information, two clinical sessions at the Community Health, Wellness and Preventative Care Centers at Cuyahoga Community College (CCC) alongside PTA students, and an interactive student seminar. Two forms of data were collected: 1) Written reflections (Clinical Performance Instrument Item re: "Direction and Supervision of Personnel" from previous clinical placements; post-seminar reflections); 2) Post-experience focus group which was transcribed verbatim. **Data Analysis:** A qualitative analysis was performed by multiple analysts using steps of Amedeo P.Giorgi (1975 as cited in Polkinghorne, 1989). **Findings:** DPT student knowledge, skills, and attitudes regarding the PT-PTA relationship were positively impacted by this experience; however the degree to which this occurred varied for individual students. Students increased their awareness of factors involved in this complex relationship. **Conclusions:** Contextual differences such as location and supervisory management of the educational process may have contributed to individual differences. Future research is needed to determine the most effective structure for the experience to show maximal meaningful change.

042 GOING OUT ON A LIMB: BIOMECHANICS OF RUNNING ON TREE BRANCHES VERSUS ON FLAT GROUND

Andrew J. Leith; Andrew R. Lammers, Ph.D.
School of Health Sciences, Cleveland State University

Animals in the wild have adapted to their natural environment, whether it be up in the trees or on the forest floor, and in the case of some animals they found it useful to adapt to both. These animals have adapted to two very different substrates and it stands to wonder if their biomechanics are also very different when on a branch compared to flat ground. In order to see if there are some differing biomechanics we trained three Siberian chipmunks (*Tamias sibiricus*) to run along an arboreal trackway (a cylindrical trackway 2cm in diameter), and a terrestrial trackway, 10.3cm wide. Our data show that on both trackways, forelimbs are net braking and hindlimbs are net propulsive. This result differs from previously collected data on opossums, where the forelimbs dominate both braking and propulsive roles during arboreal locomotion. We also found that while our terrestrial data show that body weight is distributed evenly between the forelimbs and hindlimbs, on the arboreal

trackway the forelimbs support most of their body weight. This pattern is opposite of what is typically observed among primates, which support most of their body weight with their hindlimbs, especially on arboreal supports. Adapting to move in both terrestrial and arboreal environments is no easy feat, and it seems these animals are achieving it in their own way.

043 HIGH-RISK BEHAVIORS IN THOSE WITH AND WITHOUT PTSD

Richard J. Lawrence, B.A.; Amanda Valerian, B.A.; Lisa Stines-Doane Ph.D.
Department of Psychology, Cleveland State University

Most individuals will experience a traumatic event at some point in their lifetime, and a number of trauma survivors develop posttraumatic stress disorder (PTSD) in the aftermath (e.g., Kessler et al., 1995). Many previous studies have shown a correlation between surviving traumatic events and involvement in risky behaviors, such as drug use, alcohol consumption, and unsafe sexual behaviors (e.g., Smith, Davis, & Fricker-Elhai, 2004). The current study examines whether the trauma exposure itself, or PTSD, is actually associated with high-risk behaviors.

A sample of 53 trauma survivors was recruited. A battery of self report questionnaires was administered to assess for the presence and severity of PTSD symptomatology (Posttraumatic Diagnostic Scale; PDS) and past high-risk behavior involvement (Cognitive Appraisals of Risky Events-Revised; CARE-R). Mean differences in past frequencies of the risky behaviors (risky sex, drug, and alcohol use) were compared across the diagnostic groups (PTSD vs. no PTSD) based on symptom severity scores. Nineteen participants met criteria for PTSD. A significant difference (t (37) = -2.032, p = .004) was found in past risky drug use in the groups PTSD vs. no PTSD, such that those with more severe PTSD symptomatology engaged in more risky drug use behavior. This study suggests that those with PTSD symptoms are significantly involved in more high-risk drug use behavior. The findings of this study have implications for the development of programs focused on the prevention of drug abuse and future trauma exposure for trauma survivors with PTSD.

044 THE APPLICATION OF EYE-TRACKING TECHNOLOGY IN THE STUDY OF PROCESSING OF BODY IMAGE WORDS IN EATING DISORDERED INDIVIDUALS

Teresa A. Markis, M.A.[1]; Conor T. M[c]Lennan, Ph.D.[1]
[1]Department of Psychology, Cleveland State University

Empirical evidence has revealed that patients with an eating disorder selectively attend to stimuli related to their concerns, and that this attentional component might be one way in which eating disorders are maintained. Research using a variant of the Stroop paradigm has robustly demonstrated that women with an eating disorder are slower (than controls) to color name words related to eating, weight and shape. While the Stroop effect has captivated researchers for many years, the reaction time data does not provide us with how the effect unfolds over time. Cognitive processes must be inferred. The eye-tracking methodology allows for word perception to be studied non-invasively and with real-time precision. This study is designed specifically to examine the use of eye-tracking to investigate this aspect of information processing in individuals with an eating disorder. Participants will listen to spoken words over headphones and will see the corresponding neutral word plus three distractor words (THIGHS, BOOK, SHOE) on the computer screen. Mean target and distractor fixation times will be compared across the three word type conditions and at various points throughout the trial. Our study has two hypotheses. First, we predict that individuals with an eating disorder will spend more time fixating body image related distractor words (THIGHS) relative to participants in the control group. Second, we predict that eye-tracking is a sound methodology for investigating information processing in eating disorders.

045 PREDICTING INTERACTIVE BEHAVIOR OF CYTOKINES AND THEIR RECEPTORS BY DIELECTRIC THERMAL ANALYSIS AND THERMOGRAVIMETRY

Susan E. Moreno-Molek, B.S.[1]; Salaam Saleh [1]; Druthiman Reddy Mantheni, M.S.[2]; Manik Pavan Kumar Maheswaram, B. Pharm.[2]; Tobili Yvonne Sam-Yellowe, Ph.D.[1]; Alan T. Riga, Ph.D.[2]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University,
[2]Department of Chemistry, Cleveland State University

Cytokines and soluble cytokine receptors serve as important protein biomarkers for chronic and infectious disease diagnosis. The development of biosensors capable of detecting cytokines or their soluble receptors in patient bodily fluids is a growing

area of research. In an ongoing series of studies to understand the thermal analytical behavior of cytokines and their soluble receptors, Dielectrical Thermal Analysis (DETA) and thermogravimetry (TG) were used in investigations to determine if differentiations based on dielectrical properties (e.g. conductivity) of the proteins could be identified. Permittivity (ε') and dielectric loss factor (ε") measurements were preformed over a frequency range of 0.1 to 300,000 Hz. Up to 20 min, water associated with the samples was conductive, interacting with the proteins and affecting the temperature-dependent relaxation spectra of proteins. A trend analysis revealed differences between surface charge at 0.1 Hz and bulk charge at 300,000 Hz. In addition, the greatest change detected among the proteins was due to conductivity (dielectric loss factor). Beyond a 20 min drying time, the observed conductivity was due to intrinsic properties of the proteins with limited dependence on frequency and conductivity. A 100 % water loss was obtained for samples within 20-30 min by TG. Sample drying by TG could serve as a preparatory step in drying protein samples for further DETA and DSC analysis.

046 ESTIMATING THE CONSERVATIVE COST OF OZONE DEPLETION AS A PART OF GENUINE PROGRESS INDICATOR FOR NORTH EAST OHIO FOR 2008

Orhan A. Gurbuz, B.A.
College of Urban Affairs, Cleveland State University

GDP and GNP are not good indicators of social welfare. For example, according to the GDP approach, pollution is an indication of economical growth. It brings about economic activity. However, it is not possible to accept pollution as a classification of well-being. Because of these misleading estimations, alternative methods of evaluating social welfare have been presented. In 1995, an alternative metric system was introduced for calculating the social welfare. The Genuine Progress Indicator (GPI) is a calculation system that can separate the benefits (positives) and real costs (negatives) of economical growth. This study is an attempt to estimate the non-accumulating cost of ozone depletion, which is an indicator of the cost of environmental degradation for GPI estimates for the State of Ohio, in two cities; Cleveland and Akron, and 17 North East Ohio counties for 2008. The method of Talberth et al. 2007 was followed for estimating the 2008 cost of ozone depletion. Population data were obtained from American Fact Finder for 2007-2009 three year estimates. Ozone depleting product emissions were obtained from Alternative Fluorocarbons Environmental Acceptability Study. The results of this study exhibit the effectiveness of the Montreal Protocol in regulating ozone depleting emissions. Data from Bangstand et al. 2005 clearly depict the change of the cost of ozone depletion in North East Ohio. Producing ozone depleting emissions could be a proof of economical growth for anthropocentric ideology. Certainly this depletion causes degradation of social welfare and this decline can be considered by the GPI approach.

047 LAND ANALYSIS: FINDING SUITABLE LAND FOR FIRE TOWERS IN GREEN MOUNTAIN NATIONAL FOREST, VERMONT

Alicia D. Bonskowski, B.A.
Department of Environmental Studies, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

Forest fires cause widespread significant damage. Forest fires result in the losses of recreational land, natural resources, and both vegetation and wildlife habitats. In a large forested area, such as a National Forest, it is important to spot and locate a fire immediately, in order to properly manage the fire. Areas that are secluded and inaccessible can allow a fire to grow in size before it is noticed. Early detection is key in forest fire management. To scan a forested area for fires, it is critical to be above the canopy of trees. A fire tower is essential to visually spot a fire and determine its location. The location of a fire tower is a crucial aspect to the supervision of a forest. An effective location for a fire tower can be found through the use of Geographic Inforamtion Systems (GIS) and the Analytic Hierarchy Process (AHP). The Green Mountain National Forest, located in Vermont, spans a large area. To cover the large area, it was found that three fire towers need to be constructed to maximize the amount of land that can be supervised. Land within the Green Mountain National Forest was weighted and evaluated according to specific criteria based on elevation, land cover, slope, and distance to roads and rivers. With the use of GIS and AHP, three optimal locations were identified. The entire Green Mountain National Forest cannot be seen through the combination of all three locations, however, based on the suitable land available, the locations create the best coverage possible.

048 PRIMARY CILIA REGULATES ENDOTHELIAL CELL DIRECTIONAL MIGRATION THROUGH HSP-27 DEPENDENT MODULATION OF ACTIN CYTOSKELETON AND FOCAL ADHESIONS

Thomas J Jones[1], Ravi K Adapala[2], Werner j Geldenhuys[1], Chris Bursley[1], Surya Nauli[3], Charles K Thodeti[2]
[1]Department of Pharmaceutical Sciences;
[2]Integrative Medical Sciences, Northeastern Universities Colleges of Medicine and Pharmacy, Rootstown, OH 44272;
[3]Department of Pharmacology, College of Pharmacy;
[4]Department of Medicine, College of Medicine, University of Toledo, Toledo, OH 43606;

Cilia are mechanosensing organelles that communicate extracellular signals into intracellular responses. Altered functions of primary cilia play a key role in the development of various diseases including polycystic kidney disease. Here, we show that endothelial cells from the oak ridge polycystic kidney (Tg737orpk/orpk) mouse, with impaired cilia assembly, exhibit a reduction in the actin stress fibers and focal adhesions compared to wild type. In contrast, endothelial cells from polycystin-1 deficient mice (pkd1null/null), with impaired cilia function, display robust stress fibers and focal adhesion assembly. We found that the Tg737orpk/orpk cells exhibit impaired directional migration and endothelial cell monolayer permeability compared to the wild type and pkd1null/null cells. Finally, we found that the expression of heat shock protein 27 (hsp27) and the phosphorylation of FAK are down regulated in the Tg737orpk/orpk cells. Taken together, these results demonstrate that disruption of the primary cilia structure or function compromises the endothelium through the suppression of hsp27 dependent actin organization and focal adhesion formation, which may contribute to the vascular dysfunction in ciliopathies.

049 ECOLOGICAL DISTRIBUTION OF TARDIGRADES IN THE CLEVELAND METROPARKS

Meghan Robertson[1]; Geza Varhegyi, Ph.D.[1]
[1]Department of Health Careers/Sciences, Cuyahoga Community College

Tardigrades or water bears, as they are popularly known, are microscopic segmented water-dwelling organisms that form their own phylum, *Tardigrada*. Nearly 1000 described species have been identified so far worldwide, but very little information is available on the status and distribution of tardigrades in Northeast Ohio. Since tardigrades are good indicator of environmental quality, and possess characteristics that are focus of intense scientific research, such as cryptobiosis and the related production of the sugar theralase, we sampled tardigrades in the Cleveland Metroparks, collecting information about the environment they live in at the same time. Moss samples were collected in several reserves within the Metroparks during the spring, summer and fall of 2010 and were evaluated for presence/absence, density and species diversity of tardigrades. High resolution pictures of species from both Eutardigrada and Heterotardigrada class were captured using a forensic photographic microscope. We found that moss type, hydration, and physical location of samples all affected the abundance and distribution of tardigrades. Presence/absence of rotifers, nematodes and bacteria also affected abundance of tardigrades. The results of this introductory survey of tardigrades will assists in evaluating environmental quality in the Cleveland Metroparks as well as serve as baseline data on the distribution and the species richness of these organisms in Northeast Ohio.

050 HOME SWEET METH LAB

Bryan D. Robinson, B.A.
Department of Urban Studies, Cleveland State University

Because no mandatory legislation exists regarding the cleanup, disclosure and documentation of clandestine methamphetamine laboratories, Americans are unnecessarily being put at risk. The production of this drug creates large amounts of waste and leaves behind chemicals that can be harmful to human health. Citizens can be unknowingly exposed to these chemicals and wastes when purchasing a house or property that has been utilized to “cook” the drug. This can leave people with homes they cannot live in and result in costly legal battles. Legislation must be created to give the Drug Enforcement Administration, Environmental Protection Agency and local Health Departments the authority to police these hazards and require their cleanup, while being able to hold parties accountable for the cost (in most cases the previous owner). A national list of contaminated properties and the progress that has been made on their cleanup must be made available to the public so they are aware of what is occurring around them and can be informed when making a property purchase. Before a building or house can be put up for sale, it should be mandatory that the levels of chemicals used in the production of methamphetamines be tested in each room. If unsafe levels are recorded, the property should not be eligible to

go up for sale until remediation has occurred. If these actions are taken, the adverse effects of methamphetamines can be reduced.

051 HUMAN CYTOKINES CHARACTERIZED BY DIELECTRIC THERMAL ANALYSIS, DIFFERENTIAL SCANNING CALORIMETRY AND THERMOGRAVIMETRY

Salaam Saleh[1]; Susan Moreno-Molek B.S.[1]; Druthiman Reddy Mantheni M.S.[2]; Manik Pavan Kumar Maheswaram BPharm[2]; Tobili Sam-Yellowe, Ph.D.[1]; Alan T. Riga, Ph.D.[2]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University
[2] Department of Chemistry, Cleveland State University

Malaria affects over 500 million people worldwide leading to 1-2 million deaths each year, the majority of whom are children. Four Plasmodium species cause malaria in humans. In order to properly diagnose, and correctly treat malarial infections, accurate diagnosis of infection is required. Proper diagnosis of infection will result in a reduction of morbidity, mortality and of drug resistant parasites. However, the current tests for malaria diagnosis do not efficiently identify the appropriate human and parasite biomarkers associated with disease. Detection of specific inflammatory mediators such as cytokines associated with malaria pathogenesis will aid the determination of disease progression, disease prognosis and the early diagnosis of malaria infection. In this study, we used dielectric thermal analysis (DETA), Thermogravimetric analysis (TG) and Differential Scanning Calorimetry (DSC) to characterize five human cytokines (IL-1α, IL-2, IL-4, IL-6, and IL-10), to demonstrate how their thermoanalytical properties can be investigated for sensor design. Analysis for DETA was performed at a frequency range of 0.1-300,000 Hz. Permittivity and loss factor measurements were used to calculate Tan δ values. Peak frequencies were used to determine dielectric signatures for each cytokine. The peak frequencies were different for each cytokine analyzed. In addition, activation energies were frequency dependent for IL-2 but frequency independent for the remaining four cytokines. Cytokines were also examined using DSC which established variance in heat of crystallization and heat of fusion among the five cytokines. A noticeable differentiation was observed with IL-1 α amongst the other four cytokines when analyzed using trend analysis. Detection of unique dielectric signals will aid development of sensitive dielectric sensors capable of detecting cytokines in various human samples.

052 INVITRO HUMAN CELL-FREE EXPRESSION SYSTEM FOR SYNTHESIS OF MALARIA PROTEINS

Raghavendra Yadavalli, B.S.; Tobili Sam-Yellowe, Ph.D.
Department of Biological, Geological and Environmental Sciences; Cleveland State University

Malaria caused by *Plasmodium* species results in1-2 million deaths every year. There are no vaccines for malaria. Epidemics are re-emerging because of the drug-resistant parasites and insecticide resistant mosquitoes. Expression of recombinant *Plasmodium* proteins in *Escherichia coli* for use in vaccine and diagnostic studies remains challenging. In the prokaryotic *E. coli* system, eukaryotic proteins may be incorrectly folded, proteins may become insoluble and protein modification does not occur. In addition, *Plasmodium* genes are highly AT rich, resulting in poor expression in prokaryotic systems. Eukaryotic proteins may be toxic to the bacteria resulting in reduced protein expression. Alternate approaches for the expression of malaria proteins in cell-free expression systems are under investigation. Wheat germ and rabbit reticulocyte cell free-expression systems are used for expression of malaria proteins. However, these systems differ in the length of time required to obtain expressed protein and in the yields of protein expressed. Cell-free-expression of *Plasmodium* proteins was performed using the Invitro Human cell free expression system. Successful expression of malaria proteins using 3 *P. falciparum* genes; PFc14_0344, PfA0680c, PFc0120w and 4 *P. yoelii* genes; PY01759, PY00763, PY07482 and PY04666 were obtained. Genes were cloned into a plasmid expression vector, pT7CFE1-CHis. The recombinant vector was allowed to transcribe mRNA in transcription mix for 75 minutes at 30°C. Subsequently, 2 µl of transcribed product was used to translate the malaria proteins. Following translation, the expressed proteins were separated on SDS-PAGE and analyzed by His-tag staining and by western blotting. Antibodies against whole rhoptries of *P falciparum* and *P. yoelii* merozoites were used to identify translated proteins. The antibodies exhibited cross reactivity among the expressed proteins of *P. falciparum* and *P. yoelii*. The results strongly suggest that the invitro human cell-free expression system can be used for expressing proteins for use in immunization studies.

053 META-ANALYSIS OF HOST INFLAMMATORY MEDIATORS ASSOCIATED WITH MALARIA PATHOGENESIS

Ivan Matthews, M.Ed.; Tobili Sam-Yellowe, Ph.D.
Department of Biological, Geological and Environmental Sciences; Cleveland State University

Malaria is one of the most prevalent parasitic diseases in the world. Currently there are no available vaccines to prevent malaria and drug resistance by the parasite is being observed in many malaria enedemic areas of the world. Malaria is responsible for over three-hundred million infections worldwide and approximately one to two million deaths annually. Malaria is caused by infection with parasites of *Plasmodium* species, that are one-celled organisms called protozoans transmitted through the bite of the female *Anopheles* mosquito. There are five *Plasmodium* species that infect humans: *P. knowlesi, P. vivax, P. ovale, P. falciparum and P. malariae,* of which *P. falciparum* is the agent that causes severe and potentially fatal malaria. Malaria pathogenesis results from the dysregulation of host inflammatory mediators. Host mediators are associated with disease progression and prognosis. The mediators can be used as important biomarkers for disease diagnosis. This meta-analysis examines several studies performed in different geographic areas, to evaluate host inflammatory mediators (pro-inflammatory and/or anti-inflammatory molecules) associated with uncomplicated malaria (UM), cerebral malaria (CM), placental malaria (PM), severe malarial anemia (SA), and severe malaria (SM) to determine whether they may be considered as effective biomarkers in malaria diagnosis and to aid prompt therapeutic intervention..

054 INVOLVEMENT OF RNASE L IN INNNATE IMMUNITY AND TUMOR GROWTH

Xin Yi, M.A.[1]; Xiaoli Chen, Ph.D.[1]; Chun Zeng, M.A.[1]; Hongli Liu, Ph.D.[1]; Boosoek Yun, M.A.[1]; Ge Jin, Ph.D.[2]; Aimin Zhou, Ph.D.[1]
[1]Department of Chemistry, Cleveland State University;
[2]Department of Biological Sciences, Case Western Reserve University School of Dental Medicine

Macrophages are one of the major cell types in innate immunity against microbial infections through endocytosis and phagocytosis. It is believed that the expression of proinflammatory genes such as TNF-α, IL-1β, IL–6, and COX-2 is crucial for macrophage phagocytosis and migration. By using bone marrow-derived macrophages (BMMs) from RNase $L^{+/+}$and $^{-/-}$ mice, we demonstrated that RNase L is involved in macrophage functions and migration ability. RNase L deficient BMMs showed a significant reduction of phagocytic activity to E.*coli* bacteria when compared to wild type cells under the same condition. In addition, lack of RNase L remarkably decreased the migration of BMMs and peritoneal macrophages induced by M-CSF, but at a less extent by GM-CSF, MCP-1 and IFN-γ. To determine the role of RNase L in tumor growth, $P53^{-/-}$ $RL^{+/+}$ and e $P53^{-/-}$ $RL^{-/-}$ cancer cells were subcutaneously implanted on the back of RNase L null and wild type mice with C57/BL6 background, respectively. Surprisingly, the average tumor weights from RNase $L^{+/+}$ mice with $P53^{-/-}$ $RL^{+/+}$ cells was 3-fold heavier than that with $P53^{-/-}$ $RL^{-/-}$ cells. Although tumors growing on RNase $L^{-/-}$ mice with both cell types were significantly smaller than that on RNase $L^{+/+}$ mice, presence of RNase L was overtly favorite for tumor growth. Immunohistostaining revealed that the numbers of infiltrated macrophages were markedly higher in the tumor tissues from the wild type mice with RNase $L^{+/+}$ cancer cells. Depletion of macrophages clearly inhibited tumor growth on RNase $L^{+/+}$ mice, suggesting that RNase L may promote tumor growth through regulating the function of tumor-associated macrophages (TAM). Furthermore, reduced expression of IL-6, TNF-α, and CCL2 was observed in tumors from RNase $L^{-/-}$ mice when compared to that from wild type mice. Taken together, our findings implicate that RNase L may play a dual role in innate immunity and tumor promotion.

055 IMPACT OF HEALTHY AGING AND BASAL GANGLIA DETERIORATION ON SPATIAL LEARNING

Gregory J. DeGirolamo, B.S.; Naohide Yamamoto, Ph.D.
Department of Psychology, Cleveland State University

This study examines the impact of healthy aging and basal ganglia deterioration on two important factors that are common in spatial learning. The first is the perspective a person views an environment from. The second is the sequence that the items are encountered in the environment. In order to test their effects on spatial learning, participants will watch four videos in which they will learn two environments from the ground-level perspective and another two from an aerial perspective. One video of each perspective will present each side of the rectangular layout sequentially and the other will present the layout in a random order. After each video, participants will create a map of the environment to determine how well they learned the layout. This study will compare performance between healthy young adults, healthy senior citizens, and patients with

Parkinson's disease. Patients with Parkinson's disease have a decreased functioning in the basal ganglia and this brain structure plays a role in processing sequential information. Therefore, it is anticipated that the patients will have trouble learning object locations in sequential order. Conversely, when the sides of the layout are presented in random order, their performance is expected to be similar to healthy senior citizens. It is also anticipated that healthy senior citizens will show a similar pattern of learning to healthy young adults with the exception of having a higher level of error. Overall, the present study will demonstrate that the ability to process spatial information will decline with age and that the ability to process sequential information in the context of spatial learning will deteriorate when there is a decline in functioning of the basal ganglia.

056 LOVE CANAL: A NEIGHBORHOOD STILL AT RISK?

Patricia A. Barnes, B.S.
Department of Urban Studies, Cleveland State University

Love Canal, in Niagara Falls, New York, is among the earliest and most significant hazardous waste sites in the United States. It was declared an Emergency Declaration Area in 1978. This study examines the condition of the Love Canal neighborhood today and attempts to assess the likelihood of future exposure of residents to the toxic wastes still buried there. Clean-up and containment efforts have been largely successful in limiting risks associated with direct contact or airborne exposure from the landfill itself. However, two routes of chemical exposure still remain: The existing contamination in non-remediated soils in the neighborhoods surrounding Love Canal; and the underground migration of the chemical waste through the groundwater and subsurface aquifers. Although sewers were cleaned and "hotspots" remediated, no generalized cleanup measures were taken around residential homes to the north of the canal, which were found to have toxic chemicals in their yards, including dioxin and PCBs. Further, instances of chemical waste migration have already occurred outside of the landfill containment, including most recently in January 2011, where excavation of sewer lines within the Black Creek Village neighborhood revealed a large pocket containing hundreds of gallons of toxic waste linked to Love Canal. Scientific studies suggest a link between living near a hazardous waste site and the increased likelihood of birth defects and some cancers. Reproductive effects from "endocrine-disrupting" chemicals such as dioxin have also been shown to carry forward for multiple generations. At Love Canal, currently 2000 people live within one mile of the landfill site. More research is needed to improve and expand understanding of the risks to human health from chemical wastes disposed of in landfills.

057 THE ROLE OF *TRYPANOSOMA BRUCEI* TRF DNA BINDING ACTIVITY IN ANTIGENIC VARIATION

Imaan Benmerzouga, B.S.; Bibo Li, Ph.D.
Center for Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University

Trypanosoma brucei is a protozoan parasite that causes sleeping sickness in humans and nagana in cattle. When inside the mammalian host, *T. brucei* cells stay in extracellular spaces and regularly switch their surface antigen, Variant Surface Glycoprotein (VSG), to escape the host's immune response. To maximize the efficiency of VSG switching, *T. brucei* expresses a single type VSG at any time exclusively from one of nearly 20 identical VSG expression sites located next to the telomere. Monoallelic expression of VSG and VSG switching are important for *T. brucei* pathogenesis. We have recently found that RAP1, an intrinsic component of the *T. brucei* telomere complex, is essential for silencing subtelomeric VSG genes, indicating that the telomere structure is important for antigenic variation in *T. brucei*.

Telomeres are nucleoprotein complexes located at ends of linear chromosomes and essential for maintaining genome integrity. We have identified *T. brucei* TRF as a duplex telomere DNA binding factor. Most importantly, we have found that TRF is an essential structural component of the telomere complex. To better understand how TRF helps to stabilize the telomere structure and what role does it play in antigenic variation, we aim to further study its telomere DNA binding function.

TRF uses its C-terminal myb domain to recognize the telomere DNA. In collaboration with Dr. Yanxiang Zhao at Hong Kong Polytechnic University, we have recently solved the NMR structure of the TRF myb domain. Based on this structure, we have generated point mutations in the myb domain, which displayed weakened or no DNA binding activities *in vitro*. We have now introduced these mutants in *T. brucei* cells, and we are confirming their weakened DNA binding *in vivo* using chromatin immunoprecipitation analysis. Interestingly, these TRF mutants showed weaker interaction with RAP1, although they do not seem to affect VSG silencing. Whether these mutants affect VSG switching is currently under investigation.

058 HUMAN SPEMATOZOA QUALITY IN PRESENCE OF L-CARNITINE DURING PROCESSING FOR *IN VITRO* FERTALIZATION

Saleem A. Bani Hani, M.Sc.[1,2]; Reda Mahfouz, M.D.[2]; Rakesh K. Sharma, Ph.D.[2]; Ashok Agarwal, Ph.D.[2]; Mekki Bayachou, Ph.D.[1]
[1]Department of Chemistry, Cleveland State University;
[2]Centers for Reproductive Medicine, Cleveland Clinic.

In vitro fertilization (IVF) is one of the successful approaches used to increase reproduction chances for infertile males. Sperm preparation protocols for IVF involve *in vitro* incubation and centrifugation of neat semen. Later studies showed that sperm incubation and centrifugation are increasing the level of reactive oxygen species in semen. L-carnitine (LC) is a quaternary ammonium compound. In our bodies, it facilitates the transport of activated fatty acids from cytosol to the mitochondrial matrix. Later studies showed that it also exerts an antioxidant effect. We hypothesized that LC supplementation of semen during sperm preparation may counteract the damaging effects of pre-IVF processing. Here, we measure the effect of supplementation of semen with LC on sperm motility, viability, and oxidative DNA damage during processing of sperm for IVF. The antioxidant ability of LC was confirmed using the copper-reducing antioxidant capacity assay that we specifically adapted for semen. Using semen from healthy donors, we standardized LC concentrations that are not toxic to sperm using sperm motility and viability as measurement criteria after 2- and 4-hour incubation periods at 37 °C. Control samples without LC supplementation were subjected to the same assays. Results were compared and contrasted to determine the beneficial range of LC concentration and an optimized concentration of LC was determined. Semen samples from infertile patients were centrifuged 20 min at 1600 rpm with the optimized LC concentration. Centrifuged sperm were analyzed for motility, viability and DNA damage. The DNA damage was analyzed using flow cytometry. LC of 0.5 mg/ml was useful to increase sperm motility, but not viability, during sperm incubation and centrifugation ($P < 0.05$). The flow cytometry analyses showed a decrease, but not statistically significant, in the intensity of fluorescence, and thus in the DNA damage, for sperm centrifuged with LC compared to those processed without LC.

059 MECHANISM AND ROLE OF AUTOPHAGY INDUCTION IN LEUKEMIC B CELL RESPONSE TO DNA-DAMAGING CHEMOTHERAPY

Arishya Sharma, M.Sc. (Hons.)[1,3]; Kamini Singh, Ph.D.[1]; Suparna. Mazumder, Ph.D.[1]; Alex Almasan, Ph.D.[1, 2]
[1]Department of Cancer Biology, Lerner Research Institute;
[2]Department of Radiation Oncology, Cleveland Clinic;
[3]Department of Biological, Geological and Environmental Sciences; Cleveland State University

Treatment with DNA-damaging agents activates the DNA Damage Response (DDR) in a cell in order to promote cellular survival. When the DNA damage is overwhelming, the outcome is one or more form(s) of cell death, such as apoptosis, necrosis, or autophagy. Unlike apoptosis and necrosis, autophagy (a catabolic degradation response to cellular stress) is implicated in both cell death as well as drug resistance. Fludarabine (Fd), a purine analog, is used as a frontline therapy for Chronic lymphocytic leukemia (CLL). However, Fd-refractory patients become resistant to most other chemotherapeutic agents. Interestingly, bendamustine (Bd), a bifunctional alkylating agent and purine analog, has shown excellent efficacy in patients refractory to Fd. The mechanism by which Bd overcomes Fd-mediated resistance is not clearly understood. The aim of this study is to investigate the mechanism of autophagy induction and its role in mediating Bd/ Fd-induced cell death/ resistance in leukemic B cells. Both Bd and Fd induced autophagy in Nalm-6 and IM-9 cells as shown by conversion of cytosolic-associated protein light chain 3 (LC3I) into the autophagosome-associated form (LC3II) and a punctate fluorescence pattern of endogenous LC3. The lysosomal inhibitor chloroquine accumulated both Bd- and Fd-induced LC3II, indicating an increased autophagic flux. Levels of p62, which is degraded via autophagy, decreased following both Fd and Bd treatments. Additionally, ectopic expression of the pH-sensitive GFP-mCherry-LC3 fusion protein in Nalm-6 cells showed an increased LC3 accumulation in the lysosomal compartments following both Fd and Bd treatments, indicating net autophagic outflux. Moreover, shRNA-mediated knock-down of ATG7 in Nalm-6 cells decreased Fd- and Bd-induced cell death compared to parental Nalm-6 cells due to a decrease in drug-induced apoptosis. These data suggest that autophagy is involved in regulating chemotherapy-induced cell death. Future work will focus on understanding the mechanistic coupling of DDR to autophagy and cell death.

060 TRUNCATION OF RIBOSOMAL PROTEIN S5 ABROGATES GCN4 EXPRESSION BY ACTING DOWNSTREAM OF THE 48S COMPLEX ASSEMBLY

Arnab Ghosh and Anton A. Komar, Ph.D
Center for Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University

Ribosomal protein (rp) S5 belongs to the family of ribosomal proteins that contains rpS7 from prokaryotes and rpS5 from eukaryotes. RpS5 forms part of the exit (E) site on the 40S ribosomal subunit and is essential for viability in yeast. To investigate the function of the rpS5 and in particular the role of the N-terminal extension of the yeast protein (absent in bacteria), we obtained and characterized yeast strains in which the wt yeast rpS5 was replaced by its truncated variants, lacking 13, 24, 30 and 46 N-terminal amino acids, respectively. Biochemical analysis of the mutant yeast strains previously showed that the N-terminal part of the yeast S5 plays important roles in ensuring the efficiency and accuracy of elongation and initiation processes. In particular, we have found that cap-dependent initiation in YS5-46 strain (lacking 46 N-terminal amino acids) was reduced by about 50% as compared to the wild type strain. Here we further show that this strain fails to support re-initiation as evident by the use of GCN4-lacZ reporter constructs. Comparison of lacZ expression from various GCN4-lacZ reporter constructs (containing all four uORFs and/or two uORFs (uORFs 1&4) as well as one uORF4) allowed us to suggest that YS5-46 yeast strain possesses an initiation defect downstream of the 48S complex assembly. An increased association of initiation factors eIF2alpha, eIF1 and eIF5B with mutant 40S ribosomal subunits was also observed. We thus hypothesized, that rpS5 N-terminal truncation likely results in a slow dissociation of eIF2 from 48S complexes, thus also causing accumulation of eIF5B and in turn leading to compromised subunit joining. Therefore, truncation of rpS5 causes mutant ribosomes leaky-scan through the uORF1 AUG, making it further impossible for the scanning subunits to bypass uORFs 2, 3 or 4 and re-initiate at AUG codon 5 to translate the GCN4 ORF.

061 EXOTIC PETS LAWS IN OHIO

Rachael P. Welsh, B.A.S.
College of Urban Affairs, Cleveland State University

Ohio is one of a few states left with little if any regulation on the private ownership of wild exotic animals. Governor Strickland put in effect before he left office an emergency order to ban future ownership of wild exotic animals. These animals include coyotes, wolves, big cats, bears, primates, alligators, and specific snakes. This ban grandfathers in already owned exotic animals but prevents breeding of the exotic animals and the owner from obtaining new exotic animals. If this ban is passed and made into a law the Ohio Department of Natural Resources, Division of Wildlife would be responsible for implementing and regulating the law. This new law would help with the safety and well-being of the animals as well as the people that may come into contact with them. This new law would also have a direct impact on some small businesses that deal in the exploitation of wild exotic animals. In recent news reports, it has been stated that current Governor Kasich is not for the emergency order and will maintain the current unregulated state for ownership of wild exotic animals.

062 PUBLIC TRANSPORTATION ACCESSIBILITY IN ENVIRONMENTAL JUSTCIE AND COMMUNITY DEVELOPMENT

Benjamin L. Heerdt, B.A.
College of Urban Affairs, Cleveland State University

Environmental justice concerns the inequity of the distribution of environmental risks, typically in minority and low-income communities or areas. The lack of accessibility to public transit in low-income communities is an environmental risk to the residents' quality of life and equity, making this an environmental injustice. This inequity mirrors the inequity in the distribution of socio economic and culture statuses in urban areas (Schlosberg, 5). In 2005 the APTA found that 59.2% of riders used public transit in order to get to work. 30.7% of riders had no access to a car and 21.6% could not complete their trip if public transportation was not available. 40.6% of respondents made less than $50,000 a year, including the 20.1% who made less than $15,000. The number of people who: a) do not have a car; b) make less than $15,000 a year; and c) use public transit for work illustrates the need for more transit in low-income communities. Introducing more public transportation will ease congestion by offering a cheaper more efficient transit option. Leaving cars at home and taking public transportation that uses sustainable energies will greatly improve the community's air quality. Increasing public transportation improves mobility for the transportation disadvantaged, providing an opportunity for them to get to jobs, shopping centers, and any

other destination. Urban development and public transportation are inseparable. In areas of urban decline infrastructure improvements have been used to attract new residents and employers. Public transit is part of the urban infrastructure and if that was improved it could attract desired residents and businesses (APA, 56). Environmental justice is a new, holistic, and flexible way for public transportation issues to be discussed, confronted, and solved.

063 A SEIR MODEL FOR EBOLA HEMORRHAGIC FEVER AND THE BASIC REPRODUCTIVE RATIO

Shannon D. Disterhof, B.S.
Department of Mathematics, Cleveland State University

In this paper, we define and analyze a SEIR disease model for Ebola hemorrhagic fever. Our focus is on the basic reproductive ratio, R_0, which gives the estimated number of secondary infections an infected individual is expected to produce. We perform a time series analysis for the Congo 1995 epidemic to estimate the initial growth rate of the disease. Using this initial growth rate, we are able to empirically define R_0. We also introduce and define the next-generation method and matrix as another way to calculate R_0. Once we know R_0, we can create programs that allow us to predict the course of an Ebola epidemic, including the number of people killed.

064 CHARACTERIZE THE FUNCTION OF *TRYPANOSOMA BRUCEI* RAP1 PROTEIN

Vishal P Nanavaty, M.S. and Bibo Li, Ph.D.
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease; Cleveland State University

Trypanosoma brucei is a unicellular protozoan parasite that causes Human African Trypanosomiasis. In the bloodstream of its mammalian host, *T. brucei* periodically switches the major component of its surface coat, Variant Surface Glycoprotein (VSG), and thereby evading the host's immune elimination. Although there are more than 1,000 *VSG* genes and pseudogenes in *T. brucei* genome, *VSGs* are exclusively expressed from subtelomeric VSG expression sites (ESs). To ensure that previously active *VSG* is no long expressed after a switching event and to maximize *VSG* switching efficiency, only one of ~ 20 nearly identical ES promoters is fully active, resulting in a single type of *VSG* being expressed at any time. We have identified TbRAP1 as an intrinsic component of the *T. brucei* telomere complex and shown that depletion of TbRAP1 leads to derepression of subtelomeric silent ES-linked VSGs, demonstrating for the first time that the telomere structure is important for *VSG* expression regulation. We are currently investigating whether TbRAP1 also plays an important role in *VSG* switching and trying to identify TbRAP1-interacting factors.

065 BISPHENOL-A: THE CONTROVERSY

Lauren E. West, B.S.
Department of Environmental Engineering, Cleveland State University

Bisphenol-A is a plasticizer primarily used in the production of polycarbonate plastics and epoxy resins. It is one of the world's highest production-volume chemicals with consumption continuing to rise. People are currently debating the safety of chronic low-dose exposure to BPA through animal studies and some research on human diseases; it is possibly an endocrine disruptor. However, with small sample sizes and somewhat liberal subject selection criteria it is difficult to give a legitimate response. As precautionary measures, some countries have banned the use of BPA in producing plastics and epoxies. More studies need to be done to properly determine the relevancy of any possible long-term, adverse effects on humans.

066 LATE HOLOCENE CLIMATE VARIABILITY FROM EOLIAN SEDIMENTS IN RELICT SAN LUIS LAKES

Max R. Koran, B.S.; Fasong Yuan, Ph.D.; Michael Albert
Department of Biological, Geological and Environmental Sciences; Cleveland State University

The San Luis Lakes offer a unique study site for climatic and environmental conditions of the Rio Grande Basin as the area is strongly influenced by the El Niño-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO), is close to the northern end of North American Monsoon-influenced region, is sensitive to land-surface dynamics due to its proximity to the Great Sand Dunes, and is situated in a remote valley of high mountains with minimal human disturbance prior to European settlement in the 17th century. Cores collected from the San Luis Lake and Blanca Wetland in January 2010 via vibracoring have been split lengthwise, imaged, and described. A suite of analyses have been performed on the samples, including generating magnetic susceptibility profiles, a grain size analysis, a percent total inorganic carbon analysis, and stable isotopic analysis, An age model is currently under development, incorporating data from ^{14}C dating, ^{210}Pb dating, and OSL dating methods. A future analysis of the ratio of Mg to Ca present in carbonates will assist in interpretation of the data collected from the stable isotopic analysis.

067 BLOOD PRESSURE CORRELATION TO STUDENT'S EXAM SCORES

Ian Conant, Scott Fulton, Justin Jones, Chuck Tillie
STEM, College of Sciences and Health Professions, Cleveland State University

Everyone has experienced stress and pressure the day of an exam. We take a look to see if there are any trends in students blood pressure and how well they do on an exam. There are many factors that can affect a person's blood pressure other than the stress of an exam. We wanted to see if people with a higher blood pressure received a higher grade on the exam than those with a lower blood pressure. Students had their blood pressure taken the day of their exam, and all of the students are taking the same exam. A mean arterial pressure (MAP) will also be calculated on the students. The MAP gives good indication of how well the subject's organs are perfusing. We also plan to look at how possible overperfusion will affect students' test scores. Our faculty advisor will then let us know how the students' did on the exam, they will be given a random number to respect their privacy and keep participants' identities confidential. The students' exam scores and blood pressure will be matched together and we will look for trends that may help students in the future when taking exams. We hope the study will show whether keeping your cool or having a high blood pressure is beneficial to performance on exams.

068 AMINO ACID REGION 1000-1008 OF COAGULATION FACTOR V IS A DYNAMIC REGULATOR FOR THE EMERGENCE OF PROCOAGULANT ACTIVITY

Joesph R. Wiencek, BA[1]; Jamila Hirbawi Ph.D[2]; Michael Kalafatis Ph.D[1,2].
[1]Department of Chemistry, Cleveland State University
[2]Molecular Cardiology, Cleveland Clinic

Coagulation factor V is synthesized as a multidomain (A1-A2-B-A3-C1-C2) procofactor with nominal procoagulant activity. A highly basic region of amino acids in the B-domain of factor V suggests a potential sheathing of either the heavy or light chain fXa interface sites. We investigated the role of amino acid region 1000-1008 that contains seven basic amino acid residues. To ascertain the role of this region our laboratory has generated a recombinant mutant fV molecule with all activation cleavage sites ($R^{709}/R^{1018}/R^{1545}$) mutated to glutamine ($fV^{Q3}$), a mutant fV molecule with region 1000-1008 deleted ($fV^{\Delta B8}$), and a mutant fV molecule containing the same deletion with all activation cleavage sites changed to glutamine ($fV^{\Delta B8/Q3}$). The recombinant molecules along with wild type fV (fV^{WT}) were transiently expressed in COS7L cells, purified to homogeneity, and assessed for their capability to bind fXa within prothrombinase prior (fV) and after incubation with thrombin (fVa). The data showed that fV^{Q3} and fVa^{Q3} were unable to interact with fXa. In contrast, the K_d values for $fV^{\Delta B8}$ (0.9 nM), $fVa^{\Delta B8}$ (0.4 nM), $fV^{\Delta B8/Q3}$ (0.7 nM) and $fVa^{\Delta B8/Q3}$ (0.5 nM), were similar to the affinity of fVa^{WT} for fXa (0.22 nM). Two-stage clotting assays revealed that while fVa^{Q3} was practically devoid of clotting activity, the mutant molecules $fVa^{\Delta B8}$, and $fVa^{\Delta B8/Q3}$ had clotting activities comparable to fVa^{WT}. Thus, unactivated $fV^{\Delta B8/Q3}$ has an affinity for fXa that is similar to the affinity of fVa^{WT} for the enzyme. In addition, $fV^{\Delta B8/Q3}$ that cannot be cleaved and activated by thrombin or activated during the course of the clotting assay has similar clotting activity as fVa^{WT} (~3110 U/mg). These data strongly suggest that amino acid region 1000-1008 of fV contains a regulatory sequence protecting the organisms from spontaneous binding of

the procofactor to fXa and unnecessary prothrombinase complex formation which will result in catastrophic physiological consequences.

069 EXAMINING THE EFFECTS OF VARIATION IN EMOTIONAL TONE OF VOICE ON SPOKEN WORD RECOGNITION

Maura L. Wilson, B.A., Conor T. McLennan
Department of Psychology, Cleveland State University

Despite the importance of emotional tone of voice for optimal verbal communication, how it is processed and its effects on spoken word recognition have yet to be fully understood. The current study addressed this by examining the effects of intra-talker variability in emotional tone of voice on listeners' ability to recognize spoken words. Two lexical decision experiments, varying in task difficulty, were implemented to analyze participants' accuracy rates and reaction times (RTs). Previous research on spoken word recognition using this paradigm has found performance costs resulting from stimuli that mismatch on specific information (e.g., the identity of the talker) contained in the speech signal. Such *specificity effects* occurred only when processing was slower, not when processing was relatively fast. In the current study, when processing was fast (Experiment 1), no specificity effects of emotional tone of voice emerged. When processing was slow (Experiment 2), specificity effects of emotional tone of voice emerged, but only for target words spoken in a sad emotional tone of voice and not for frightened. RTs to sad target words mismatched in emotional tone of voice from prime to target blocks were longer than those that matched, but RTs to frightened target words were the same regardless of the emotional tone of voice of the word in the prime block. Separate analyses were conducted on the top and bottom performers on a Musical Listening Test (MLT). For those who scored in the top 25%, for sad target words only (not frightened), specificity effects of emotional tone of voice emerged. For those who scored in the bottom 75% on the MLT, no specificity effects emerged, regardless of emotional tone of voice. The results of the current study have important implications for theoretical models of spoken word recognition and emotional tone of voice.

070 HYDROLOGICAL AND BIOLOGICAL INFLUENCES ON PHOSPHORUS TRANSPORT AND SPECIATION IN THE CUYAHOGA RIVER

Jaime A. Quellos, B.A.; Fasong Yuan, Ph.D.; Chaojun Fan, Ph.D.; Joseph Andre; Jenifer Wiebusch
Department of Biological, Geological and Environmental Science; Cleveland State University

Although the total amount of phosphorus loading into Lake Erie has been rigorously regulated, to about 11,000 metric tons per year, the eutrophic conditions have persisted since 1995. Anthropogenic phosphorus loading into the lake that promotes algal growth is a suspected cause. The average daily total phosphorus (TP) concentration of stream water in the Cuyahoga River in recent years is about 0.197 mg/l and approximately 0.050 mg/l, or about 20-25% of that is soluble reactive phosphorus (SRP). SRP has been shown to be almost 100% bioavailable. Phosphorus concentration and loading were examined on the Cuyahoga River at the USGS monitoring station in Independence, Ohio. Together with effluent data from waste water treatment plants (WWTP) and historical nutrient data from the National Center for Water Quality Research at Heidelberg University, two observations have been noted: 1. TP from WWTP effluent has been calculated and the amounts monitored at Independence show that there is approximately a 40% reduction of SRP loading in the stretch from Akron WWTP to the Independence monitoring station. Biological influences such as biomass uptake and conversion to less bioavailable forms such as PP are being examined. 2. Samples taken just after a high discharge event show TP levels as expected, increasing in proportion to the total water discharge. Conversely, the SRP% of TP rises very quickly to levels greater than the average SRP/TP ratio just after an event. The SRP% of TP diminishes rapidly as discharge falls and eventually the SRP% of overall TP returns to average levels. The sharp increase in SRP is likely the result of discharge overload as input from storm drains, combined sewer overflows (CSO), and WWTP effluent increase.

071 EFFECTIVE TRANSITION FROM HIGH SCHOOL TO COLLEGE FOR STUDENTS WITH LEARNING DISABILITIES

Lindsay A. Marie, B.H.S.; Kerrie A. Shisila, B.A.; **Jason C. Valley, B.A.; Ian S. Grissett, B.A.S.M.;** Dustin R. Davison, B.H.S., B.A.; Glenn D. Goodman, Ph.D.
School of Health Sciences, Cleveland State University

The research question for this project was: What components contribute to an effective transition from high school to college among students with learning disabilities? We conducted a systematic literature review and analysis of research that was published between 1990 and 2011. We ranked 24 studies that met our inclusion criteria based on the following components related to quality of research: year of publication, participants, design, interventions, outcomes, quality of analysis, and limitations. After reviewing the research, four main components were identified as important for a successful transition to postsecondary education. These included knowledge of the differences between the laws in high school versus college, the role of the high school guidance counselor, the presence self-determination and self-advocacy, and effective use of assistive technology. The implications and recommendations for a successful transition from high school to college will be presented in our poster.

072 KINETIC CONTROL OF CO-TRANSLATIONAL PROTEIN FOLDING BY TRANSLATIONAL PAUSING

Sujata S Jha, M.S.[1]; Joerg Mittelstaet[2]; Marina V. Rodnina, Ph.D.[2]; Anton A. Komar, Ph.D.[1]
[1]Center for Gene Regulation in Health and Disease, Department of Biological, Geological and Environmental Sciences, Cleveland State University;
[2]Department of Physical Biochemistry, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany.

Recent experiments have provided evidences that protein folding in vivo is co-translational (i.e. occurring on the ribosome during the process of elongation of the polypeptide chain). Additionally it's known that rates of chain elongation during translation of proteins are not uniform. These two factors considered together suggest that mRNA carries additional information that might dictate the folding of protein itself. Although several factors can contribute to the discontinuous elongation rates, it was shown that the rate of protein synthesis on the ribosome is predominantly modulated by non-random use of synonymous. The distribution of rare and frequent codons appears to be non random and it was shown that there are regions on mRNA rich in rare codons which might lead to transient ribosomal stalling. The abundance of tRNAs is known to be directly proportional to the frequency of codon usage characteristic for a given organism, implying that a given frequent codon would be translated faster than an infrequent one. It was hypothesized that such optimization of the local translation rates might be necessary to fine tune the synthesis and folding of the nascent polypeptide chain growing on the ribosome, thus ensuring high accuracy of the in vivo co-translational folding. We are currently testing this hypothesis using different approaches that would allow us to study impact of relative distribution of rare codons and synonymous codon on co-translational folding intermediates and protein folding itself.

073 ROLE OF CIRCADIAN CLOCK PROTEIN BMAL1 IN SENESCENCE, AGING AND CONNECTION TO mTOR PATHWAY

Rohini V. Khapre, B.S.[1]; Anna A. Kondratova, Ph.D.[2]; William E. Samsa, B.S.[1]; Olga Y. Susova, Ph.D.[1]; Yuliya Debrovsky, B.S.[1]; Roman V. Kondratov, Ph.D.[1]
Department of Biological, Geological and Environmental Sciences; Cleveland State University
[2]Molecular Genetics

BMAL1(Brain and Muscle Arnt Like Protein 1) is a transcription factor and core component of the mammalian circadian clock . The circadian clock is an endogenous time keeping system that helps organisms to synchronize their physiological activities and behavior with the environment. Previously, our lab has shown that BMAL1 knockout mice show accelerated aging phenotype and cellular senescence in vivo. We investigated the mechanisms of BMAL1 deficiency associated senescence in cell culture and found that BMAL1 deficient cells are more sensitive to oxidative stress, which can contribute to senescence in vivo. Surprisingly we found that immortalized BMAL1 deficient cells have increased rate of proliferation. Based on these results we hypothesized that BMAL1 may regulate mTOR signaling pathway. The mTOR (mammalian target of rapamycin) pathway is a key regulator of cell growth and cell proliferation and aging. We have observed that cells from BMAL1 knockout mice show higher levels of phoshorylated S6kinase and 4EBP1 which are indicative of higher mTOR

activity. In our preliminary experiments, we observed that cells from BMAL1 knockout mice show higher protein content and larger cell size as compare with wild type. In agreement with cell culture data we also observed increased activity of mTOR pathway in the tissues of Bmal1-/- mice. Based on these results we suggested a model of functional interaction between the circadian clock and mTOR signaling pathway. Physiological significance of the suggested loop is adaptation to periodic changes in the nutrient availability.

074 THE TELOMERE TERMINAL STRUCTURE IN *TRYPANOSOMA BRUCEI*

Ranjodh Sandhu, M.S; Bibo Li, Ph.D.
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease; Cleveland State University

Telomeres are specialized nucleoprotein complexes at the end of linear chromosomes. They are essential for chromosome stability and genome integrity. In most eukaryotes, telomere DNA consists of simple repetitive TG-rich sequences, and there is a single-stranded 3' G-rich overhang at the very end of the telomere. This telomere G-overhang structure is essential for telomere maintenance: in the presence of telomerase, G-overhang serves as a substrate; in the absence of telomerase, G-overhang can mediate efficient break-induced-repair (BIR) of chromosome ends, an alternative mechanism for telomere maintenance and an important pathway for telomere recombination. Telomere recombination is particularly important for *Trypanosoma brucei*, a protozoan parasite and the causative agent of Human African Trypanosomiasis. *T. brucei* evades the host's immune attack by regularly changing its variant surface glycoprotein (VSG), and homologous recombination is one of several important mechanisms for VSG switching. Therefore, abnormal telomere recombination may affect VSG switching efficiency. So far, the telomere terminal structure in *T. brucei* is poorly understood, and the only available native in-gel hybridization analysis is not sensitive enough to reveal the details of this structure. To better characterize the *T. brucei* telomere G-overhang structure, we adopted a ligation-mediated primer extension assay. This assay allowed us to determine both the length and the terminal nucleotide of the telomere G-overhang, and we observed that the majority of *T. brucei* telomeres have very short G-overhangs that end in 5' TTAGGG 3'. Such TTAGGG-ending G-overhangs are greatly diminished in cells lacking TERT, the telomerase protein component, and in cells depleted of tbTRF, the duplex telomere DNA binding factor.

075 A DEFICIENCY OF THE CIRCADIAN CLOCK PROTEIN BMAL-1 RESULTS IN OSTEOPOROSIS

William E. Samsa, B.S.; Rohini V. Khapre, B.S.; Yuliya Dubrovsky, B.S.; Olga Y. Susova, Ph.D.; Roman V. Kondratov, Ph.D.
Department of Biological, Geological and Environmental Sciences; Cleveland State University

Osteoporosis is a disease characterized by reduced bone mass and an increased risk of fractures due to bone fragility as a result of the accumulation of microarchitectural damage. Brain and Muscle ARNT-Like protein 1 (BMAL-1) is a basic helix-loop-helix transcription factor and a core component of the mammalian circadian clock, which is an internal genetically determined system that controls an organism's circadian rhythms (Latin, Circa = around, Diem = day) in physiology and behavior. We have shown that a BMAL-1 deficiency in mice results in a progeria phenotype. We also observed that with age BMAL-1 deficient mice develop osteoporosis: they have reduced bone mineral density and decreased bone mass (both cortical and trabecular bone thickness is reduced). Mesenchymal Stem Cells (MSCs) play a central role in bone homeostasis. These cells are able to differentiate into osteoblasts, the bone forming cells; therefore, we hypothesized that a BMAL1 deficiency may result in defects in MSCs. We investigated the differentiation capacity of osteoprogenitor cells isolated from the bone marrow of Wild Type and *Bmal1*$^{-/-}$ mice. We used cell culture based differentiation assays and found that the ability of marrow osteoprogenitor cells to differentiate into osteoblasts is significantly compromised in BMAL1 deficient cells compared with wild type cells as measured by Alizarin Red and Von Kossa Staining. Thus, osteoporosis development in *Bmal1*$^{-/-}$ mice can be at least partially due to defective differentiation of MSCs. Molecular mechanisms of BMAL1 dependent regulation of osteoblast differentiation is currently in progress. We are investigating the effect of osteoblast differentiation on the expression and activity of BMAL1 and BMAL1 target genes.

076 OCCUPATIONAL THERAPY FOR RHEUMATOID ARTHRITIS: AN EVIDENCE-BASED PROTOCOL FOR TREATMENT

Beth A. Ekelman, J.D.; Alexander G. Davis, B.S.; Jessica **L.** Klan, B.S.; Deirdre R. Newburn, M.A.; Katie J. Pylypiak, B.S.; Nick M. Ricchino, B.S.
School of Health Sciences; Occupational Therapy Program; Cleveland State University

Currently to researchers' knowledge, there are no published evidence-based protocols for occupational therapy (OT) treatment of rheumatoid arthritis (RA). The purpose of this research was to conduct an evidence based review of the most relevant published literature investigating the effectiveness of current treatment principles used in occupational therapy intervention. From our findings, we developed an evidence-based protocol for OT treatment of RA that can be put into use to ensure that OT interventions used have been demonstrated to be effective in creating positive outcomes in one's life.

Research databases were searched over the period 1985–2011. The keywords were "rheumatoid arthritis" AND "treatment OR occupational therapy OR rehabilitation". These general keywords were combined with specific keywords relating to therapeutic exercise, energy conservation (EC), work simplification, joint protection (JP), fatigue, education, splinting, assistive devices, lifestyle redesign, and self-efficacy. Exclusion criteria included participants less than 18 years of age and articles with an emphasis on acute rheumatoid arthritis or osteoarthritis.

Therapeutic exercise may reduce pain, improve function, and improve overall strength and endurance in individuals with RA. The use of dynamic exercise in individuals may cause worse large joint radiographic damage. Splints can decrease pain and inflammation and improve function, but may have a negative effect on dexterity. Education on EC and JP can have positive effects on overall functioning, disease progression, psychological status, joint counts, self-efficacy, and fatigue. The use of assistive devices may decrease pain, swelling, and fatigue. Self management skills can help individuals cope with their condition and modify their lifestyles and make informed choices about treatment options. Improved psychosocial coping skills are positively related to pain relief and functional mobility. Individuals with RA should focus on eating a varied balanced diet. Changes in self-efficacy, regarding pain, fatigue, and mental distress, are positively related to changes in perceived health-status.

077 TESTING THE EFFICACY OF SMALL NUCLEAR snRNAs IN SPLICING INTERFERENCE

Chaucola K. Pleasant, B.S.; Girish C. Shukla, Ph.D.
Department of Physics, Cleveland State University

In nuclear pre-mRNA splicing, introns are removed through the work of small nuclear RNAs (snRNAs). In the human genome there are two types of introns. major class introns, the U2-dependent type, which are spliced by U1, U2, U4, U5 and U6 snRNAs, and the minor class introns, the U12 dependent type, which are spliced by U11, U12, U4atac, U5, and U6atac snRNAs. It has been shown that over expression of minor class spliceosomal snRNAs can have an inhibitory effect on the splicing of major class introns. To further test the concept we targeted the HER-2/Neu proto-oncogene, which is over-expressed in 20-30% of breast tumors. We constructed a series of mutant human U6atac and U11 snRNAs to target introns 1, 2, 6, 8, 12 and 13 of HER-2/Neu to block nuclear pre-mRNA splicing and down regulate protein synthesis. We transfected mutant snRNAs in breast cancer cell line MDA-MB-453 to determine the efficacy of our approach on HER-2/Neu pre-mRNA splicing interference. Our preliminary data indicates variable effect on the HER-2/Neu pre-mRNA splicing and protein synthesis in cultured cells. Further experiments are in progress to confirm the efficacy of mutant snRNAs in blockading of HER-2/Neu expression.

078 LEED ZOO EXHIBITS AND PUBLIC PRECEPTIONS OF GREEN BUILDING

Evan M. Zuzik, B.S., B.A.
Department of Environmental Studies, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

Zoo and Aquariums aim to teach the world about conservation and preservation of the natural world through living collections and education. In recent years there has been a growing trend towards zoos being a resource in sustainability and green practices. Zoos have been at the forefront of recycling, composting and more recently pioneering the use of energy efficiency and LEED (Leadership in Environmental Engineering and Design) certified buildings. This study examines if erecting new zoo buildings to LEED standards can influence public knowledge and perception about green buildings. We

will investigate how zoos, which are gradually moving toward all eco-friendly buildings, are anticipating and accommodating the educational challenges of informing their visitors in a way that is easily understood, accessed and motivational. Many zoos have been slowly adapting green practices, but the African Elephant Crossing exhibit at the Cleveland Metroparks Zoo will be the first large scale zoo exhibit built to LEED standards. As the exhibit approaches completion, employees try to balance the monumental zoological event of making a state-of-the-art animal exhibit with the engineering feat of refurbishing a 56 year old building to 39 LEED codes. The project has had to overcome obstacles of implementing specifications, which are traditionally integrated in the construction of office buildings, for a 5 acre exhibit which is home to multiple species, including multiple 13-ton elephants. The project manager, zoo director, group interpreter, educational program manager and graphics artists all have different plans for ways to relay the building achievement to the public, most of which involve waiting until initial opening has occurred and when the LEED certification is officially designated.

079 SYNTHESIS AND CHARACTERIZATION OF THERMALLY RESPONSIVE POLYSACCHARIDE NANOPARTICLES

Krista Freeman, B.S.; Sean Sheridan, B.S.; Imaan Benmerzouga, M.S.; John McKenna, M.S.; Kiril Streletzky, Ph.D
Department of Physics, Cleveland State University

Environmentally-manipulable nanoparticles (microgels) have been synthesized from the amphiphilic polymer hydroxypropyl-cellulose and characterized using dynamic and static light scattering spectroscopies. Careful synthesis studies have revealed dependences of microgel size and structure on polymer molecular weight, polymer concentration, salt concentration, and crosslinker density. An understanding of these dependences has allowed the synthesis of stable, largely spherical, and relatively small (about 100nm) and monodisperse microgels. The synthesized microgels exhibit a volume phase transition between temperatures of 40 and 41C, under which particles undergo a reversible 15-50-fold change in volume. The microgel structure, dynamics, and longevity have been systematically studied by light scattering both below and above the transition temperature.

080 FUNCTIONAL ROLE OF SYNAPTONEMAL COMPLEX PROTEIN ZIP1 OF *SACCHAROMYCES CEREVISIAE* DURING MEIOSIS

Rima Sahany, M.S.; Valentin G. Boerner, Ph.D.
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease;
Cleveland State University

Meiosis is a special type of cell division that produces four haploid cells from a single diploid cell. Misseggregation of chromosomes during meiosis is leading cause of birth defects and still births. As prerequisites to proper segregation, homologues must pair and undergo crossover recombination. Proper segregation of chromosomes during meiosis depends on a series of interactions between homologues, including formation of the synaptonemal complex. Synaptonemal complex is an elaborate proteinaceous structure that starts assembling between homologues at leptotene stage and completes at pachytene stage of meiosis I. Zip1, a central element of synaptonemal complex, is a coiled coil protein that bridges the space between the cores of the homologues and it plays a structural role in meiosis as a component of synaptonemal complex. Functional role of zip1 during various steps of recombination remains elusive. We are investigating the functional role of a specific Zip1 mutant protein called as Zip1C1, which fails to polymerize in to synaptonemal complex (Tung& Roeder,1998). It has already been shown by our lab that Zip1C1 mutant assists in recombination by promoting formation of single end invasion intermediate in the absence of polymerization in to synaptonemal complex. We now show that in the presence of wild type zip1 protein, Zip1 C1 does get incorporated into synaptonemal complex at specific positions. We are also doing a genetic screen to identify genes which when over expressed overcome (some) of the mutant phenotypes of zip1 mutant protein zip1c1.

081 CHIMERIC GLUTATHIONE S-TANSFERASES; THE STUDY OF PROTEIN'S THERMOSTABILITY

Rita M. Rozmarynowycz, B.S.; Amber A. Bentley, B.S.; Anton A. Komar, Ph.D.
Center for Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University

The ultimate goal of protein design is the creation of proteins with desired functions. We have constructed a set of engineered glutathione S-transferase (GST) proteins (denoted GSHKTs) in which peptide fragments (of varying lengths from 8 to 16 amino acids), derived from human high molecular weight kininogen (HK) domain 5, have been inserted into a surface GST loop (between GST residues Gly49 and Leu50). Functionally, these hybrid proteins cause inhibition of endothelial cell proliferation and experimental lung metastasis in mice, in contrast to the ancestor GST molecule, which does not possess these types of activities. Thus, chimeric GSHKTs can potentially be used as therapeutic agents. For a chimeric protein to be used as therapeutic agent high stability and retention of biological activity through purification and storage steps is required. However, as loop length increases, the stability of the protein usually decreases. Therefore, we have measured the stability of the GSHKT proteins using Differential Scanning Calorimetry (DSC). DSC analyses have shown that all of the chimeric GSHKT proteins (independently of the size of the inserted peptide) possess roughly 8 degrees C lower stability in comparison with the ancestor GST. According to the loop entropy model, loop closure in proteins becomes entropically more costly as the length of the loop increases. For short fragments, however, no direct relationship between the length of the inserted peptide and the destabilizing effect of the insertion has been observed. As a rule, insertion of the first two residues is on average more destabilizing per residue than the insertion of subsequent longer fragments. Our data corroborate these previous observations.

082 ESTIMATION OF BIOMASS AND DIVERSITY OF EARTHWORMS WITHIN THE CLEVELAND METROPARKS AND HOW THEY INFLUENCE PLANT AND SOIL INVERTEBRATE COMMUNITIES

A.F. Schermaier, B.S.E.E.
Department of Biological, Geological and Environmental Sciences; Cleveland State University.

Earthworms are not native to formerly-glaciated regions of North America. Their presence is primarily due to anthropogenic activities such as agriculture, sport fishing, and recreation. While worms can be beneficial for improving garden soils, they can be devastating to forest floor ecosystems and may impact plant and animal biodiversity and abundance. During the summer of 2010, sixty-six sites within the Cleveland Metroparks were studied for soil composition, plant habitat quality, and plant community composition. Earthworms and soil invertebrate communities were also sampled from these sites. Earthworm specimens (N=897) were analyzed for prevalence, assemblage composition, and biomass. Invertebrate community composition was analyzed for 60 of the 66 sites. Of particular interest is a recent arrival of the invasive earthworm of genus *Amynthas*. An allometric equation relating AFDM to length was developed from a set of specimens taken from northeastern Ohio forests in 2009, consisting of both *A. hilgendorfi* and *A. agrestis*. I hypothesize that sites with larger populations and diversity of earthworms will depress the richness and diversity of soil invertebrate communities as well as the percentage of sensitive plants, while boosting the prevalence of tolerant and non-native plants. The *Amynthas* allometric equation reliably predicts (R^2=0.959) AFDM from length measurements for the sample population (N=160) of *A. hilgendorfi* and *A. agrestis* and is useful for estimating biomass of subsequent *Amynthas* samples. By supplementing the aforementioned equation with previously published equations for other identified genus and species of earthworms, approximate biomass will be determined at each site. Fifty-five out of 66 sites sampled contained worms. Earthworm densities varied between 0 and 666 individuals per square meter (μ=132/m^2, σ=167/m^2). Analysis of relationships between earthworm communities and their impacts upon plant and soil invertebrate communities are ongoing.

083 REGULATION OF CELL DIFFERENTIATION THROUGH POST-TRANSLATIONAL PROTEIN MODIFICATION IN *GIARDIA INTESTINALIS*

Iryna G. Tsarukyanova, M.S.; Harry van Keulen, Ph.D.
Department of Biological, Geological and Environmental Sciences; Cleveland State University

Giardia intestinalis is a human parasite that inhabits in the intestine attached to the jejunal epithelium and causes nutrient malabsorption and severe dehydration, which is especially dangerous in children under 5 years old. Some studies indicate severe defects in the growth and development of the infected infants. According the World Health Organization about 200 million people are infected with *Giardia* worldwide, and only 500,000 develop symptoms. The parasite exists in two forms:

trophic (**trophozoite**) responsible for the disease symptoms, and a semi-dormant **cyst**, that could be transmitted to a new human host. Cysts are protected from the environment by a cyst wall build up from proteins and a complex polysaccharide, called by us: giardan. Cyst production can be induced in the laboratory. The first reaction in the cyst wall synthesis is isomerization and amination of fructose 6-phosphate to glucosamine 6-phosphate by glucosamine 6-phosphate deaminase (GNP), which acts in *Giardia* as a biosynthetic enzyme. Fructose 6-phosphate is a normal intermediate in glycolysis, but is now used for cyst wall synthesis. We hypothesize that the switch from one pathway to another is regulated by enzyme modification which changes its catalytic properties. The modifications include ubiquitination and nitrosylation. GNP is expressed at 6 h post induction, has a putative nitrosylation motif and is shown to be ubiquitinated. The time of modification and function of the ubiquitinated enzyme is not known. Here we show *in vivo* nitrosylation of GNP and change in enzyme kinetics. The experiments performed on the recombinant protein showed reduction of K*m* from 3.5 mM to 1.5 mM upon nitrosylation. The modified cysteine residues have been identified by mutational analysis. We also detected an increase in the level of protein ubiquitination 6 h post induction.

084 USING RADIOCARBON TO MONITOR CARBON DIOXIDE EMMISSIONS

Brendan C. Barrington, B.A.
College of Urban Affairs

Radiocarbon or carbon 14 is an unstable isotope of Carbon with a relatively slow decay rate. Radiocarbon is created through a process called solar conversion where forces from space cause nitrogen to be transformed into carbon. It takes thousands of years for Carbon 14 to decay back into nitrogen and therefore this isotope is rarely found in fossil fuels such as coal, oil and natural gas which take millions of years to create. Radiocarbon contributes a constant level of background radiation due to solar conversion in the Earth's atmosphere. Because the radioactive and nonradioactive isotopes of carbon are distinguishable, it may be possible to use radiocarbon to track carbon dioxide emissions from both point and nonpoint sources. The purpose of this project would be to discover if such a task is possible. Currently Accelerator Mass Spectrometry (AMS) is the most efficient method for observing the carbon 12 (the most common nonradioactive isotope of carbon) to carbon 14 ratio. This project will explore new technologies that may be more cost effective and more efficient than AMS with accuracy still in mind. The logistics of such a system will also come into question. The time it takes to process this lab results is an issue as well as the number of facilities required for achieving accurate results are factors to consider in this project. Current resources available to the government or otherwise will be taken into consideration as will the opportunity cost associated with creating this project. Benefits will also be considered and the advantages both politically and economically this system would have and possible incentives that could be issued. This project may even create a model for the use of this new method as well. Issues to consider include sample processing time, accuracy, facilities and private sector rescores

085 TRIACSIN C LIMITS NEUROLOGIC DAMAGE IN THE PERMANENT AND TRANSIENT MIDDLE CEREBRAL ARTERY OCCLUSION (MCAO) STROKE MODELS

A. Mdzinarishvili[1], U. Bickel[2], X. Chen[3], M. Weis[3]
[1]Department of Pharmaceutical Sciences, School of Pharmacy, Northeastern Ohio Universities (NEOUCOM), Rootstown, OH 44272,
[2]Department of Pharmaceutical Sciences, School of Pharmacy, Texas Tech University HSC, Amarillo, TX 79106
[3]Department of Biomedical Sciences, School of Pharmacy, Texas Tech University HSC, Amarillo, TX 79106

Brain stroke is the third leading cause of death and disabilities in the world but treatment options are very limited. Previously we showed that triacsin C (*streptomyces aureofaciens*) a potent inhibitor of fatty acyl CoA synthetase (FACS) increased eNOS activity in cultured endothelial cells (Weis et al, 2004). Others had observed that triacsin C inhibited iNOS expression in cultured pancreatic islets (Shimabukuro et al, 1998). As both eNOS and iNOS activities are important in the biochemistry of stroke, we hypothesized that triacsin C might limit the neurologic damage of brain stroke. The hypothesis was tested *in vivo*, using the mice brain stroke models - permanent (24h) and transient (1h) MCAO. CD-1 mice (27-32g) were treated with triacsin C (1mg/kg) or 0.1% DMSO in saline (control) administered via the jugular vein 60min before brain stroke was induced. For p-MCAO coronal brain slices (1mm) were stained with TTC (1%). For t-MCAO 40μ coronal brain slices were stained with Fluoro-Jade B. Infarct volume and edema formation was evaluated. Motor function was evaluated in t-MCAO model using the behavior "corner test". *In vitro* experiments measured the expression of cytokine-stimulated immunoreactive iNOS in cultured C6 astrocytes. In the p-MCAO model triacsin C reduced infarct volume by 25 ± 8% ($p<0.005$) without changing the edema volume. In the t-MCAO model infarct volume was reduced by 34 ± 5% ($p<0.001$). Triacsin C also

significantly improved motor performance within 24h ($p<0.001$) after t-MCAO and performance continued to improve over the 3 days of the experiment. In C6 astrocytes triacsin C (5 μM) reduced 24h cytokine stimulated iNOS expression by 63 ± 6%. Triacsin C reduced cytokine stimulated 24h media nitrite accumulation by 19 ± 1%. These results suggest that FACS participates in the signaling pathway that mediates stroke damage, possibly by inhibiting cytokine stimulated iNOS expression.

086 DECREASED METAL ION LEVELS IN THE DBA/2J MOUSE MODEL OF GLAUCOMA.

Samuel D. Crish, Ph.D.[1]; Joseph J. Braymer, B.S.[2]; Werner J. Geldenhuys, Ph.D.[1]; Cornelis J. Van der Schyf, D.Sc.[1]; Mi Hee Lim, Ph.D.[2]

[1]Department of Pharmaceutical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy, Rootstown, OH, 44272.

[2]Department of Chemistry, University of Michigan, Ann Arbor, MI, 48109.

Glaucoma, the leading cause of irreversible blindness worldwide, is a group of chronic neurodegenerative disorders that is estimated to affect 80 million people by 2020 - with 11 million left bilaterally blind as a result (Quigley and Broman, 2006). Despite glaucoma's association with intraocular pressure (IOP) elevations that result from changes in the anterior chamber of the eye, glaucoma actually blinds through the degeneration of retinal ganglion cells in the posterior chamber (Quigley, 1999; Nickells, 2007). Current treatments for glaucoma are solely focused on lowering IOP through the use of medication or surgery. However, this approach is ineffective in some people while only slowing the progression of the disease in others, leading clinicians and investigators to call for a "complete therapy," - i.e., treatment strategies that address the neurodegenerative processes (McKinnon, 2008). Despite increasing interest, there are currently no accepted neuroprotective therapies for glaucoma. Recent evidence suggests that glaucoma shares similar epidemiology and mechanisms with other CNS neurodegenerative diseases such as Alzheimer's disease (AD) (McKinnon, 2003; Crish et al., 2010). Metal ion metabolism is attracting increasing attention as a target for intervention in neurodegenerative disorders, as accumulation or deficiencies in metal ion levels can lead to neural dysfunction and loss. We used inductively coupled plasma mass spectrometry to examine metal ion levels in the primary visual pathway in the DBA/2J mouse model of glaucoma. We report here that levels of several ions including magnesium, iron, manganese, zinc, and calcium are reduced in these mice as compared to nonglaucomatous controls. Furthermore, changes could occur in both the retina and their most distant target, the superior colliculus, raising implications for defects in neuronal signaling and secondary degeneration. Our data indicate that aberrant metal ion levels may play a role in glaucomatous degeneration and may represent valid targets for intervention.

087 REVERSE PHASE - GRADIENT CHROMATOFOCUSING - MASS SPECTROMETRY: A NEW 2D LC-MS TECHNIQUE IN PROTEIN AND PEPTIDE ANALYSIS

Kiran K. Pedada, M.Pharm.; Harini Jogiraju, M.Sc.; David J. Anderson, Ph.D.
Department of Chemistry, Cleveland State University

Conventional 2D HPLC mass spectrometry (MS) in proteomics utilizes ion-exchange (IX) and reversed phase (RP) columns in series, taking salt fractions from the IX column and chromatographing them on the RP column, followed by on-line MS analysis. In current 2D techniques, the order of the columns is limited to IX-RP due to the incompatibility issues of IX with mass spectrometric detection. We have recently developed an IX-HPLC technique called gradient chromatofocusing (GCF) that employs linear pH gradients generated with volatile buffers. This technique separates proteins accordingly to their pI values and permits direct interfacing to MS via electrospray ionization. This gives additional capability in the 2D design allowing for two column sequences to be interfaced to the mass spectrometer. Preliminary results of the chromatography of eleven standard proteins on individual GCF and RP columns show a predicted selectivity differences when the columns are in the two different serial sequences. This is important in that proteins in complex biological samples are missed due to the masking of MS signal for co-eluting proteins. Having two sequence of the columns can unmask proteins that are hidden when limited to serial column arrangement. Results also show superior chromatographic performance of GCF compared to RP in the analysis of proteins.

088 UNIVERSAL STANDARD PROTOCOL FOR TEMPERATURE AND MATERIAL CHARACTERIZATION CALIBRATION WITH PHARMACEUTICALS BY THERMAL ANALYSIS

Manik Pavan Maheswaram, B. Pharm.; Dhruthiman. Mantheni, M.S.; Shravan Singh Thakur, B. Pharm.; Hareesha. Venumuddala, B. Pharm.; Lakshmi. Kaza, B. Pharm.; Indika Perera. Naullage, Ph.D.; Alan. Riga, Ph.D.
Department of Chemistry, Cleveland State University

New test protocols have been developed which describes the temperature and material characterization calibration of Differential Scanning Calorimeters, Dielectric Analyzers, and Thermal mechanical analyzers with pharmaceuticals over the temperature range from 25°C to 250°C. These test protocols can be blended into a universal standard protocol for Differential Scanning Calorimetry (DSC), Dielectric Analysis (DEA) and Thermal Mechanical Analysis (TMA) employing devices from a variety of commercial companies. Calibration is performed by observing the melting transition temperature of standard Pharmaceutical materials within the temperature range of interest. While calibrating DSC, a thermodynamic transition i.e. change in heat flow is marked by absorption (or release) of energy by the calibrants resulting in an endothermic (or exothermic) peak in the heating (or cooling) curve is recorded. Similarly, the test calibrants are evaluated by DEA using an interdigitated electrode array (IDA) over a specific temperature range. At the melt transition temperature, there is an abrupt change in DEA permittivity which is recorded by the instrument. A quartz stage and probe are used in TMA to test the sample and then evaluated for the melting properties of the calibrants. At the transition temperature of the test specimen, there is a change in dimensional stability and a measured change in the coefficient of thermal expansion is recorded. These melt transition temperatures of test specimens obtained from DSC; DEA and TMA data are compared directly to the known literature melt transition temperatures. These test protocols were accomplished based on the Standard Test Method for temperature calibration of DSC, DEA and TMA, ASTM method E967, E 2038 and E 1363, respectively. The preliminary R^2 coefficient of correlation for known literature transition temperature vs. DSC melting peak temperature, DEA Permittivity melt temperature and TMA extrapolated onset melt temperature for the calibrants was 0.98.

089 DEVELOPING LIGANDS TO PROBE THE FUNCTION OF mitoNEET

Richard T. Carroll, Ph.D.; Prabha S. Awale, B. Pharm.; Li Lin, M.S.; Werner J. Geldenhuys, B. Pharm, Ph.D.
Pharmaceutical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy

mitoNEET is a novel mitochondrial protein which belongs to a zinc-finger group of proteins that is conserved throughout evolution. It belongs to a family of three proteins which are known for their “CDGSH-type zinc finger” domains. The mitoNEET family proteins have an interesting structural feature which contains an iron-sulfur ([2Fe-2S]) cluster unique to its protein family. This cluster has been suggested to play a role in mitoNEET’s ability to undergo redox-type reactions and more importantly, it is thought to regulate the oxidative capacity of the mitochondria during respiration. With the lack of pharmacological tools available to fully elucidate mitoNEET’s function, we have developed a binding assay to probe the binding site with multiple compounds to identify a structure-activity relationship. We have used multiple thiazolidine-2,4-dione (TZD), 2-thioxothiazolidin-4-one (TTD), and 2-iminothiazolidin-4-one (ITD) compounds to establish several trends to enhance ligand development which can be used to elucidate mitoNEET function. Regulating this function has been implicated in neuronal protection in several CNS disease models.

090 MOLECULAR MECHANISM OF THROMBIN MEDIATED ACTIVATION OF COAGULATION FACTOR V

Mahesheema Na, M.Sc.[1]; Jamila Hirbawi, Ph.D.[3]; Michael Kalafatis, Ph.D.[1,2,3]
[1]Department of Chemistry, Cleveland State University
[2]Department of Biological, Geological and Environmental Sciences, Cleveland State University;
[3]Department of Molecular Cardiology. Cleveland Clinic

The coagulation cascade represents a system of proteases that are crucially involved in maintenance of vascular hemostasis. Factor V is a multidomain inactive procofactor composed of A1-A2-B-A3-C1-C2 domains. Thrombin cleaves FV at three sites in a kinetically preferred order at Arg^{709}, Arg^{1018}, Arg^{1545} to ultimately generate the active cofactor . The last thrombin cleavage site at Arg^{1545} is kinetically less favored than the other two cleavage sites. To understand the significance of each cleavage for cofactor formation and prothrombinase function. We have generated a factor V molecule mutating Arg $^{709/1018}$ cleavage sites (FVQQR), a factor V molecule mutating Arg $^{709/1545}$ cleavage sites (FV^{QRQ}), a factor V molecule mutating Arg $^{1018/1545}$ cleavage sites (FV^{RQQ}) and a factor V molecule mutating three cleavage sites (FV^{QQQ}). These recombinant factor

V molecules along with wild type factor V (FV^{WT}) were transiently expressed in COS7L cells, purified and assessed their capability to interact with factor Xa and activate prothrombin to thrombin. Prothrombin activation by prothrombinase assembled with the mutant molecule was evaluated by SDS-PAGE and the kinetic parameters were determined. Two-stage clotting assays revealed that FVa^{QQR}, FVa^{QRQ} and FVa^{RQQ} all have impaired clotting compared to FVa^{WT}. FV^{QQQ} was devoid of clotting and had poor cofactor activity. Kinetic analyses demonstrated Kd values of FVa^{QQR} of 0.75nM while FVa^{WT} had a Kd of 0.25nM. FVa^{QRQ} and FV^{RQQ} were impaired in their interaction with factor Xa. The kcat value for prothrombinase assembled with FVa^{QQR} was slightly lower than the kcat for FVa^{WT} while prothrombinase assembled with FVa^{QRQ} and FVa^{RQQ} had approximately 3-fold reduced catalytic efficiency when compared to FVa^{WT}. Overall, the data demonstrate that cleavage at Arg^{1545} is a prerequisite for expression of optimum cofactor activity. These data provide structure/function insights of thrombin cleavage sites which lead to the activation of FV.

091 DESIGN AND CHARACTERIZATION OF THERMALLY RESPONSIVE NANOPARTICLES: EXPLORING STRUCTURE, SHAPE, AND DYNAMICS WITH LIGHT SCATTERING

Kaitlin Vandemark; Ali Ghoorchian; Kiril A. Streletzky, Ph.D.; Nolan B Holland, Ph.D.
Department of Physics and Department of Chemical and Biochemical Engineering, Cleveland State University

Environmentally responsive nanoparticles synthesized from elastic-like polypeptides (ELP) present a promising system for applications as biosensors, drug delivery vehicles, and viscosity modifiers. These nanoparticles undergo a transition from a soluble state at room to micellar aggregates above the transition. The size, shape, and dynamics of micelles above the transition as well as effects of the solvent salt concentration and pH on the transition are important to understand from scientific and application points of view. This system has been characterized with high resolution multiangle Dynamic and Static Light Scattering Spectroscopies. We confirmed the transition of the system from ELP extended trimers and their non-spherical formations into compact particulates (micelles). We discovered that micellar size and structure are very sensitive to pH of the solution. We found that micelles generally exhibit properties of the hyper-branched spheres while their shape becomes much more elongated at certain pH. Non-spherical micelles are seemingly sensitive to the heating protocol of the sample and show signs of aging upon cooling and air exposure. Spherical micelles appear to be insensitive to difference in heating rate and can be stored longer. We also found that the size of micelles strongly depends on salt concentration displaying at least two (potentially three) different size regimes (2Rh=20-45nm at 0-15mM and 100-150nm at 25-40mM) with apparent different dependence on salt concentration.

092 SERUM AND GLUCOCORTICOID INDUCIBLE KINASE 1(SGK1) IS A TRANSCRIPTIONAL AS WELL AS A PHOSPHORYLATION TARGET OF THYROID HORMONE IN HEPG2 HEPATOMA CELL LINE.

Dmitry Kazimirko, B.S.; **Prabodh Sadana, Ph.D.**
Department of Pharmaceutical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy, Rootstown,

Thyroid hormone, the endocrine hormone secreted by the thyroid gland regulates crucial functions of growth, development, metabolism and homeostasis. The cellular actions of T3 are mediated by cognate thyroid hormone receptors (α and β) which are members of nuclear receptor superfamily. T3 binding to these receptors stimulates the recruitment of coactivator proteins to the thyroid hormone receptor proteins and consequent activation of downstream gene expression. Classically T3 target genes have been known to belong to groups like metabolic enzymes, transcription factors, ion channels among others. Mounting evidence indicates that T3 also causes upstream activation of certain kinase pathways in specific cell types including PI3Kinase and mTOR pathways. We have identified that T3 induces the transcriptional induction of a specific kinase called the serum and glucocorticoid inducible kinase 1 (SGK1). This protein belongs to AGC family of protein kinases and is activated downstream of PI3-kinase/Akt pathway. SGK1 has significant roles in cell survival, ion transport, salt homeostasis and integration of number of transcriptional inputs. In HepG2 cells, thyroid hormone induces the expression of SGK1mRNA and protein. At least partially, this transcriptional induction of SGK1 gene is mediated by a secondary gene product- early growth response 1 (EGR1). Thyroid hormone causes rapid induction of EGR-1 mRNA in HepG2 cells. In these cells, siRNA mediated knockdown of EGR1 led to significant reduction in the transcriptional induction of SGK1 by T3. In addition, T3 activated SGK1 via phosphorylation at conserved serine and threonine residues. Collectively our data validates SGK1 as a novel T3 target gene in HepG2 cells as well as a downstream phosphorylation target. Given the ubiquitous nature of SGK1 expression, our findings suggest a prominent role for SGK1 in thyroid hormone function.

093 *TRYPANOSOMA BRUCEI* TIN2 SUPPRESSES VSG SWITCHING RATE

Sanaa Jehi, M.S.; Bibo Li, Ph.D.*
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease; Cleveland State University
*Corresponding Author

Trypanosoma brucei, the causative protozoan parasite for Human African Trypanosomiasis, evades the host immune response by regularly switching its surface antigen - Variant Surface Glycoproteins (VSG). VSGs are exclusively expressed in a monoallelic manner from VSG expression sites (ESs) located at subtelomeric loci. Telomeres are nucleoprotein complexes located at the ends of linear chromosomes. They often form a heterochromatin structure that affects subtelomeric gene expression. In fact, we have found that telomeres are important for subtelomeric VSG silencing, as depletion of a telomere protein RAP1 led to derepression of ES-linked VSG genes. In addition, telomeres protect the chromosome ends from illegitimate DNA processes including degradation, repair and recombination. Because homologous recombination-mediated gene conversion is one of several important mechanisms for VSG switching, it is possible that the telomere structure also influences VSG switching. We have now identified another telomere protein, the *T. brucei* Tin2 homolog, which interacts with the duplex TTAGGG repeat binding factor, TRF, directly. Depletion of Tin2 led to growth arrest but does not seem to affect the silencing of subtelomeric VSG genes. However, using a cell line carrying both a positive and a negative selective marker in the active ES, we found that a temporary depletion of Tin2 led to an increased VSG switching rate, indicating for the first time that the telomere structure is also important for the regulation of VSG switching. In addition, we also found that depletion of Tin2 caused a decrease in TRF protein level without affecting its mRNA amount, indicating that Tin2 is important for TRF protein stability.

094 EVIDENCE THAT THE 5' SPLICE SITE MUTATIONS OF A MicroRNA CODING INTRON MODULATE THE TARGET mRNA EXPRESSION.

Jagjit Singh, Neha Aggarwal, Kavleen Sikand and Girish C. Shukla
Cleveland State University

A large number of microRNAs (miRNAs) are encoded in introns of protein coding genes. The processing of these miRNAs takes place from the primary and precursor stem Loop expressed cotranscriptional with the host *pre*cursor mRNA. Experimental evidence, thus far suggest that miRNA processing is independent of the host pre-mRNA processing. Previous these studies overlooked the pre-mRNA processing and its subtle effect on mature miRNA production and target mRNA expression. In this study, we investigated if mutations in the 5' splice site of a miRNA intron influence the production of the mature resident miRNA and alter its target gene expression. We generated a series of point mutations starting from the position 1 to 7 of MYH6 intron 29 which host miR208a. Our preliminary data indicated that 5' splice site mutations affects the mature miRNA production and its target mRNA modulation in vivo.

095 THE ROLE OF RNASE L IN ADIPOGENESIS

Boo Seok Yun, M.S.; Aimin Zhou, Ph.D.
Department of Chemistry, Cleveland State University

The 2'-5' oligoadenylate (2-5A)-dependent RNase L (RNase L) is one of the key enzymes mediating the molecular mechanisms of interferon (IFN) functions. Obesity is defined as a result of uncontrolled adipose tissue expansion and the development of fat cells by adipogenesis. Obesity may affect the heart through its influence on known risk factors such as dyslipidemia, hypertension, glucose intolerance, inflammatory markers, obstructive sleep apnea/hypoventilation, and the prothrombotic state, in addition to as-yet-unrecognized mechanisms. RNase L $^{+/+}$ and $^{-/-}$ mice (C57BL/6 background) were housed in a pathogen-free facility and fed with a normal chew-diet for 18 months. The role of RNase L in adipocyte differentiation was investigated by inducing adipogenesis of RNase L $^{+/+}$ and $^{-/-}$ mouse embryonic fibroblasts (MEFs) in normal growth medium supplemented with a hormone cocktail. Adipocytes were analyzed by Oil Red O staining. Adipocytes isolated from RNase L $^{+/+}$ and $^{-/-}$ mice were used to determine the expression of proinflammatory genes in the presence or absence of stmuli. RNase L deficient mice were 21% heavier than RNase L $^{+/+}$ mice. The average white fat mass isolated from RNase L $^{-/-}$ mice (n=3) was 11.88g whereas the white fat mass of RNase L $^{+/+}$ mice (n=3) was 5.78g. Histological analysis of tissues revealed that hepatocellular fatty droplets were remarkably abundant in the livers of RNase L $^{-/-}$ mice. The expression of TNF-α in RNase L $^{+/+}$ MEFs and adipocytes after treatment with lipopolysaccharides (LPS) was about 5-fold

higher than that in RNase L $^{-/-}$ mice by qRT-PCR. Analysis of adipocyte population with Oil Red O staining showed that adipocytes differentiated from RNase L-/- MEFs were about 1.5 times higher than that in RNase L $^{+/+}$ MEFs. RNase L is involved in adipogenesis and mediates the development of adipocytes through regulating the expression of proinflammatory gene products.

096 BIOMECHANICS OF LOCOMOTION THROUGH A BURROW VERSUS FLAT GROUND

Sean D. Mayerik, B.S.[1]**;** Andrew R. Lammers, Ph.D.[1]
[1]School of Health Sciences, Cleveland State University

Chipmunks, like many other animals, travel on a wide variety of substrates. These include tree branches, flat ground, and in burrows. Burrowing is an adaptation found in many animals and is used for habitation, foraging, and evading predators. Little data exist comparing the differences between locomotion through a burrow compared to that on a flat terrestrial surface. We predict that chipmunks will modify their locomotion to deal with the constraints of traveling in a narrow tunnel. These changes include differences in speed, gait and stability, and ground reaction force. We ran Siberian chipmunks (*Tamias sibiricus*) on a flat trackway and through a 5.1 cm diameter cylindrical tunnel. Each trackway contained a region instrumented to measure substrate reaction force. High-speed videography was used to measure speed and kinematic patterns. Preliminary results demonstrate significant differences between peak vertical forces, braking impulse, and medial-lateral impulse during burrow locomotion when compared to ground movement. Specifically, the impulses and peak force exerted in the burrow trackway are much lower than the forces measured on the terrestrial track. The factors of the environment itself, such as the diameter of a burrow, can be the cause for the lower impulses. The limited physical space of a burrow can alter an animal's locomotion. Additionally, animals in a burrow may not have the need to utilize their environment for peak performance, as the limited space provides enough safety to evade prey.

097 *TRYPANOSOMA BRUCEI* RAP1: A KEY REGULATOR FOR *VSG* EXPRESSION

Unnati Pandya, M.S.; Bibo Li, Ph.D.
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease; Cleveland State University

Trypanosoma brucei uses antigenic variation to evade host immune defense. In mammalian host, bloodstream form (BF) *T. brucei* regularly switches its surface antigen, Variant Surface Glycoprotein (VSG), which is exclusively transcribed from the VSG Expression Sites (ESs) located at the subtelomeric loci. Monoallelic expression of *VSG* from only one ES ensures the effectiveness of antigenic variation. While in the mid-gut of its insect host, procyclic form (PF) *T. brucei* expresses procyclins as its surface molecules and all *VSGs* are silent. *VSG* expression is therefore dynamically regulated and is essential for *T. brucei* pathogenesis and normal development. Telomeres are nucleoprotein complexes located at ends of linear chromosomes. They maintain chromosome stability and are essential for genome integrity. In addition, telomeres often form a specialized chromatin structure that influences transcription of genes located nearby. In fact, we have shown recently that tbRAP1, an integral component of the *T. brucei* telomeric complex, is required for normal subtelomeric *VSG* silencing in both BF and PF cells. We now have found that depletion of tbRAP1 led to less tightly packed chromatin at the de-repressed ESs compared to silent ones. Furthermore, in bloodstream form cells, tbRAP1 preferentially associates with silent ES marked telomeres but not the active ES marked telomere. Thus it is likely that tbRAP1 acts similarly to its yeast homolog and mediates *VSG* silencing through modulation of local chromatin structure.

098 REQUIREMENT OF HELIX 1 BASE-PAIRING BETWEEN U6ATAC AND U12 SNRNAS IN U12-DEPENDENT PRE-MRNA SPLICING

Tupa Basu-Roy, M.S.[1]; Girish C. Shukla, Ph.D.[1]; Richard A. Padgett, Ph.D.[2]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University;
[2]Department of Molecular Genetics, Cleveland Clinic, Lerner Research Institute

Of most metazoan genes, one of the most essential and critical step in gene expression is the removal of intervening sequences or introns by splicing from the primary transcripts. Intron removal is accomplished by a distinct set of spliceosome consisting of major and minor class of spliceosomal small nuclear RNAs (snRNAs) whose intermolecular and intramolecular sequential RNA-RNA base pairing interactions are often analogous. In the minor or U12-dependent spliceosome U11, U12,

U6atac and U4atac are unique snRNAs and essential for the splicing of U12-dependent intron. We are studying sequential base-pairing interactions between U4atac:U6atac and U6atac:U12 snRNA to understand the role and requirement of a conserved intermolecular helix I. Single and double nucleotide mutations revealed base-pairs which are essential and required for the formation of helix I. Also, for the first time, our data produces the evidence of in vivo intermolecular helix I of U6atac:U12 snRNAs interactions.

099 AUTOMATED ANALYSIS OF EMPIRICAL RAMAN SPECTRAL SHAPES

Nikolas J. Neric, B.S.; John F. Turner II, Ph.D.
Department of Chemistry, Cleveland State University

While the use of Raman spectroscopy has been growing rapidly, spectra acquired on the same sample using instruments that employ different laser wavelengths or different Raman modalities, like resonance Raman and coherent anti-Stokes Raman, can appear very different. Hence, the appeal of Raman methods for routine qualitative chemical identification has not yet matched that of infrared spectroscopy, a technique for which numerous extensive databases of infrared spectra exist. Baseline shifts, the difficulty in obtaining accurate background spectra, the wide variety of spectral resolutions among commercially available instruments, the sensitivity of Raman scattering to polarization state, and intense fluorescence that sometimes obscures the Raman bands make it difficult to develop computer algorithms for automated spectral matching. Yet these algorithms are necessary if Raman, a non-destructive method that requires little or no sample preparation, is to become as widely used as infrared spectroscopy. In qualitative work, Raman spectra are analyzed according to the peak positions along the wavelength axis. Identifying peaks can be problematic in cases where other artifacts are present or in cases where the signal barely exceeds the noise threshold. As part of our work to develop turnkey Raman solutions, we propose a method to calculate theoretical spectral shapes based on instrument information and ambient laboratory conditions. This allows us to tailor our band recognition algorithms to suit a particular analysis in a fully automated fashion, thus avoiding the “one size fits all” generic approach.

100 HEAVY METAL DECONTAMINATION USING PHYTOREMEDIATION: A REVIEW

Justine D. Rose, B.A.
Department of Environmental Engineering, Cleveland State University

Heavy metal contamination in soil and water can result from agricultural and industrial activities. These can be toxic to both plants and animals, disrupting the ecosystem and accumulating in the food chain. Decontamination is difficult because heavy metals do not degrade. Techniques for decontaminating water previously consisted of distillation, evaporation, chemical precipitation or reverse osmosis. Decontaminated soil and wetlands would need to be excavated or covered over. These methods are difficult and the materials are expensive. Within the last decade, decontamination processes are being developed that are more economically feasible and environmentally friendly. One technique is phytoremediation, which is the use of living plants to remove pollutants from the environment. The plants are established in a contaminated area, and their roots sorb the toxins and store them within the plant. Contaminated plants can be removed and disposed of, or the heavy metals may be volatized and recovered.

Heavy metal contamination still presents problems both to humans and to the natural world. Bioremediation techniques such as phytoremediation are becoming more important as we search for environmentally sound ways to repair and restore our ecosystems.

101 CHARACTERIZATION AND OPTIMIZATION CONSIDERATIONS OF THE VIRTUAL IMAGE PHASED ARRAY (VIPA) HIGH RESOLUTION WAVELENGTH FILTER

Jonathan R. Damsel, B.S.; John F. Turner, Ph.D.
Department of Chemistry, Cleveland State University

The Virtual Image Phased Array (VIPA) is a narrow passband filter that provides large angular dispersion. Dispersion is achieved by beam interference resulting from internal reflection. The VIPA offers several advantages over conventional dispersers and has found applications in wavelength division multiplexing, high resolution inelastic scattering spectroscopy, rotationally resolved electronic spectroscopy and pulse shaping. We have conducted theoretical studies for two VIPA models,

one employing isotropic substrates and one employing uniaxial anisotropic materials. In these studies, the free spectral range (FSR) and angular dispersion as a function of incident angle, wavelength, substrate thickness, refractive index, and output angle are considered. In the work presented here we compare the angular dispersion and optical throughput characteristics of the VIPA to our theoretical predictions. We discuss the VIPA design considerations and explore strategies to improve its FSR.

102 BIOASSESSMENT OF THE CUYAHOGA RIVER TO MONITOR WATER QUALITY IMPROVEMENT USING ADULT FISH

Derrick D. Cooper[1]; Kyle Tulisiak, B.S.[1]; Julie Wolin, Ph.D.[1]
[1]Department of Biological, Geological and Environmental Sciences

Bioassessment is a practical method for analyzing water quality in an aquatic ecosystem such as the Cuyahoga River. Water quality determines the assemblage of organisms found in an aquatic ecosystem based on tolerance level of the organisms for example tolerant species are found in abundance when conditions are degraded. For this study adult fish assemblages were examined from 1970 to present, using Ohio Environmental Protection Agency (OEPA) historical data, to analyze trends of sample percentage of intolerant species and Index of Biotic Integrity (IBI) scores to indicate water quality improvement in the Cuyahoga River.

103 IDENTIFICATION OF NEW GENES INVOLVED IN MEIOSIS VIA A GENOME WIDE SCREEN

Sneharthi Banerjee, Hanna Morris, G. Valentin Boerner
Center of Gene Regulation in Health and Disease; Department of Biological, Geological and Environmental Sciences; Cleveland State University

Meiosis is a type of cell division comprising of two successive nuclear divisions with only one round of DNA replication. In meiosis I, homologous chromosomes are positioned by the assembly of structurally conserved, coiled coil proteinacious filament (ZIP1 in *S. cerevisiae*) in a structure called the synaptonemal complex (SC), which in turn mediates chromosome pairing and synapsis during homologous recombination. Crossovers and proper segregation of homologous chromosomes are central to the formation of healthy sperms and egg cells and defect in meiosis is the largest genetic cause of infertility, pregnancy loss and still births. Only a fraction of the genes involved in recombination, SC formation and cell division are presently identified. Our goal is to identify novel ZMM like mutants which are chromosome segregation and recombination defective. We have set up a screen of the entire yeast genome randomly mutated by Tn7 transposon which uses temperature sensitiveness as a reporter phenotype for involvement in meiotic functions, as previously observed for zmm mutants. It is a functional assay which uses a particular phenotype to identify new genes with functions in meiosis. The identified mutants are validated by either performing a direct genome sequencing using a transposon specific primer to reconstruct the mutation and then determine that it results in the same phenotype or by crossing the mutant with a haploid yeast strain having *zip3* tagged with an antibiotic marker and studying the phenotype to confirm that transposon is responsible for the phenotype. Future works involve determining the specific defect conferred by the mutations and identifying the particular step in recombination for which they are required. I have screened for 22,000 transformants using 10 pools of plasmid based Tn7 library with 810 potential candidates, 130 candidates retested as temperature sensitive for meiosis, 24 return to growth and 41 poor spore viability candidates.

104 PKR AND RNAseL PLAY DIFFERENTIAL ROLES DURING VIRAL ENCEPHALOMYELITIS

Parul Kapil, M.S.[1,2]; Stephen Stohlman[1]; Cornelia Bergmann[1]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University,
[2]Cleveland Clinic

IFNαβ plays an eminent role in limiting viral tropism and dissemination within the CNS following neurotropic coronavirus (JHMV) infection. However, the downstream IFNαβ stimulated innate antiviral factors are poorly characterized in the CNS. RNaseL and Protein Kinase RNA dependent (PKR) are principal IFN stimulated anti-viral proteins. In the absence of RNaseL neither overall JHMV control nor CNS inflammation was altered. However, infection was elevated in microglia/macrophages, which coincided with accelerated demyelination and axonal degeneration and increased mortality. To identify other innate antiviral pathways contributing to viral control, we explored a potential contribution of PKR, an

inhibitor and modulator of host cell translation. Mice deficient in either both RNAseL and PKR (DRP-/-), or in PKR only (PKR-/-), were analyzed for alterations in tropism, viral spread and pathology. DRP-/- mice succumbed to infection with similar kinetics as RNaseL-/- mice, suggesting no additional contribution of PKR to overall protection. This was supported by similarly low mortality of PKR-/- mice as wt mice. Although viral burden was increased by ~10-fold in both DRP-/- and PKR-/- mice relative to wt mice, it was controlled with similar kinetics. Immunohistochemical analysis confirmed enhanced microglial/macrophage infection attributed to absence of RNaseL in DRP-/- mice, but also revealed prominently increased infection of oligodendrocytes. However, increased oligodendrocyte infection was not evident in single PKR-/- mice, suggesting PKR alone does not limit viral spread within oligodendrocytes. Unexpectedly we observed similar demyelination to wt mice in both DRP-/- and PKR-/- mice, indicating PKR is responsible for the enhanced demyelination in RNaseL-/- mice, independent of virus load. This suggests that RNaseL and PKR exert subtle differences in cellular functions, which can have detrimental effects during CNS inflammation, independent of antiviral activity. The data further support potential crosstalk between RNAseL and PKR regulatory mechanisms during JHMV encephalomyelitis.
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105 LARVAL FISH MIGRATION OF LITHOPHILIC SPAWNERS WITHIN A NAVIGATIONAL CHANNEL: THE EFFECTS OF DISSOLVED OXYGEN LEVELS

Kyle T, Tulisiak, B.S.[1]; Julie Wolin, Ph.D.[1]
[1]Department of Biological, Geological and Environmental Science; Cleveland State University

Many inland rivers throughout the world are dredged, bulkheaded, and maintained to facilitate commercial and recreational boat traffic. These anthropogenic alterations have altered or disturbed the biotic and abiotic components and functions of the systems, including habitat availability, temperature fluctuations, dissolved oxygen levels, food availably, flow rates, depth, and community assemblages. The first 7.1 river miles of the Cuyahoga River (Cuyahoga Co., OH, USA) is maintained as a navigational channel for commercial and recreational boat traffic. Many nativeLake Erie fish species have historically and currently utilize the Cuyahoga river for annual spring reproduction. The white sucker (Catostomus commersonii), currently spawns in the Cuyahoga river above the navigational channel and these larval fish migrate downstream to Lake Erie. Previous study has indicated large rates of larval white sucker attrition within the navigational channel. This attrition may be caused by inadequate dissolved oxygen levels. This study aims to identify the impact of dissolved oxygen levels and other stressors on larval fish survival within the navigational channel of the Cuyahoga River.

106 HIGH FIDELITY RAMAN CHEMICAL IMAGING USING AN ACOUSTO-OPTIC TUNABLE FILTER

Ajaykumar Zalavadia, M.S.; Nikolas J. Neric, B.S.; John F. Turner II, Ph.D.
Department of Chemistry, Cleveland State University

The acousto-optic tunable filter (AOTF) is an electronically tuned wavelength selection device that is well suited to spectroscopic and widefield chemical imaging applications. A periodic modulation of the refractive index is established in the AOTF by acoustic waves originating from a piezoelectric transducer that is bonded to one face of the crystal and that receives a radio frequency (RF) alternating current. Light enters the crystal in a geometry that is non-collinear with the acoustic wave train. By changing the applied RF, the periodicity of the acoustic modulation is altered leading to a change in the Bragg spacing. By adjusting the RF amplitude, the refractive index gradient can be increased or decreased. Thus, the AOTF acts as a dynamic Bragg diffraction grating that controls both the diffracted wavelength and intensity. The challenges in performing high fidelity AOTF chemical imaging include overcoming the effects of image distortion and image shift as a function of tuning wavelength and providing sufficiently narrow passbands to acquire images at typical Raman bandwidths ($<12cm^{-1}$). In the work presented here, a custom AOTF designed for Raman imaging is characterized spatially and spectrally over its operating range. In addition, we demonstrate the efficacy of AOTF imaging on a model system.

107 A TUNABLE SURFACE PLASMON FILTER FOR HYPERSPECTRAL IMAGING

Nick Pallas, B.S.; John F. Turner II, Ph.D,
Department of Chemistry, Cleveland State University

Widefield chemical imaging has benefited from the development of fast electronically tunable filter technologies like the acousto-optic tunable filter (AOTF), the liquid crystal tunable filter (LCTF), and liquid crystal Fabry-Perot filters (LCFP). A

more recent development, the surface plasmon tunable filter (SPTF), yields diffraction limited image fidelity and high throughput for a wider range of acceptance angles than these earlier filter technologies. In our work, we have developed a gold film SPTF suitable for chemical imaging applications in the red to near-infrared region of the spectrum. We present a theoretical treatment of its performance characteristics and compare our theoretical results to the measured SPTF performance. In addition, we demonstrate the gold film SPTF as a widefield spectral imaging filter and compare its performance to the AOTF and LCTF.

108 THE ROLE OF PCH2 AAA ATPase IN THE INTERHOMOLOGUE BIAS OF CROSSOVER FORMATION IN SACCHAROMYCES CERVISIAE DURING MEIOSIS.

Scott Gaskell, B.A.; Valentin G. Boerner, Ph.D.
Department of Biological, Geological and Environmental Sciences; Center for Gene Regulation in Health and Disease; Cleveland State University

Meiosis is a specialized form of cell division from which four haploid daughter cells are derived from a single diploid parent cell. Missegregation of chromosomes during meiosis is the primary cause of birth defects and still births in humans. Proper segregation in meiosis is dependent upon synapsis of homologous chromosomes followed the formation of crossovers which create a physical linkage between the homologues. This link provides necessary tension on spindle fibers which attach to chromosomes and pull them toward the poles of the cell in meiosis I, ensuring the accurate division of genetic material between daughter cells. Crossovers are formed when self-induced DNA double strand breaks catalyzed by SPO11 protein are repaired through the process of homologous recombination. Single end invasion must be directed toward the homologous chromosome in order for a crossover to occur and failure to do so results in missegragation and low spore viability. At low double strand break levels, PCH2 protein is required to ensure that at least one crossover occurs per homologue in a process called crossover assurance. In a process known as crossover interference, PCH2 is required to ensure that crossovers are as far apart as possible at normal double strand break levels. Both of these processes are poorly understood. We have constructed pch2 deletion mutants in a spo11 hyomorph background in which DSB levels are reduced (spo11DA/DA). These mutants exhibit poor spore viability when meiosis is induced and tetrads are dissected. We are currently conducting a genetic screen in which overexpression of genes that interact with either SPO11 or PCH2 rescue the poor spore viability phenotype. We have screened 2,376 transformants of a overexpression library and have found 3candidate suppressors. We have also introduced mutations in histone modifying proteins into strains that reduce meiotic DSB formation to investigate their possible roles in meiotic chromosome segregation.

109 A NON-CANONICAL ROLE FOR THE TRAIL/DR5/CASPASE PATHWAY IN THE REGULATION OF MYOD EXPRESSION AND SKELETAL MYOBLAST DIFFERENTIATION

Jason A. Ross, B.S.[1]; Crystal M. Weyman, Ph.D.[1,2]
[1]Department of Biological, Geological and Environmental Science, Cleveland State University;
[2]Center for Gene Regulation in Health and Disease, Cleveland State University

Signaling through the DR5/FADD/Caspase pathway of apoptosis plays a role in the apoptosis associated with skeletal myoblast differentiation. The stable expression of dominant negative Death Receptor 5 (dnDR5) in 23A2 proliferating skeletal myoblasts inhibits differentiation by decreasing mRNA and protein expression of the master muscle regulatory factor MyoD, but without altering MyoD mRNA stability. Treatment with the histone deacetylase (HDAC) inhibitor trichostatin A (TSA) allows a partial recovery of MyoD expression and differentiation in differentiation-defective, dnDR5-expressing skeletal myoblasts, suggesting that an increase in histone acetylation is sufficient for MyoD expression in these cells. Our lab has previously demonstrated that the acetylation of histones associated with the MyoD DRR in dnDR5-expressing 23A2 cell lines is decreased. The expression of MyoD is transcriptionally regulated in response to serum withdrawal by a distal regulatory region (DRR), which includes a non-canonical serum response element (SRE) that is required for differentiation. Contained in this *cis*-element is a CArG box required for MyoD expression; it has been demonstrated that two trans-acting factors, SRF and Mef-2, bind to this CArG element in proliferating and terminally differentiated myoblasts respectively. A third transcription factor, Yin yang 1 (YY1) can also be found bound to the SRE in both conditions. 23A2 myoblasts stably expressing dnDR5 exhibit both a significant increase in the amount of Mef-2 and YY1 bound at this non-canonical SRE and a decrease in Myod protein expression levels in proliferating myoblasts as compared with wild type (WT) cells. We infer from these results that there is an inverse relationship between MyoD protein expression and Mef-2/YY1 recruitment, and that the recruitment of HDAC(s) by Mef-2 and/or YY1 bound to the MyoD DRR can at least partially explain the reduction

in MyoD protein and concomitant delay in differentiation observed when dnDR5-expressing cells are cultured in differentiation media.

110 SYNTHESIS AND ANALYSIS OF HPC MICROGELS USING DYNAMIC LIGHT SCATTERING

Sean Sheridan; Krista Freeman; Kiril A. Streletzky, Ph.D.
Department of Physics, Cleveland State University

Hydroxypropylcellulose (HPC) is an organic polymer that when cross-linked with Divinyl Sulfone (DVS), can form microgels, which are complex nanoparticles whose shape and size are dependent on temperature. HPC when dissolved in a 0.05% aqueous solution forms a relatively uniform colloid which is relatively clear at room temperature. Above the transition temperature (~41^0C) the HPC solution becomes cloudy and less uniform. By adding DVS, raising the pH to 12, and maintaining a temperature that is slightly above the transition temperature, microgels can be synthesized. Theoretically, due to the dewetting transition nature of HPC, these microgels act like microscopic sponges which shrink and expel their contents above the transition temperature. Since HPC is FDA approved and since the transition temperature is near the human body temperature, HPC microgels are ideal candidates for drug delivery. By using Dynamic Light Scattering (DLS), the size of these molecules can be determined at different temperatures.

111 USE OF VIDEO GAMING AS AN ADJUNCT DURING OUTPATIENT STROKE REHABILITATION TO OBTAIN UPPER EXTREMITY TASK SPECIFIC PRACTICE AND IMPROVE SITTING BALANCE: A PILOT STUDY

Jeffrey Swiers; M. Ann Reinthal, Ph.D.; Susan Linder, M.H.S.
School of Health Sciences, Cleveland State University

Background and Purpose: Stroke is one of the leading causes of disability in the United States. Frequently, patients post stroke have residual upper extremity impairment that limits function. Prior research has demonstrated that extensive upper extremity practice repetitions are required to relearn tasks. The purpose of this study was to determine the feasibility of using commercially available video gaming equipment to increase the repetitions of motor practice in an engaging way in order to improve upper extremity function post stroke. **Subjects:** Sixteen individuals at least 3 months post stroke participated in the pilot study. All participants regularly attended a community-based stroke exercise class or outpatient physical and/or occupational therapy. **Methods:** All subjects completed at least 500 minutes of gaming. The following outcome measures were utilized: Wolf-Motor Function Test, Fugl-Meyer Stroke Assessment (Upper Extremity portion), and Intrinsic Motivation Index. After pretesting was completed, a collaborative functional goal was determined between the therapist and the participant. Functional task analysis of the goal was completed and games were selected to bridge the gap between patient's impairments and the movement required to complete the goal. **Data Analysis:** Wilcoxon Signed Ranks test was used to determine changes in all outcome measures. **Results:** Statistically significant changes were noted with the Wolf-Motor Function Test ($p=0.003$), the Fugl-Meyer ($p=0.002$), and the Intrinsic Motivation Index ($p=0.001$). **Conclusions:** Video gaming has shown the ability to demonstrate modest improvement in upper extremity function in individuals in this small pilot sample.

112 ASSESSING BALANCE IMPROVEMENT IN ADULTS POST NEUROLOGIC INJURY USING THE PANASONIC CORE TRAINER

Natalie R. Helm[1]; M. Ann Reinthal, Ph.D.[1]; Kenneth Sparks, Ph.D.[2]
[1.]School of Health Sciences, Cleveland State University
[2.]Department of Health, Physical Education, Recreation, and Dance; Cleveland State University

Many individuals post CNS injury require rehabilitation due to motor control and balance impairments. It is theorized that improvements in motor control of core muscle should result in corresponding changes in balance. The purpose of this study was to test the feasibility of using the Panasonic Core Trainer (PCT) as a means to improve balance post-CNS injury. METHODS: In this pilot case series, participants included two individuals with chronic stroke and one person with chronic incomplete T4-T5 spinal cord injury. Pre-testing and post-testing of participants included the Berg Balance Scale and measurement of Limits of Stability and Rhythmic Weight Shift using NeuroCom's Balance Master. In addition, gait analysis of walking kinematics and kinetics was completed, as well as a kinematic analysis of riding the PCT. Training consisted of

300 minutes split up into approximately 30 minute sessions on the PCT while virtual reality gaming using the Wii and PlayStation 2 with EyeToy. During one training session, heart rate was monitored to assess the cardiovascular training capability of gaming. RESULTS: The results of this study indicated that the use of the PCT in tandem with virtual reality gaming was feasible as a tool for balance as well as cardiovascular training. In addition, all three subjects had improvement in their balance and movement kinematics. CONCLUSION: In this case series, use of the PCT in conjunction with virtual reality gaming was both a feasible and effective method of cardiovascular as well as balance rehabilitation post incomplete spinal cord injury and stroke.

113 VIRTUALLY IMAGE PHASED ARRAYS (VIPA) TUNABLE FILTER

Rajesh Morampudi, B.S.P.S.; John F Turner II, Ph.D.
Department of Chemistry, Cleveland State University

The virtual image phased array (VIPA) is a narrow passband device that provides large angular dispersion. Its use in demanding applications like wavelength division multiplexing has been demonstrated, but its use as a high resolution dispersive element for spectroscopy has been impeded by its complex dispersion field and limited free spectral range. Theoretical treatments of the VIPA to date have assumed isotropic dielectrics and are largely focused on determining the conditions necessary for constructive interference. By replacing the isotropic dielectric with uniaxial anisotropic substrates, the destructive interference of off-axis rays can be enhanced and potentially lead to larger free spectral ranges. In the work presented here, we introduce a fully generalized dispersion law that is well suited to describing both the isotropic and anisotropic VIPA. In addition, we extend this law to include calculation of the theoretical field amplitude as a function of wavelength for desired output angles within the dispersion field.

114 CRYSTALLIZATION OF THE CATALYTIC SUBUNIT OF *M. JANNASCHII* ASPARTATE TRANSCARBAMOYLASE WITH LIGANDS

Charlie Dorflinger; Khadidja Benmerzouga, B.S.; Jonathan Allen, B.S.; Nura Orra, B.S.; Jacqueline Vitali, Ph.D.
Department of Physics; Department of Biological, Geological and Environmental Sciences; and the Department of Chemistry; Cleveland State University

Aspartate transcarbamoylase (ATCase) is the enzyme that catalyzes the second step in pyrimidine biosynthesis, the reaction between carbamoyl phosphate and L-aspartate to form N-carbamoyl-L-aspartate and inorganic phosphate and is a highly regulated enzyme. We crystallized the catalytic subunit of ATCase from the hyperthermophilic and barophilic archaeon *Methanococcus jannaschii* isolated, in complex with the anti-cancer drug N-phosphonacetyl-L-aspartate (PALA) which is an analog of both substrates and in complex with tricarballylic acid which is a product analog. The crystals will be analyzed with x-ray diffraction to better understand the binding of these ligands to the enzyme. The three dimensional structures of these complexes will give insight in the mechanism of catalysis and help design anticancer drugs with less toxicity, more effectiveness, and better function.

115 SYNTHESIS AND CHARACTERIZATION OF SOME MARINE STEROID COMPOUNDS

Lin Zhang, B.S.[1]; Stephen Moreton, B.S.[1]; Yanmin Huang, M.S.[2]; Qiaoxia Zeng, B.S.[3]; Quan Chen, Ph.D.[3]; Jianguo Cui, Ph.D.[2]; Aimin Zhou, Ph.D.[1]
[1] Department of Chemistry, Cleveland State University;
[2] School of Chemistry and Life Sciences, Guangxi Teachers Education University;
[3]Institute of Zoology, Chinese Academy of Sciences

Using cholesterol as the raw material, a series of 6-substituted-3-aza-A-homo-3-oxycholestanes and 6-substituted-4-aza-A-homo-3-oxycholestanes were synthesized. These synthesized compounds showed cytotoxicity to a variety of cancer cell types. Interestingly, side-chain groups on the steroidal ring are crucial for these compounds to have cytotoxic activity. Further evaluation of the cytotoxicity has revealed that these compounds were able to effectively induce cancer cell apoptosis, which was demonstrated by release of cytochrome C, activation of casepase 3 and annexin V labeling. Furthermore, the compounds displayed anti-tumor activity in an athymic mouse model. Taken together, these compounds are warranted for further development as possible therapeutic drugs for cancer.

116 A FULLY AUTOMATED WAVELENGTH CALIBRATION METHOD FOR RAMAN SPECTROSCOPY

Robert W. Cannon, B.S.; Jonathan R. Damsel, B.S.**;** Nikolas J. Neric, B.S.; John F. Turner II, Ph.D.
Department of Chemistry, Cleveland State University

During the past seven years, our research team, in collaboration with regional museums and private mineral collectors, has created one of the first extensive databases of Raman mineral spectra. Presently, there are approximately 4500 known minerals and each year another dozen or so are added to the list. Conventional methods of mineral identification and characterization include x-ray diffraction, energy dispersive x-ray analysis, and polarization microscopy, but these methods require considerable sample preparation and require destructive procedures such as polishing, cutting, and pulverizing.

Raman spectroscopy, a non-destructive method that requires little or no sample preparation, has moved to the forefront as the analytical method of choice for identifying mineral species. One of the challenges in assembling a functional database is in generating automated methods for performing spectral calibrations and spectral matching. In the work presented here, we describe a fully automated calibration method based on a spectral correlation method called spectral identity mapping (SIM). The method enables calibrations to be performed for spectra acquired using different laser wavelengths. We present the SIM theory as well as the calibration protocol and describe the advantages of this method for general applications in Raman spectroscopy.

117 VISUAL INFORMATION MODULATES MOVEMENT OUTPUT STRUCTURE

Andrew B. Slifkin, Ph.D.; Jeffrey R. Eder, Ph.D.
Department of Psychology, Cleveland State University

Studies using a variety of experimental tasks have established that when humans repeatedly produce an action, the amount of variability in system output is distributed across a range of time scales or frequencies. A finding of particular interest is that fluctuations in the output of cognitive systems are the highest at the lowest frequencies with fluctuation magnitude (power) systematically declining as frequency increases (e.g., for a review see Gilden, 2001). Such time-series structure—captured by spectral analysis—is termed *pink noise*. (In contrast, *white noise* has equal amounts of power at all spectral frequencies.) However, the appearance of pink noise is limited to tasks where action is executed in the absence of external, action-related feedback (e.g., Gilden, Thornton, & Mallon, 1995; Gilden, 2001). A few studies have shown a white-noise structure for action executed in the presence of sensory feedback (e.g., Miyazaki et al., 2004). Here, we sought to determine if time-series structure would change when movement amplitude increased (6.35, 12.70, 25.40, 50.80, 101.60 mm) under conditions of full visual feedback. Given that increases in movement amplitude induce increased reliance on available visual feedback (Khan, et al., 2006) we predicted a movement-amplitude-induced shift in time-series structure from pink to white noise. In other words, at low amplitude requirements movement should mainly be controlled by internal information processes—with minimized visual feedback processing—and pink noise should result; however, as amplitude requirements increase there should be increased reliance on visual feedback and time-series structure should shifts toward white noise. Indeed, as movement amplitude requirements increased there was shift in structure from pink to white noise. Last, the main findings were captured by a computer simulation; the model running the simulation was based on established principles of motor control.

118 SOLID STATE STUDIES OF DRUGS AND CHEMICALS BY DIELECTRIC AND CALORIMETRIC ANALYSIS

Dhruthiman R Mantheni, Manik Pavan Kumar Maheswaram, Alan T. Riga
Department of Chemistry, Cleveland State University

Novel Dielectric behavior of a linear increase in ionic conductivity prior to melt temperature was observed for active pharmaceutical ingredients, organic chemicals, amino acids, and carbohydrates. Though, there are solids like polyolefins and long chain organic compounds (tetracosane, pentacosane) which do not exhibit this premelt behavior (i.e., the temperature where the onset of increase in ionic conductivity to melt temperature). We have discovered novel electrical conductivity properties and other physical analytical variations which can lead to unique synthetic routes of certain chemical entities. The above mentioned unique variations are not related to solid-solid transitions which are quite often observed in pharmaceutical crystalline solids. These new properties are related to amorphous crystalline behavior of a solid. We have also studied the effect of various experimental variables: such as amount of mass tested, applied frequency at a given electric field and

heating rate, which results in varying the onset temperature of the increase in ionic conductivity. Melting of the solids was correlated using Differential Scanning Calorimetry (DSC). Activation energies for all the solids were measured in the premelt region using an Arrhenius plot at a specific frequency since we observed changes in the conductivity with frequency. This study focused on frequencies 0.1 Hz to 10 Hz since the conductivity at these frequencies related to surface analysis .This new physical properties are leading to new electro synthetic procedures to modify or prepare chemicals.

119 ENGAGED LEARNING: UNDERGRADUATE RESEARCH & PHYSICS EXTRACURRICULAR ENGAGEMENT AS A MODERN PHYSICS PEDAGOGY

K. A. Streletzky, Ph.D.
Department of Physics, Cleveland State University

The role of undergraduate research (UR) in clarification of graduate school intentions and refinement of career plans for physics majors is crucial (AIP Report [R-211.32, June 2004]). However, evaluating the pedagogical benefits of learning through a research experience is somewhat challenging. We report on our efforts to integrate UR into the physics curriculum of an urban state university and evaluate its perceived pedagogical benefits. In particular, we found that UR significantly helps the personal/professional development of students, cultivates their social/networking/communicative skills, and provides clarification to their career/ educational goals. The conclusions are substantiated by student and alumni interviews and compared to available literature. To deepen the interest in physics we encourage our majors to participate in teaching intro physics labs and engage them in vibrant SPS activities, which include outreach, student seminars, professional conferences, and physics competitions. The interplay between UR, teaching by undergraduates, and SPS activities provides a comprehensive physics education.

120 THE UPTAKE OF ARSENIC AND DIFFERENTIAL EXPRESSION OF ARSENIC REGULATED PROTEINS IN CHINESE BRAKE FERN *PTERIS VITTATA*

Chamari Walliwalagedara, **B.S.**[1]; Jerome D. McGinty[2];Katie L. Lemmeyer[2];Harry van Keulen, Ph.D.[2]; Belinda Willard, Ph.D.[3]; Robert Wei, Ph.D.[1]
[1]Department of Chemistry, Cleveland State University
[2]Department of Biological, Geological, and Environmental Sciences; Cleveland State University
[3]Learner Research Institute, Cleveland Clinic

The aim of this study was to determine the uptake of arsenic in *Pteris vittata* (Chinese Brake Fern) and to identify proteins that are differentially expressed in response to arsenic. The determination of arsenic uptake was performed using two different concentrations (150 and 300 µM) of arsenic (As[v]). The hydroponically grown ferns were harvested after seven days and were analyzed for the uptake of arsenic by using Inductive Coupled Plasma Spectroscopy (ICP) following digestion with nitric acid (HNO_3) (USEPA Method 3050B). The ICP data revealed that *P.vittata* is capable of accumulating As [v] higher than that of other plants. The results also indicated that fronds have higher levels of arsenic accumulation than roots. The concentration range of As [v] was extended up to 150-600 µM for the proteomic analysis and protein extraction was performed using polyethylene-glycol fractionation (PEG) method. The differential expression of these proteins after exposure to arsenic was determined using two dimensional gel electrophoresis followed by liquid chromatography-tandem mass spectroscopy. A total of 22 proteins were induced upon arsenic exposure and most of them were repeatedly expressed at all concentrations tested. The induction of these proteins suggested impairment of the photo-system, energy production, some aspects of carbohydrate metabolism, and oxidative stress.

121 CYTOSKELETAL CONNECTION BETWEEN INTEGRIN BINDING PARTNERS AND THE EFFECTS ON ENDOTHELIAL CELL RESPONSE TO SHEAR STRESS

Sidney Jones[1,2], Kasia Bialkowska[2], Edward Plow[2]
[1]Department of Chemistry, Cleveland State University
[2]Department of Molecular Cardiology, Lerner Research Institute, Cleveland Clinic

Atherosclerosis is prominently located in bifurcated regions of vasculature where disturbances in hemodynamic flow patterns induce pathological shear stress which is experienced as a mechanical stimulus by endothelial cells lining the vessel wall. Endothelial cells are unable to respond to disturbed flow and develop a sustained inflammatory state which primes the

vascular region for atherogenesis. Numerous investigations which have used shear flow assays have shown that integrins transduce mechanical forces applied by fluid shear stress into biochemical events through cytoskeletal structure distortion-dependent changes either locally at the site of integrin-extracellular matrix protein binding or distally, such as the cell surface in contact to flow. In this study, we provide insight into the role of the kindlin-2 and kindlin-3 in integrin mediated mechanotransduction by applying low shear stress to human umbilical vein endothelial cells (HUVECs). HUVECs express {beta}1 and {beta}3 integrins and can interact with various substrates. The kindlins, via their F3 subdomain of the FERM domain, have been shown to bind the conserved $NITY^{759}$ motif of the C-terminal region of integrin {beta} cytoplasmic tails and consequently participate in bidirectional signaling events attributable to integrin activation. Kindlin-2 has been shown to bind cytoskeletal proteins such as migfilin and may facilitate the localization of proteins required for mechanotransduction to the cytoplasmic tail of integrins. Our data indicates that under low shear stress conditions, kindlin-3, but not kindlin-2, experiences changes in its distribution which may implicate kindlin-3 to have a role in mechanotransduction. Low shear stress has been reported to induce changes in vesicle displacement, gene regulation, and secretion of proteins from endothelial cells. We suggest that the changes in kindlin-3 distribution may involve interactions with vesicles or secreted proteins resulting in it redistribution under shear. In summary, the cytoskeletal connection between the {beta}3 subunit of integrins and kindlins may be involved in mechanotransduction in endothelial cells.

122 QUANTITATIVE ANALYSIS OF BENZYL ISOTHIOCYANATE, A DIETARY ANTICANCER AGENT, IN MOUSE PLASMA BY LC-MS/MS

Simuli L. Wabuyele, M.Sc.; Yan Xu, Ph.D.
Department of Chemistry, Cleveland University

Benzyl isothiocyanate (BITC) is a naturally occurring compound in a variety of cruciferous vegetables as glucotropaeolin (benzyl glucosinolate), which is enzymatically released upon dietary intake/consumption. BITC has been shown to have chemopreventative properties against various types of cancers, including pancreatic, lung and breast. To determine the bioavailability and pharmacokinetic properties of this compound, a sensitive and selective analytical method is critically needed. In this work, a liquid chromatography tandem mass spectrometry (LC-MS/MS) method for quantitative measurement of BITC in mouse plasma has been developed. BITC was extracted from plasma using hexane as the organic solvent and the derivatization reaction with ammonia to benzylthiourea was optimized. Isocratic baseline separation of BITC and internal standard (methoxy benzylthiourea) was achieved on a Waters Phenyl C18 column. Positive electrospray ionization (ESI^+) and multiple-reaction-monitoring (MRM) modes were used for quantification with mass transitions *m/z* 167 → 91 and *m/z* 197 → 121 for benzylthiourea and the internal standard, respectively. The linear calibration range and lower limit of quantification (LLOQ) for BITC have been established. The developed method will be validated in mouse plasma for pharmacological studies of the compound.

123 THE EFFICACY OF HIPPOCAMPAL STIMULATION IN THE PREVENTION OF DEPRESSIVE SYMPTOMS INDUCED BY CHRONIC MILD STRESS

Timothy B. Patrick, B.A.[1]; Michael D. Hammonds, Ph.D.[2]; Stephen A. Moreton, B.A.[3]
[1]Department of Psychology, Cleveland State University
[2]School of Health Sciences, Cleveland State University
[3]Post-Baccalaureate College of Sciences and Health Professions, Cleveland State University

Long term stress and depression can eventually lead to chronic impairments in cognitive ability as well as structural damage in the hippocampus. Exercise and environmental enrichment stimulate significant growth and activity in the hippocampus. They have been used successfully as antidepressant treatments in previous studies. However, these studies fail to demonstrate whether these treatments are capable of preventing the cognitive symptoms of depression during times of chronic prolonged stress. Previous research has also evaded the possibility of a potential additive effect when both treatments are used in combination. The current study aimed to demonstrate both the preventative efficacy of hippocampal stimulation during periods of stress, as well as any underlying interactive effect of both treatments. Rodents underwent a 10- week period of chronic mild stress along with concurrent exposure to environmental enrichment, environmental enrichment and exercise, or neither. Sucrose consumption was used as a measure of anhedonia at the 8-week point. At the completion of the 10-week CMS period spatial memory was measured using the Morris Water Maze and a Novel object position task. The overall level of spatial memory impairment was determined based on the group means collected during these tests. The results suggest that while environmental enrichment cannot protect against the onset of depressive symptoms in the presence of prolonged

chronic stress, exercise and environmental enrichment used in combination is capable of preventing these impairments. Future studies should focus on the most effective arrangement of these treatments as well as the discovery of new and potentially more beneficial environmental and behavioral treatments.

124 DYNAMICS OF A LINEAR POLYMER IN A MICROCHANNEL CREEPING FLOW

Prasenjit Bose; Petru S. Fodor, Ph.D.; Miron Kaufman, Ph.D.
Department of Physics, Cleveland State University

An understanding of the dynamics of a polymer in a microchannel could be used to design the technology for high throughput molecular analysis and manipulation. We simulate the motion of a linear polymer advected by a fluid in a rectangular microchannel. We consider the creeping laminar flow, i. e. zero Reynolds number. The model polymer is made up of beads connected by elastic springs. The dynamics of this nonlinear mechanical system is studied as a function of model parameters: the spring equilibrium distance, the mass of a bead, and the spring constant.

125 CRASH AND SHOOT: A RAPID LC-MS/MS METHOD FOR THE QUANTIFICATION OF ILLICIT DRUGS BZP AND TFMPP IN HUMAN BLOOD, URINE, BILE, AND VITREOUS FLUID

Kerri M. Smith[1], Szabolcs Sofalvi[2], Eric S. Lavins[2], Frank P. Miller III[2], Yan Xu[1]
[1]Department of Chemistry. Cleveland State University
[2]Cuyahoga County Coroner's Office, 11001 Cedar Avenue, Cleveland, Ohio 44106

BZP stimulates the release of dopamine and serotonin while also inhibiting the reuptake of serotonin. TFMPP is a nonselective serotonin agonist. Together, BZP and TFMPP exert properties that mimic the effects of MDMA (euphoria and energy stimulation) *in vivo* and indicate a high potential for abuse. There is an increase prevalence of the use of BZP/TFMPP and BZP/TFMPP adulterated MDMA tablets in the United States.

There are four published LC-MS (SIM) and one LC-MS/MS method for the quantification of BZP and TFMPP in biological matrices. Four involve cumbersome sample preparation and none offer near ideal separation. The goal of this work was to develop a fast and simple method for the quantification of BZP and TFMPP in biological matrices.

Full mass spectrometric infusion scans of BZP, TFMPP, and the Internal Standard showed parent ions of 177.1, 231.1, and 191.1 m/z respectively. Upon fragmentation, the predominant ions of 91.0, 188.0, and 105.0 m/z were chosen for quantitation. The method was calibrated from 0.500 ng/mL to 250 ng/mL for BZP and 500 ng/mL for TFMPP. Extraction recoveries for BZP and TFMPP were 87 – 109%, while matrix effects were -9 – 8 in the matrices. Positive Enzyme Multiplied Immunoassay Test (EMIT) samples from ante- and post-mortem cases were submitted for LC-MS/MS analysis. The results of the analysis are presented.

126 COPING REACTIONS, RISKY BEHAVIORS, AND RISK PERCEPTION IN TRAUMA SURVIVORS

Amanda Valerian, B.A.; Lisa Stines Doane, Ph.D.
Department of Psychology, Cleveland State University

In the aftermath of a traumatic event, perceptions of risk have been shown to decrease while frequencies of risky behaviors appear to increase. We hypothesize that, following a trauma, coping reactions will be associated with perceptions of and past involvement in high-risk behavior. Furthermore, we expect that coping reactions will predict later perceptions of risky behavior and frequencies of risk taking behaviors. To investigate possible relationships, preliminary correlation analyses were conducted to examine coping reactions and past frequencies and perceptions of high-risk behavior. We found no significant correlation between risk perceptions and coping reactions, though preliminary correlation analysis did reveal a significant relationship between avoidant emotional coping reactions and frequency of high-risk drug, alcohol, and sexual behavior. The results suggest that trauma survivors who presented with more maladaptive avoidant emotional coping reactions engaged in significantly more frequent alcohol use, substance abuse, and risky sexual activity. Further research is warranted to better understand whether this behavior functions as a method of self-medication to escape the emotions related to traumatic events.

127 ROLE OF RNASE L IN THE ONSET OF TYPE 1 DIABETES

Chun Zeng, B.Sc.; Lin Zhang, B.A.; Xin Yi, B.Sc.; Aimin Zhou, Ph.D.
Department of Chemistry, Cleveland State University

The cause of type I diabetes continues to be a focus of investigation. It is believed that type I diabetes onset is initiated by autoimmune responses triggered by viral infection or other toxic agents, resulting in destroy of insulin producing pancreatic β-cells, leading to an absolute deficiency of insulin. Studies have revealed that an antiviral protein known as interferon (IFN)-α produced in pancreatic islets after viral infection is associated with the onset of type I diabetes. Much effort has been devoted toward the understanding of the role of IFN-α in the development of type I diabetes over past years. However, how IFN-α contributing to the onset of type I diabetes remains to be obscure.

RNase L is an IFN inducible enzyme which plays an important role in IFN action against viral infection and cell proliferation. We created an RNase L deficient RIP-B7.1 mouse which is more vulnerable to environmental harmful factors such as viral infection. By using this mouse model, we have found that the onset of type I diabetes in RNase L deficient RIP-B7.1 mice induced by polyinosinic:polycytidylic acid (poly I:C), a type of double-stranded RNA which is used to mimic viral infection, and streptozotocin (STZ), was significantly delayed. Immunohistostaining showed that the population of infiltrated $CD8^+$ T-cells was remarkably less in the islets of RNase L deficient mice, implicating RNase L may contribute to type I diabetes onset through regulating immune responses. Our finding provides new insight into the molecular basis leading to β-cells destruction, the cause of absolute deficiency of insulin in type I diabetes and may suggest novel therapies for treatment and prevention of the disease based on the selective regulation and inhibition of RNase L.

128 COMPLEX ROLES OF LUNGLESS SALAMANDERS AND WOLF SPIDERS IN FOREST-FLOOR FOOD WEB DYNAMICS

Owen M. Lockhart, M.S.[1]; Kimberly A. Thompson, B.S.[2]; B. Michael Walton, Ph.D.[1]
[1]Department of Biological, Geological and Environmental Sciences; Cleveland State University
[2]Department of Biology, John Carroll University

Forest-floor food web dynamics are complex and include top-down, bottom-up, and intraguild interactions. Within the forest-floor community of Ohio, salamanders and spiders are important predators that influence invertebrate community dynamics. The red-backed salamander (*Plethodon cinereus*) and brush-legged wolf spider (*Schizocosa ocreata*) are common and often abundant forest inhabitants that prey upon a wide variety of invertebrates. To date, however, few data are available for direct comparison of these two predators' impacts. Herein we present the results of a laboratory microcosm experiment in which we manipulated the presence/absence of *P. cinereus* and *S. ocreata* to resolve how each predator affects forest-floor invertebrate populations. In a parallel study, we tested whether salamander feces contribute to regulation of meso-detritivores by serving as a supplemental resource. Our results show that salamanders reduced the density of snails and predaceous mites, whereas spiders had no detectable effect on these taxa. Snails also exhibited a negative response to salamander feces, and we suggest that this is an example of behavioral avoidance of predator cues by snails. Isotomid springtails showed a positive response to salamanders but a negative response to spiders, with no significant interaction between salamander and spider treatments. Fecal subsidies did not result in greater isotomid densities, thus we rule out salamander feces as a significant resource for this group. The opposing roles of salamanders and spiders in the regulation of isotomid populations reflects the complexity of the forest-floor food web and highlights the need for further study to understand the dynamic interactions within this community.

129 DEVELOPMENT AND OPTIMIZATION OF AN HPLC-UV METHOD FOR THE MEASUREMENT OF TRIAPINE

Ye Feng, B.A.[1], Yan Xu, Ph.D[1].
[1]Department of Chemistry, Cleveland State University

Triapine (3-aminopyridine-2-carboxaldehyde thiosemicarbazone, or 3-AP) is a novel anticancer drug which belongs to a family of drugs known as ribonucleotide reductase (RNR) inhibitor. Due to its chelating effect, triapine can remove iron (III) from the catalytic di-iron-tyrosyl radical center of RNR. Preclinical study showed that triapine significantly decreased RNR activity and enhanced radiation-mediated cytotoxicity in cervical and colon cancer cells. These preliminary findings warrant further clinical study of this compound. Therefore, a sensitive analytical method is critically needed to support pharmacological study of triapine.

The major challenge in the development of a quantitative method for the measurement of triapine has been the nature of triapine as metal chelator. In this work, we have studied the complexation reactions of triapine with Fe (III) under various conditions. Our data showed that the reaction pH, buffer composition, temperature, and other coexisting chelators have effects on the complexation reactions. Based on the optimization of these influencing factors, we have developed a quantitative HPLC-UV method for the determination of triapine. In this method, hydrazinecarbothioamide {2-[(3-methoxy-2-pyridinyl)]-methylene} was used as internal standard. Triapine and the internal standard are separated on a Waters Xterra RP18 column (2.1 x 150 mm, 5 µm particle size), and detected at the wavelength of 365 nm by photodiode array detector. The mobile phase for chromatographic separation consists of 18.0% acetonitrile and 82.0% EDTA-ammonium bicarbonate buffer [5 mM EDTA and 25 mM NH_4HCO_3, pH 8.5] (v/v). This method has a linear calibration range of 15.6-5200 nM for triapine with correlation coefficient of 1.00. The lower limit of quantification (LLOQ) of the method was 15.6 nM. Our work shows that triapine can be measured accurately and reliably if the influencing factors are under controls. This method may be useful for preclinical and clinical studies of triapine.

130 METHOD FOR ASSESSING THE TOXICITY OF 3,3'-DICHLOROBIPHENYL (PCB 11) USING *VIBRIO FISCHERI*

Kathleen R. Gibbons[1]; Bhagya Gunasekera[1]; Donald Lindmark, Ph.D.[2]; Anne O'Connor, Ph.D.[1]
[1]Department of Chemistry, Cleveland State University
[2]Department of Biological, Geological and Environmental Sciences; Cleveland State University

Recent research has revealed PCB 11 to be ubiquitous in the environment as well as consumer products. As such, there is a concern regarding the possible toxicity of PCB 11. Bioluminescent bacteria, *Vibrio fischeri* (previously used in chemical toxicity studies) are used as a bioassay, to test the hypothesis that non-Arclor PCB 11 will adversely affect the growth and luminescence of *Vibrio fischeri* versus the untreated condition. Preliminary results suggest an inverse relationship between the variables that merit further investigation.