

COLLEGE OF SCIENCE
ABSTRACTS
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001 NOMATIVE DATA FOR ARABIC SPEAKING OMANI ADULTS ON COMMONLY USED NEUROPSYCHOLOGICAL MEASURES

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Normative data for Arabic speaking adults is limited. This study provides normative data for commonly used neuropsychological measures using a sample of 200 Arabic speaking Omani adults aged from 18-50. Included are the norms for six neuropsychological measures assessing attention, memory, and verbal and nonverbal fluency. Similar to previous cross-cultural studies the age and education appear to have a strong effect on the subjects' test performance. Although the verbal memory measure in the present study produced identical results to those that have been published in other countries, most of the other measures did not produce equivalent scores. These results support the important role linguistic, cultural, and educational experiences play in the performance of subjects on neuropsychological tests.

002 GENERATION OF MACROPHAGE SPECIFIC KNOCKOUT MOUSE OF L13A AND EVALUATION OF ITS POTENTIAL TO BE A NOVEL MODEL FOR UNCONTROLLED INFLAMMATION.

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Inflammatory gene expression is subject to control by an array of stimuli using diverse molecular mechanisms and transcript-selective translational control can regulate the expression of a set of inflammatory genes. However, the endogenous cellular mechanisms for resolving inflammation are poorly understood. Understanding these mechanisms will provide an entirely novel approach to treat and prevent chronic inflammatory diseases. Ceruloplasmin, an inflammatory protein, can be regulated at the level of translation. IFN γ induced synthesis of Ceruloplasmin in monocytes and macrophages is under translational control IFN-Gamma-Activated Inhibitor of Translation (GAIT) complex and its binding to the GAIT element located in the 3'UTR of the Ceruloplasmin mRNA is required for this translational silencing. Experimental data also suggest the absolute requirement of ribosomal protein L13a in this silencing mechanism. Using cell culture models, we have identified a group of mRNAs encoding inflammatory proteins as a target for L13a dependent translational silencing. Our hypothesis is that L13a-dependent translational silencing is an endogenous defense mechanism in monocytes and macrophages against uncontrolled inflammation and disruption of this pathway can severely impair the resolution phase of inflammation. To test our hypothesis at the physiological level, we have generated macrophage specific L13a knockout mice using the Cre-Lox system and will test its potential to serve as a model to study the resolution of inflammation and also validate the results obtained from cell culture models. We will challenge these knockout mice of L13a with various inflammatory stimuli and compare their responses to those of wild type mice. Since macrophages are the central component of immune response, we expect that due to the absence of L13a leading to absence of the GAIT mediated translational silencing pathway,

these mice will show accelerated levels of inflammation. Successful completion of this project will uncover the endogenous cellular pathways for the resolution of inflammation.

003 ANGIOTENSIN II AND LOSARTAN INDUCE DIFFERENT CONFORMATION IN THE EXTRACELLULAR LOOP-2 UPON BINDING ANGIOTENSIN II TYPE 1 RECEPTOR

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Direct interaction of ligands and autoantibodies with the extra cellular domain of Ang II Type 1 receptor (AT1R) plays a novel role in the regulation of active-state; however, the molecular mechanism is unknown. The orientation of the second extracellular loop (ECL2) is divergent in G-protein coupled receptor (GPCR) structures determined. This discovery provoked the question, is the ECL2-conformation differentially regulated in the GPCRs that respond to diffusible ligands? We determined the conformation of the ECL2 of the angiotensin II type 1 receptor by reporter-cysteine accessibility mapping in different receptor states (i.e., empty, agonist-bound and antagonist-bound). We introduced cysteines at each position of ECL2 of an N-terminal epitope-tagged receptor surrogate lacking all non-essential cysteines and then measured reaction of these with a cysteine-reactive biotin probe. The ability of biotinylated mutant receptors to react with a streptavidin-HRP-conjugated antibody was used as the basis for examining differences in accessibility. Two segments of ECL2 were accessible in the empty receptor, indicating open-conformation of ECL2. These segments were inaccessible in the ligand-bound states of the receptor. Using the accessibility constraint, we performed molecular dynamics simulation to predict ECL2 conformation in different states of the receptor. Analysis suggested that a 'lid' conformation similar to that of ECL2 in rhodopsin was induced upon binding both agonist and antagonist, but exposing different accessible segments delimited by the highly conserved disulfide bond. Our study reveals the ability of ECL2 to interact with diffusing ligands and to adopt a ligand-specific 'lid' conformation, thus, slowing down dissociation of ligands when bound. Distinct conformations induced by the bound agonist and the antagonist around the conserved disulfide bond suggest an important role for this disulfide bond in producing different functional states of the receptor.

004 ASSESSMENT OF HABITAT USE BY EASTERN COYOTE (*CANIS LATRANS*) ALONG AN URBAN-PARKLAND GRADIENT

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This study used coyote howl surveys combined with GIS to locate local coyote (*Canis latrans*) populations, determine the habitats where coyotes occur and estimate coyote group sizes within the Cleveland Metroparks, Ohio. Coyotes have become the "top terrestrial predator" in northeastern North America, and these animals are choosing to live in urban areas where humans are present and few natural habitats are available. I performed howl surveys in Bedford, North Chagrin, and West Creek Reservations. Overall, coyotes were heard 16.9% when howl surveys were performed. Bedford Reservation had a minimum of 13 coyotes during winter months and 11 coyotes during the summer. It is believed that three coyote groups (Bedford, Cuyahoga Valley National Park and Walton Hills) were present around Bedford Reservation. North Chagrin Reservation had at least five coyotes during the winter and four coyotes in the summer months. West Creek Reservation had three coyotes respond to surveys in the winter and five coyotes replied during summer surveys. North Chagrin and West Creek Reservation each had one coyote group. Bedford Reservation coyote groups had similar responses during all three seasons (dispersal, breeding and pup-rearing). North Chagrin coyotes responded the most during the dispersal and pup-rearing

seasons. West Creek Reservation had peak coyote responses during the breeding and pup-rearing seasons. For all three reservations, coyotes responded from natural areas more than from urban areas (Bedford 65%, North Chagrin 79%, and West Creek 83%). Statistics showed that Bedford coyotes responded more than West Creek coyotes. More coyotes responded during the dispersal season than during the pup-rearing season. Coyote response rates increased the closer howl surveys were performed to sunset and/or later at night (closer to midnight). Coyotes also responded more to howl surveys when temperatures were low and the moon was visible.

005 STRUCTURE AND GELATION OF TUNABLE GUANOSINE-BASE SUPRAMOLECULAR HYDROGELS

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The mechanism of gelation of 50/50 w/w mixtures of Guanosine (**G**) and 2',3',5'-Tri-O-Acetylguanosine (**TAcG**) in aqueous 0.354 M KCl was investigated using static light scattering (SLS), polarized & depolarized dynamic light scattering, small-angle neutron and X-ray scattering (SANS, SAXS), and viscometry. SLS and viscometry show a dramatic increase in apparent molecular weight and hydrodynamic volume at 0.2 wt% and 0.3 wt%, respectively, indicating the critical concentration (c_c) for self-association of **G/TAcG** quartets into columnar assemblies. Above c_c , SANS and SAXS generate complementary information on structure of individual columnar stacks. VV and VH DLS results indicate bimodal correlation functions, whose properties suggest, respectively, translational and rotational diffusion of a bimodal distribution of particles. The fast mode appears to originate from fibrillar agglomerates of **G/TAcG** columnar quartet assemblies, while the slow mode comes from microgel domains. Guinier plot analysis of SLS data probes the internal structure of microgel domains. Collectively, results suggest that sol and microgel phases coexist below the macroscopic gel point, and that the sol phase contains individual columnar stacks of **G/TAcG** quartets and fibrillar aggregates formed via lateral aggregation of these columnar assemblies. With increasing c , DLS data indicate a progressive increase in volume fraction of microgel domains, which ultimately leads to macroscopic gelation. Prior observation of a transient network contribution to gel rheology at low temperature is attributed to presence of individual columnar stacks within the gel network.

006 THEORETICAL BACKGROUND FOR INTERPRETING ROTATIONAL DIFFUSION OF BIOPOLYMERS

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Some organic compounds have capability to aggregate together to form rod-shaped polymers in certain solutions. These polymers perform translational and rotational diffusion. The diffusion processes depend on rod concentration (c). The two most commonly used theoretical models for motion of rod-like polymers are Broersma's and Doi-Edward's. Broersma's model for thin rods is used for dilute rod solutions. This model relates both diffusion coefficients with the average rod length (L) and predicts that the diffusion coefficients are independent of c . The Doi Edward's model is used for semi-dilute rod solutions. This theory also relates both diffusion coefficients to L . It predicts that only translational motion parallel to the rod axis is allowed and its diffusion coefficient is independent of c , while the rotational diffusion coefficient is inversely proportional to c^2 . A relation between c and L for polydisperse rods was developed to estimate the concentration regime of rods. KCl:water solution of Guanosine and 3-Acetyl Guanosine was tested with Depolarized Dynamic Light Scattering (DDLs) technique. Using $L(c)$ relation for the rods, the solution was predicted to be semi-dilute. However, the c -dependences of diffusion coefficients

obtained from DDLS were found to contradict the Doi-Edward's model. The experimental results were compared to literature,^{[1][2]} which led to conclusion that large non-rod shaped aggregates were formed in the solution, with not all monomers contributing to rod formation. Therefore, rods in the solution can be considered to be dilute and analyzed by Broesma's model.

007 CONGRUENCY BETWEEN BIOPHYSICAL DATA AND COMPUTER SIMULATION OF HIGH DENSITY LIPOPROTEIN

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The predicted structure and molecular trajectories from over 80 ns molecular dynamics simulation of solvated reconstituted nascent-high density lipoprotein (rHDL) was determined and compared with experimental data on rHDL obtained from multiple biophysical platforms including small angle neutron scattering (SANS) with contrast variation, hydrogen-deuterium exchange tandem mass spectrometry (H/D-MS/MS), nuclear magnetic resonance spectroscopy (NMR), cross-linking tandem mass spectrometry (MS/MS), fluorescent resonance energy transfer (FRET), electron spin resonance spectroscopy (ESR), and electron microscopy. In general, biophysical constraints experimentally derived from the multiple platforms agree with the same quantities evaluated using the simulation trajectory. Notably, key structural features postulated for the recent Double Super Helix (DSH) model of nascent HDL are retained during the simulation including: 1) the super helical conformation of the anti-parallel apolipoprotein A1 (apoA1) chains; 2) the lipid micellar-pseudolamellar organization; and 3) the solvent exposed Solar Flare loops, sites of interaction with LCAT (lecithin cholesteryl acyltransferase). Analysis of salt bridge persistence during simulation provides insights into structural features of apoA1 that form the backbone of the lipoprotein. The combination of molecular dynamics simulation and experimental data from a broad range of biophysical platforms serves as a powerful approach to study large macromolecular assemblies such as lipoproteins. The present application to nascent HDL validates the DSH model proposed earlier, and suggests new structural details of nascent HDL.

008 CHANGES IN SPEAKING FUNDAMENTAL FREQUENCY AND SPEAKING INTENSITY IN THE VOICE FOLLOWING VOCAL TRAINING

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Recent study on the impact of singing training on the speaking voice has been largely inconclusive. Studies by Mendes et al. (2004) and Walzak et al. (2008) disagree about the impact of singing training on speaking voice intensity. This study will assess changes in the speaking voice due to singing training by recording speaking samples from one participant over an entire semester of singing training. These recorded samples will be analyzed for changes in speaking intensity and speaking fundamental frequency and should aid in understanding other research and data collected about the impact of singing training on the speaking voice.

009 AUTONOMOUS CARDIAC CONTROL OF SUBJECTS WITH EPILEPSY

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Mortality in people with epilepsy is about three times higher than in the general population. Sudden death in epilepsy [SUDEP] is the most common cause of epilepsy-related deaths. Cardiac arrhythmia has been suggested to be a causal mechanism in SUDEP. The analysis of heart rate variability [HRV] is difficult because several dynamic processes influence the heart rate on different time scales. We calculate the fractional heart rate by identifying the *RR*-intervals from the EKG. Coupling between cardiac and respiratory cycles associated with respiratory sinus arrhythmia [RSA] leads to nearly oscillatory behavior of HRV with frequency 12 bpm. We use RSA oscillations to differentiate between short- and long time behavior of HRV. Methods from nonlinear time series analysis are then used to quantify HRV on different time scales. We examine how these novel methods can be used as a prognostic tool of identifying epilepsy patients at greatest risk of SUDEP.

010 BEAMLIKE SOLUTIONS OF THE VECTOR WAVE EQUATION

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The vector wave equation for electromagnetic waves, when subject to a number of constraints corresponding to near-paraxial propagation of a monochromatic beam, reduces to two sets of inhomogeneous differential equations. Each set describes the transverse electric or the transverse magnetic polarized beam component. When the beam fields are expressed as a Taylor series in powers of the beam confinement parameter $s = \lambda / (2\pi w_0)$, where λ is the beam wavelength and w_0 is the field half-width in its focal plane, the resulting set of inhomogeneous differential equations for the beam fields link adjacent pairs of terms in the expansion. These differential equations are solved by iteration, and the arbitrary coefficients of the homogeneous part of the solution are adjusted so as to produce the most general fields to order s^5 of a beam that is linearly polarized in its focal plane. The Davis-Barton fifth order beam turns out to be a special case of this general result.

011 PROPHYLACTIC PROTOCOL FOR SPACEFLIGHT CARDIOPULMONARY DECONDITIONING

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During spaceflight, a combination of factors including the reduced gravity environment, sleep disturbance and confinement in the spacecraft may lead to potentially serious deterioration of muscles of the respiratory and circulatory systems [1, 2]. This muscle weakness is intensified as flight duration increases. As human space missions become more prolonged, space crews are at risk for returning home with significant cardiopulmonary deconditioning. To maintain fitness and prevent progressive weakness during long-duration space missions, a rigorous conditioning and monitoring protocol is proposed. To counteract the deconditioning effects of space, assessments including daily Pulmonary function tests (PFTs) will be measured to trend breathing volumes and flow over time while breathing resistance training will be utilized as a form of rehabilitation designed to address functional changes in the cardiopulmonary system. The primary goal is to implement programs that help maintain each crew member's conditioning level and anticipate post-flight rehabilitation.

012 PRINCIPLES OF UNDERGRADUATE INDEPENDENT RESEARCH PROJECT PLANNING

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Advances in science and technology are now at the heart of the global economy, but the number of students earning degrees in the sciences, technology, engineering and math (STEM) fields has stalled. According to the National Association for Colleges and Employers (NACE), programs have been initiated nationwide to nurture interest in the sciences, including a focus on independent research for undergraduate students. This project provides a review of best practices for undergraduate research project planning, development and implementation, including decision-making models, timing, scope and significance. Best practice recommendations are collected from published literature and interviews with research faculty and students in the College of Science at Cleveland State University.

013 WASHED MEDIASTINAL DRAINAGE WITH THE HAEMONETICS CARDIOPAT® POST OPEN HEART SURGERY: A SAFE ALTERNATIVE TO ALLOGENEIC BLOOD TRANSFUSION

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Background: Some cardiac surgery patients have a higher risk of post operative bleeding, and are more likely to require allogeneic blood transfusion. In this pilot study, we examined whether the Haemonetics cardioPAT® autotransfusion system was an effective cell washing device, the known adverse reaction of infusing unwashed mediastinal drainage was eliminated, and there was a decrease in allogeneic transfusion.

Methods: A prospective randomized study of 16 (2-groups of eight) patients undergoing open heart surgery. Chest tubes were either connected to the Atrium Oasis® dry drainage system (control) or the Haemonetics cardioPAT® autotransfusion system (cardioPAT®). Mediastinal drainage was collected and processed by the cardioPAT® for 6-hours postoperatively. After that, the cardioPAT® was replaced with the Atrium Oasis®. The cardioPAT® processed drainage was quality checked before being returned to the patient. Data collected during the first 24-hour following surgery included: arterial pressure, pulmonary artery pressure, central venous pressure, heart rate, mechanical ventilation time, bladder temperature, urine output, chest tube drainage, and red blood cell transfusion.

Results: Potassium removed from mediastinal drainage by washing with the cardioPAT® system averaged 93%. The hematocrit of the washed product was consistently greater than 65%. No patients required re-exploration for bleeding or had increased mediastinal drainage. There were no clinically significant differences in mean pulmonary artery pressure, mean arterial pressure, heart rate, mechanical ventilation time, urine output, or incidence of post operative fever. No patients in the study developed a deep sternal wound infection within 30 days of surgery, but the decrease in allogeneic transfusion was not observed.

Conclusion: The Haemonetics cardioPAT® effectively washed the mediastinal drainage. Whether cardioPAT® eliminated the adverse reaction of infusing unwashed drainage or reduced the need for allogeneic transfusion remains unknown, due to the small sample size.

Key words: Haemonetics cardioPAT®, washed mediastinal drainage, autotransfusion, cell saver

014 VARIATION IN EMOTIONAL TONE OF VOICE AND SPOKEN WORD RECOGNITION

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Despite the significance of emotional tone of voice for optimal verbal communication, the extent to which emotional tone of voice influences online spoken word recognition remains unclear. The proposed experiments will address this issue 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 will be conducted, and participants' mean accuracy rates and reaction times (RTs) will be analyzed. Previous research using the long-term repetition priming paradigm, in which listeners respond to two separate blocks of spoken words, found performance costs for stimuli mismatching in surface information (e.g., the identity of the talker) across the two blocks of trials. Consequently, specificity effects are predicted, such that longer RTs or reduced accuracy are expected for target words mismatching – relative to those matching – in emotional tone of voice across the two blocks of trials. That is, when words are repeated across the two blocks of trials, but the emotional tone of voice changes (e.g., from sad to frightened), longer RTs or reduced accuracy are expected relative to when words are repeated across the two blocks of trials, and the emotional tone of voice remains the same (e.g., frightened to frightened). Furthermore, because previous work found specificity effects only when processing was relatively slow and effortful, the magnitude of the predicted effect with emotional tone of voice is also expected to be greater for participants performing the hard lexical decision task compared to participants performing the easy lexical decision task. Finally, neurotic personality traits and musical experience will also be measured, as the former has been associated with greater processing of negatively charged emotional stimuli, and there is evidence to suggest that the latter may modulate listeners' perception of emotional tone of voice.

015 IN SEARCH OF ASPIRINASE

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The antiplatelet drug aspirin is historically an extremely efficacious drug against inflammation and more recently as a prophylactic agent against cardiovascular complications. However, there is an apparent lack of beneficial effects of aspirin in certain individuals termed “Aspirin resistance” that is not currently understood. Aspirin has a short half-life in circulation, and esterases are believed to catalyze its hydrolysis. Paraoxonase-1 (PON-1) is an HDL associated esterase of unknown function, but implicated in cardiovascular diseases. It now has been shown to hydrolyze aspirin. We find human HDL particles where PON-1 is localized acting like aspirinase, but EDTA had no effect on aspirin hydrolysis. On the other hand, Eserine, an esterase inhibitor blocked aspirin hydrolysis by HDL, suggesting the presence of an esterase such as butyrylcholinesterase in HDL particles. Western immunoblot barely detected butyrylcholinesterase in HDL but in situ activity staining using butyrylthiocholine iodide which is much more sensitive than immunoblotting suggested the presence of esterase in HDL particles. Purified butyrylcholinesterase catalyzed aspirin hydrolysis similar to HDL particles while recombinant Paraoxonase-1 had no effect on aspirin hydrolysis. Plasma from a donor with established butyrylcholinesterase deficiency had intact aspirinase activity. Our efforts are in progress to identify the aspirinase in human plasma.

016 THE INFLUENCE OF AN EXTERNAL VERSUS INTERNAL FOCUS OF ATTENTION WITH REGARD TO MOTOR LEARNING AND SKILL ACQUISITION FOR ANTERIOR CRUCIATE LIGAMENT (ACL) INJURY PREVENTION

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Context: For a variety of movement skills it has been demonstrated that using an external attentional focus (EAF) during instruction of a motor task, compared to traditional instruction that uses an internal attentional focus (IAF), leads to more effective learning of that motor task (Wulf, 2009, 2004).

Objective: To determine whether training programs using EAF lead to more effective muscle onset patterns compared to training methods using IAF, when complex motor tasks to prevent ACL injury are taught. **Participants:** 32 healthy active female college students (24.5 ± 1.9 yrs) randomly assigned to the EAF (n=16) or IAF (n=16) group. **Interventions:** Each group underwent a 6-week, biweekly exercise training program specifically designed to prevent ACL injury. The first group received training of the motor tasks using EAF; the second group received the same training, but with cues that utilized IAF. Prior to the training program, and 1 week after training completion, all subjects underwent biomechanical testing, including monitoring of muscle activity using surface EMG on 7 muscles of the dominant leg during a side-step maneuver. **Main outcome measures:** A MATLAB program determined muscle onset times (secs) from initial foot contact. A non-parametric Wilcoxon signed rank test ($p \leq .05$) compared muscle onset times between groups. **Results:** There were no significant differences in muscle onset times for vastus medialis ($p = 0.881$), vastus lateralis, ($p = 0.294$), rectus femoris ($p = 0.525$), biceps femoris ($p = 0.433$), gastrocnemius ($p = 0.257$), gluteus medius ($p = 0.120$), gluteus maximus ($p = 0.166$) in the EAF group, compared to the IAF group. **Conclusions:** Motor skill training using EAF may not be superior to training using IAF, when used for exercise programs designed to prevent ACL injury. Further analysis of the data, including amplitude of muscle activation and kinematic variables, is warranted prior to confirming current results.

017 DUAL BINDING SPECIFICITY OF 65KD RNA BINDING PROTEIN IN THE MINOR SPLICEOSOME

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Most eukaryotic nuclear-encoded genes are interrupted by introns, which are needed to be removed from pre-mRNAs by splicing to generate functional mRNAs. In metazoan, two types of introns are spliced by two distinct spliceosomes. The major type of introns or U2-dependent introns are spliced by U2-dependent spliceosomal small nuclear (sn) RNAs including U1, U2, U4, U5 and U6. On the other hand, minor or U12-dependent introns are spliced by a distinct set of snRNAs containing U11, U12, U4atac and U6atac snRNAs. U5 appears to be a common snRNA in both systems. Recent work shows that 3' RNA element of U6atac snRNA is sufficient to guide U6 snRNA to minor spliceosome and activates the splicing of a U12-dependent intron. This data lead us to believe that splicing activity that targets U6atac to minor spliceosome is modulated by a RNA binding protein specific to 3' stem-loop element of RNA element. Of various novel proteins of U12-dependent spliceosome, protein 65K 3'RRM contains a well-characterized domain called 3'-RNA recognition motif, and our preliminary data indicate that P65 3' RRM protein has potential to bind U6atac 3' stem-loop element. To determine 65K-C-RRM protein-RNA binding site on U6atac 3' stem-loop, we are using Electrophoretic Mobility Shift Assay (EMSA) and a series of deletion mutants of U6atac RNAs. More investigations need to be done to determine dual binding specificity of 65kd RNA binding protein in the minor spliceosome.

018 BIOFEEDBACK-MEDIATED STRESS MANAGEMENT TRAINING TO REVERSE MYOCARDIAL REMODELING IN PATIENTS WITH ADVANCED HEART FAILURE

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Heart failure is the leading cause of death in American men and women, and for years this disease was believed to be irreversible. Pharmacological therapies were provided to control disease symptoms, but cardiac transplantation was viewed as the only truly successful therapy. Recent studies, however, have illustrated marked recovery in end-stage heart failure patients who have been hemodynamically supported by a left ventricular assist device (LVAD) prior to transplantation. Cardiac tissue removed from these patients before and after LVAD support has shown a reversal of the maladaptive changes to both muscular and cellular function as well as gene and protein expression, suggesting that the failing heart is capable of recovery. This project will test the hypothesis that biofeedback-mediated stress management (BFSM) training can cause a similar reversal of myocardial remodeling in advanced heart failure patients. The hypothesis will be tested using end-stage heart failure patients who are listed for heart transplantation at the Cleveland Clinic over a two-year period. Patients will be divided into three groups: (1) patients who receive BFSM training, (2) patients who do not receive BFSM training, and (3) patients who do not receive BFSM training but do require LVAD support while waiting for cardiac transplantation. These three groups will be compared in order to achieve the following specific aims: 1) To measure the efficacy of BFSM on cellular and molecular myocardial remodeling, 2) To measure the clinical efficacy of BFSM on cardiac function, and 3) To assess the effects of BFSM on quality of life, perceived stress and coping strategies. We are currently conducting a pilot study of Status 1B inpatients, and preliminary data suggest that advanced heart failure patients can be trained using biofeedback. Data also suggest that biofeedback may improve quality of life and remodel the beta-adrenergic signaling system in this patient population.

019 SOCIAL FACTORS AND LISTENERS' SENSITIVITY TO TALKER-SPECIFIC INFORMATION DURING ONLINE SPOKEN WORD RECOGNITION

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McLennan and Luce (2005) found no significant cost associated with changing which talker produced a particular word from the first block of trials to the second (no talker effects) when participants responded relatively quickly (easy lexical decision), and that talker effects emerged when participants responded relatively slowly (hard lexical decision). In a lexical decision task, participants hear words and nonwords and reaction times to correct responses are measured. In the current study, we are examining whether social factors will lead to talker effects in an easy lexical decision task. In Experiment 1, participants will be told that they have a chance to be part of a desirable high achieving group if they perform with high accuracy. Based on previous time-course findings, we predict talker effects will emerge in the current experiment, given that participants' attention to accuracy is expected to slow processing. In Experiment 2, participants (all males) will be told that they will meet the two talkers they hear during the experiment (one male and one female) at the end of the experiment. Moreover, participants will be given some (fabricated) background information about the talkers, including mention that the female is attractive and the male is unattractive. Based on previous findings in social psychology, we predict that the male participants will attend more to the female's voice than to the male's voice. Consequently, we predict a significant interaction, with greater talker effects when the talker changes from a female in Block 1 to a male in Block 2 than the reverse. Examining the relationship between social factors and talker effects should lead to improved models of spoken word recognition and provide important new insights into how listeners perceive spoken words in various social contexts.

020 EF1A1 & hnRNP-E1 COORDINATE TRANSCRIPT-SELECTIVE TRANSLATIONAL SILENCING OF EMT-FACILITATING TRANSCRIPTS AT THE ELONGATION STAGE OF PROTEIN BIOSYNTHESIS

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Transcript-selective translational regulation of epithelial-mesenchymal transition (EMT) by transforming growth factor beta (TGF β) is mediated through an hnRNP E1-containing mRNP complex. Herein, eukaryotic elongation factor-1 A1 (EF1A1) is identified as an integral, functional component of the TGF β -activated-translational (BAT) mRNP complex. Translational silencing of mRNAs regulating EMT is induced by a ternary complex consisting of a 33-nt BAT RNA element, EF1A1, and hnRNP E1, whereby hnRNP E1 attenuates translational elongation by inhibiting the release of EF1A1 from the ribosomal A site following delivery of the aminoacyl-tRNA and GTP hydrolysis. TGF β -mediated hnRNP E1 phosphorylation disrupts the BAT complex, thereby reversing translational silencing. Significantly, shRNA-mediated knockdown of hnRNP E1 results in a complete ablation of the translational silencing capacity of the BAT mRNP complex, and results in EMT, tumor growth initiation, and metastasis. These results uncover a TGF β -mediated post-transcriptional pathway regulating the expression of genes required in EMT and tumorigenesis by specifically targeting mRNA translation at the elongation stage of protein biosynthesis.

021 A STUDY ON THE BIOLOGICAL ROLES OF TMCO1

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Transmembrane and coiled-coil domains 1 (TMCO1) is a membrane-associated protein and belongs to the DUF841 superfamily of several eukaryotic proteins with unknown functions. The human TMCO1 gene is located on chromosome 1q22-q25. A homozygous frame shift mutation, c.139_140delAG, has been identified in the TMCO1 gene in patients with TMCO1 defect syndrome (TDS). TDS is characterized by distinctive craniofacial dysmorphism, skeletal anomalies, and mental retardation. In this study, human TMCO1 was expressed in both bacteria and mammalian cells. The recombinant TMCO1 expressed in bacteria was purified for preparing an antibody. Subcellular localization using the immune-fluorescent staining technique revealed that TMCO1 may be expressed in the mitochondria of cells. Further study showed that the lymphocytes isolated from the periphery blood of the patients with TDS grew significantly faster than that from health individuals, suggesting that TMCO1 may be involved in the regulation of cell proliferation. In addition, we have generated a TMCO1 knock down cell line, which will be used for further studying the molecular basis underlying TDS.

022 TIME OF DAY EFFECTS ON OLDER ADULT EXECUTIVE FUNCTIONING

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The present time of day (TOD) body of research has explored how TOD affects certain cognitive domains such as semantic memory, episodic memory, processing speed, and executive functioning. Research also suggests that morning performance is poorer than afternoon or evening performance in executive function tasks for young adults. However, TOD effects on older adults have shown to impair afternoon performance, relative to morning performance. To date, research has not examined the effects from TOD using a comprehensive measure of executive functioning to compare older and younger adult performance.

Thus, the current study intends to examine this issue by testing older adult participants (n=40, 65+ years) once in the morning and once in the afternoon on two separate days. Influencing factors will be taken into account using a questionnaire mainly looking at diet, sleep, and caffeine intake. Effects from circadian rhythm will be controlled for by measuring oral body temperature, which is predicted to parallel peak performance with elevated body temperature. A pilot study involving young adult participants (n= 27, mean age 22) will be used as a comparison group. These participants were involved in the same tasks as the older adult group, although the questionnaire will be modified to tailor to the older adult group. Results from this study are predicted to show different TOD effects in executive functioning between the groups of adults. By using the Delis-Kaplin Executive Function System (D-KEFS) assessment measure, there is evidence to predict that this is a comprehensive effect across a wide variety of executive function tasks. This is the case even when controlling for order of times and other influencing factors.

023 THE PARASYMPATHETIC NERVOUS SYSTEM IN HUMAN HEART FAILURE

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Heart failure (HF) is a condition affecting 5.7 million Americans, and it 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 and muscarinic receptors (M). Muscarinic receptors are found on cardiomyocytes and act through two pathways: (1) $M_{1/3/5}$ produce an increase in cardiac output and force of contraction and (2) $M_{2/4}$ produce a decrease in heart rate and force of contraction. 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; however, the role of the PNS in HF is not well understood. We hypothesize that the PNS is dysregulated in HF, resulting in a change of muscarinic receptor densities. We will be measuring total muscarinic receptor density on non-failing and failing human heart samples, and we will also see if demonstrated differences can be reversed through mechanical unloading with a left ventricular assist device. We will also measure the density of M_1 - M_5 muscarinic receptor subtypes on these samples as well as in a subset of patients with previously recorded heart rate variability (HRV). Because HRV may be used as a marker of overall health and has been shown to decrease almost to the point of absence in patients with end-stage heart failure, we will look for a correlation between muscarinic receptor density and HRV. Through a pilot project, protocols are established for a radioligand binding and time-dependent competition binding assay.

024 EXPLORING THE EFFECT OF PREFERENTIAL HYDRATION ON THE DYNAMICS OF LYOZYME IN GLYCEROL-WATER SOLUTIONS

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The relaxation processes of the protein lysozyme in glycerol-water solutions were studied with Dielectric Spectroscopy and Dynamic Light Scattering (DLS) in a wide temperature range. Analysis of the dielectric spectra revealed three relaxation processes: protein rotation, large scale protein motions (slow delta-relaxation), and solvent alpha-relaxation. Analysis reveals a decoupling of protein dynamics from the solvent relaxation. These effects were also studied by comparing the protein diffusion as measured by DLS to the viscosity of protein solutions. Both spectroscopic techniques suggest preferential hydration of the protein in solution.

025 THE RELATIONSHIP BETWEEN TURNING AND FRICTION DURING ARBOREAL LOCOMOTION IN *TAMIAS SIBIRICUS*

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Arboreal animals are frequently forced to change directions during locomotion on tree branches, trunks, or twigs (arboreal substrates). Changes in direction should cause the animal to generate different forces as compared with linear progression on arboreal substrates. As an animal travels, it generates shear force (parallel to the substrate) and normal force (perpendicular to the substrate). If shear force is greater than friction force, then a slip should occur. Because we expect shear forces to be higher when an animal performs a turn, slipping may be more likely unless the animal simultaneously increases friction force. If shear force increases during turning, animals will employ at least two different strategies to decrease the amount of shear force and avoid slipping. They may increase normal force or they may increase the coefficient of friction (μ_s). To understand how turning affects friction force during arboreal locomotion, we measured shear and normal forces using Siberian chipmunks (*Tamias sibiricus*) on two 2 cm diameter cylindrical trackways. The straight trackway had a force pole positioned in the middle. The second trackway had a 45° bend to the right; a force pole was positioned before the bend to collect take off data, and then moved after the bend to collect landing data. Normal force was significantly decreased on the turning trackways compared to the straight trackways while shear force was significantly increased. The results suggest that chipmunks rely more on increasing μ_s rather than normal force in order to maintain stability when performing a turn on an arboreal substrate. It is possible that neither of these methods is being used and chipmunks are just less stable during turning locomotion.

026 DYNAMIC STABILITY DURING ARBOREAL LOCOMOTION IN THE SIBERIAN CHIPMUNK (*TAMIAS SIBIRICUS*)

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When animals walk or run on tree branches, avoiding falls is of paramount importance. A fast-moving animal running on a narrow branch cannot widen its stance or increase its step duration to remain stable. Therefore it must rely on the movement itself to create stability. In this study, we examined how Siberian chipmunks (*Tamias sibiricus*) remain stable on a narrow tree branch trackway. More specifically, we examined how the substrate reaction force caused each chipmunk's center of mass to rotate around the vertical, fore-aft, and mediolateral axes. We theorized that within a step sequence (stride), any rotation (for example, a yaw rotation to the right) would be canceled out by an equal and opposite rotation (in this example, an equal yaw rotation to the left). Three chipmunks were videotaped at 240Hz running on a 2cm diameter branch trackway. A short region of the trackway was instrumented to measure substrate reaction force in three components (vertical, fore-aft, and mediolateral). We found that pitch rotation is by far the greatest. The front of the body pitched upward when the forelimbs landed simultaneously, and then the body pitched in the opposite direction as the hindlimbs simultaneously made contact. However the pitch torque was not balanced over the course of the stride. Yaw and rolling torques were small and more or less equivalent to each other and between forelimbs and hindlimbs. These too were not always balanced. We conclude that the chipmunks may balance out the torques acting on the center of mass over the course or two or more strides, rather than one stride as we hypothesized.

027 INVESTIGATION OF STRUCTURE AND FUNCTION OF THIN FILMS OF NITRIC OXIDE SYNTHASE AND POLYETHYLENIMINE FORMED USING THE LAYER-BY-LAYER DEPOSITION METHOD

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Layer-by-layer electrostatic adsorption allows for assembly of multi-component protein/polyelectrolytes nanostructured films. Application of these films as functional coatings particularly on medical implants is a transformative leap for biocompatible coatings that can be tailored to fulfill various biological functions. In this project, we investigate the layer-by-layer (LBL) deposition of nitric oxide synthase (NOS) as a functional component and polyethylenimine (PEI) as a matrix on pyrolytic graphite and mica surfaces as model surfaces. We have previously shown that these films, when exposed to NOS substrate arginine and other ingredients, can release fluxes of nitric oxide (NO). The latter is a molecule known to counteract platelet aggregation, and thus can stop the thrombosis cascade on the surface of medical devices.

Negative and positive charge density in each layer is the driving force that leads to adhesion of film components. In this work we examined if the pH of the medium of each component can modulate the charge achieved in each layer. We used buffered NOS solutions and saline PEI adjusted to desired pHs to investigate charge-driven adhesion of NOS and PEI as well as extent of NO release that results. In addition to measurements of NO release using the Griess assay, we also used the catalytic reduction of nitric oxide as an electrochemical handle to monitor functional aspects of various films built under different pH conditions. In terms of structure, we used atomic force microscopy to characterize the morphology of the outermost NOS layer. Our results show that the charge density of each layer brought about by the pH of film components during the LBL process affects the structure of the film as well as the extent of NO release by the resulting NOS/PEI thin film.

028 POLICY ANALYSIS OF U.S. CAP-AND-TRADE

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The purpose of the project is to evaluate the proposed policy for the U.S. Carbon Cap-and-Trade act, H.R.2454 also called the American Clean Energy and Security Act. The analysis of the policy will be broken into key sections that allow a comprehensive overview of the policy as it is currently written for the U.S. Senate. All attempts will be made to follow the “eight-fold path” of policy analysis as proposed by Eugene Bardach (Bardach 2009). Although it is often impractical and difficult to follow the eight-fold path in a linear fashion, it is my intention to attempt to stay as true to the method as possible.

The policy is designed to tackle the problem of excessive carbon emissions from sources within the United States. To accomplish this, the policy proposes a Carbon Cap-and-Trade system of market based pollution rights trading. The bills policy is important to the United States for several reasons. First, the bill addresses what some consider a dire circumstance that is global warming deceleration, through the reduction of greenhouse gases in this case CO₂. Second, the bill tackles the issue of how to control those emissions of carbon by using a market based pollution rights trading system, which allows the market to determine pollution cost pricing. Lastly if the policy should be enacted, there are hopes that it will bring some much needed credence to the U.S. over the issues of pollution controls, as the U.S. is one of the largest producers of greenhouse gases and as many have cited is behind other nations in doing it’s part to prevent global warming.

029 DETERMINATION OF TETRACYCLINE ANTIBIOTICS IN BEEF TISSUES USING ION-PAIRED LIQUID CHROMATOGRAPHY

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Beef samples were obtained from local butchers and Whole Foods (an organic market) in order to determine and compare the amount of Tetracycline antibiotics in organic and non-organic beef. Extraction was used to separate the antibiotics from the meat tissues and then High Powered Liquid Chromatography (HPLC) was used to analyze the amount of antibiotics in the samples. Currently, many farm animals are feed antibiotics in order to provide therapeutic treatment. Even though, antibiotics are not toxic, they can cause some harm to consumers who eat meat. In this study, the amount of antibiotics in organic and non-organic meats will be determined and compared.

030 THE SOCIAL AND EMOTIONAL EFFECTS OF DEMENTIA CAREGIVING: AN EXAMINATION OF CAREGIVER AND CARE RECEIVER PERSPECTIVES

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Individuals with dementia (IWDs) and their family caregivers (CGs) face a variety of challenging care-related issues, such as relationship strains, changes in their daily routines, and concerns about the future. Several studies have begun investigating IWDs' perceptions and concerns about these issues and how CGs' perspective can impact the quality of caregiving. Newsom and Schulz (1998) examined caregiving in many forms and found that individuals had negative experiences with greater numbers of ADL & IADL impairments, external locus of control, marital discord and low self-esteem. Smyth and colleagues (2002) examined how deficit identification affects quality of life (QoL) in dementia patients—they surmised that interventions target deficit identification as an interpersonal challenge and the CG and IWD must work to identify deficits and build strategies to work with the deficits in order to improve QoL. Hellostrom et. al. (2005) sought to apply Awareness Context Theory to IWDs in spousal relationships and concluded that a supportive marital relationship and mutual awareness of the illness determines a nurturing environment for the IWD. Lewis and colleagues (2005) examined CG perspectives, but they concluded that interventions must be tailored to the caregiving perspective that the CG subscribes to. However, limited research exists that examines the congruence or incongruence between IWD's and CG's perspectives on these issues and the extent to which IWD's insight or awareness impacts the experience of their illness. Using a set of open-ended questions, the following qualitative study examined 1) the concerns and perceptions of IWDs and family CGs and 2) how these responses were congruent across IWDs and CGs. Discussion will focus on the need to develop interventions that address the needs and concerns of both the IWDs and CGs by including the perspectives of both care partners.

031 A PRILIMINARY ANALYSIS OF PHOSPHORUS CONCENTRATIONS IN THE CUYAHOGA RIVER

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The eutrophication of Lake Erie is an ongoing problem. Although the total amount of phosphorus loading into Lake Erie has been effectively regulated, the eutrophic conditions or 'The Dead Zone' have increased since 1995. Anthropogenic phosphorus loading into the lake that promotes algal growth is a suspected cause. Phosphorus loading has been examined on the Cuyahoga River at the USGS monitoring station in

Independence, Ohio. Several sets of water samples were taken from the river after periods of high discharge. Although the Cuyahoga River accounts for a small amount (<1%) of the water that flows into Lake Erie, it accounts for over 5% of the total phosphorus (TP) loading into the lake. The average daily TP concentration in recent years is about 0.197 mg/l and approximately 0.050 mg/l, or approximately 25% of that is soluble reactive phosphorus (SRP). SRP has been shown to be almost 100% bioavailable, making it easily utilized by algae that contribute to eutrophication. Analysis has shown that 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 almost double 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 a result of discharge overload as input from storm drains, combined sewer overflows (CSO), and waste water treatment plant effluent increase. More analysis is needed to determine the exact sources.

032 DEVELOPMENT OF IMPROVED ANTICIPATORY BALANCE IN ADULTS WITH CHRONIC STROKE USING REPETITIVE PRACTICE ON A MOBILE SURFACE IN CONJUNCTION WITH GAMING

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Purpose/Hypothesis : Balance deficits are common post central nervous system insult. While numerous therapeutic techniques are used in balance rehabilitation, no single type of intervention has proven to be most effective. The purpose of this pilot study is to examine the feasibility of using a mechanized balance system in conjunction with computer gaming to provide large quantities of repetitive task practice. **Methods**: Seven adults with chronic hemiparesis participated. Pre- and post assessment included the BBS, Chedoke-McMaster (CM) Stroke Assessment, the Modified Falls Efficacy Scale (MFES), the Stroke-Adapted Sickness Impact Profile (SA-SIP), and three dimensional gait analysis including EMG and force data. Data were analyzed both visually by individual case and using the Wilcoxon Signed-Ranks Test. Participants trained for between 12 to 25 sessions using a mechanized tilting balance platform. Platform rotations were set at a predictable velocity, direction, and magnitude of motion for four-minute increments, at which time the training parameters were varied. Participants played Wii games during the platform perturbations. **Results**: Repetitions of practice (platform tilt) ranged from 14,000 to 49,000 repetitions per participant, with total practice times ranging from 4.2 to 16.3 hours. All participants improved on the BBS (P=0.017), from a baseline mean of 39.3 (SD=12.4) to 46.6 (SD=8.4). Hip power generation (H1) during early stance phase also improved (P=0.044) from a baseline of 0.60 W/Kg (SD=0.39) to 0.97 W/Kg (SD=0.64). **Conclusions**: This practice environment was feasible and allowed for a large number of practice repetitions. Balance and hip power generation in walking improved, and there was carryover to other improvements in gait and quality of life for some participants. Concurrent computer gaming resulted in a high degree of engagement during the predictable platform movements and provided an implicit learning environment for anticipatory balance responses.

033 CHARACTERIZATION OF NOVEL MUTANTS WITH MEIOTIC RECOMBINATION DEFECT

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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. Chiasma are formed as a result of recombination. These events are essential for bipolar orientation of chromosomes. This bipolar orientation ensures that the homologs segregate to opposite spindle poles. In this study, we have 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.

034 PINK NOISE IN HUMAN BEHAVIORAL OUTPUT

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Rather than containing uncorrelated, random *white noise*, studies on the structure of behavioral output often reveal long-term correlations termed *pink noise*. The current research attempts to examine conditions under which time-series structure varies along the continuum from white to pink noise. We hypothesize that motor output controlled by internal information processes will produce pink noise, but when external feedback information is processed, system output will have a white noise structure. Our previous research suggests that small amplitude movements—having the least reliance on external feedback—produced the pinkest noise, but increases in movement amplitude produced white noise. In that study, participants always had access to movement-related visual feedback, In the current study, under one set of conditions, movement-related visual feedback was always available, and under other conditions feedback was removed. Movement-output structure pinkened dramatically in the absence of visual feedback. Under those conditions, motor output would be governed by internal information processes alone.

035 PROTEIN NITROSYLATION IN *GIARDIA INTESTINALIS*: EFFECT ON METABOLISM AND CYST WALL BIOSYNTHESIS

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Giardia intestinalis exhibits a life cycle consisting of trophozoites and cysts. Trophozoites colonize the host's small intestine and energy is produced from glucose by substrate-level phosphorylation (glycolysis). Cyst formation occurs as they traverse the intestinal tract and are shed in the feces.

Encystment biochemistry has been studied extensively in our laboratory. Five soluble enzymes and one membrane-bound enzyme are induced to generate UDP-N-acetylgalactosamine (UDP-GalNAc) the precursor to the cyst wall polysaccharide, giardan, from fructose 6-phosphate (F6P). Giardan is a $\beta(1, 3)$ -linked polymer of GalNAc. When encystment occurs, F6P is shunted from the glycolytic pathway and is redirected towards giardan biosynthesis. Control of glycolysis in *Giardia* is not through phosphofructokinase as in other organisms. Therefore, the regulatory question is: how is the switch from glucose as energy source to glucose as structural component (giardan) accomplished?

Our thinking about the regulation of these two pathways changed when it was discovered that *Giardia* synthesizes nitric oxide (NO). One of the enzymes proven to be modified by NO in humans is glyceraldehyde 3-phosphate dehydrogenase (GAPDH). Modification of the enzyme by NO on its catalytic (acidic) cysteine, S-nitrosation or S-nitrosylation, inhibits the enzyme's activity.

In *Giardia* acidic cysteines can be found in several key enzymes including but not limited to GAPDH and glucosamine 6-phosphate deaminase (GNP), the first induced enzyme of the encystment pathway. This has

led to our hypothesis that the shift from glycolysis to UDP-GalNAc synthesis might be regulated via nitrosylation of these key enzymes.

The purpose of this investigation was to show that *Giardia* indeed nitrosylates proteins. It was found that nitrosylation of GAPDH inhibits its activity and nitrosylation of GNP alters its catalytic properties. In vitro nitrosylation of recombinant GNP showed that its k_m for F6P changes from 2.5 mM to 0.7 mM, thus its affinity for its substrate increases.

036 NEW SOLID STATE DIELECTRIC PROPERTIES OF PHARMACEUTICAL SOLIDS REVEAL UNIQUE CRYSTALLINE AND AMORPHOUS CHARACTERISTICS

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Quantifying the crystalline and amorphous content in drugs as well as studying the morphological and thermodynamic transitions in pharmaceutical solids have been distinguished by Thermal Analytical Methods like DEA & DSC, Eye Clops Microscopy and Macro-photography and X-ray diffraction. To establish a structure vs. property relationship with the active pharmacy ingredients (APIs) of Drugs these various methods were used successfully. The APIs studied to develop this protocol include Lidocaine, Quetiapine fumarate, Indomethacin, Acetophenitidine, and Sulfapyradine. A distinctive method to determine crystalline and amorphous content in pharmaceutical solids is by DSC which is based on the fusion properties of the specific drug API and its recrystallization. Crystalline-amorphous content is quantified by DSC based on a series of heat and cool cycles to evaluate the drugs ability to recrystallize. Dielectric Analysis (DEA) measures the crystalline solid and amorphous liquid API electrical conductivity. The DEA conductivity is repeatable and differentiates the solid crystalline drug with a low conductivity level (10^{-2} pS/cm) and a high conductivity associated with the amorphous liquid (10^6 pS/cm). The DSC sets the analytical transition temperature range from melting to crystallization. However, analysis of the DEA conductivity cycle establishes the semi-quantitative amorphous and crystalline content in the solid state at frequencies of 0.10 to 1.00 Hz and $>30^{\circ}\text{C}$ below the melt transition temperature. An Arrhenius plot, log conductivity vs. reciprocal temperature ($1/K$), of the pre-melt DEA transition yields frequency dependent activation energy (E_a , J/mole) for the complex charging in the solid state. The amorphous content is proportional to the E_a where the E_a for the crystalline form is higher and lower for the amorphous form with a standard deviation of $\pm 10\%$, e.g., E_a for 100% crystalline Lidocaine is 440 J/mole at <1.0 Hz and 35 J/mole for ca. 100% amorphous Lidocaine.

037 DANGEROUSLY APPLIED STRENGTH OF MATERIALS

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This poster describes the fatal accident of the Interstate 35W Bridge that occurred on August 1st 2008. The information is prepared by Cleveland State Engineering students with a background in Strength of Materials. The Strength of Materials illustrates how the bearing stress is used in the determination of the acceptable strength of the gusset plates while also stimulating the audience with diagrams and pictures. The report is presented to people who not know too much about engineering or the cause of the bridge collapse.

038 ANALYSIS OF TELOMERE G-OVERHANG STRUCTURE IN *TRYPANOSOMA BRUCEI*

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Telomeres are specialized nucleoprotein complexes at the ends of linear chromosomes and are essential for chromosome stability. Telomere G-overhang structure is essential for telomere maintenance: in the presence of telomerase, G-overhang serves as a primer; 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 African trypanosomiasis. *T. brucei* evades the host immune attack by regularly changing its variant surface glycoprotein (VSG), and telomere recombination through BIR pathway is an important mechanism for VSG switching. However, *T. brucei* telomere terminal structure is poorly understood, and so far native in-gel hybridization is the only method to detect telomere G-overhang signal in this organism. This method is not sensitive enough for measuring the length of G-overhang. To further analyze the telomere G-overhang structure in *T. brucei*, we used a ligation mediated primer extension assay and end ligation assay to examine G-overhang structure. This allows us to determine both the length and the terminal nucleotide of the G-overhang structure.

039 A HYBRID APPROACH TO MANIPULATE HIERACHICAL ASSEMBLIES OF METAL AND SEMICONDUCTOR NANOPARTICLES

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The use of anodic alumina templates with regular arrangements of pores with nanoscale diameter, can serve to direct the self-assembly of metal and semiconductor nanostructures. Two different strategies for the template fabrication are explored. The first one involves a double anodization process, and takes advantage of only self-assembly processes, with no use of optical or e-beam lithography. In the second method interference patterned gratings with submicrometer pitch can serve as templates for the conformal deposition of aluminum films with controlled strain profiles. These methods can provide a strategy to assemble large arrays of nano-objects efficiently and at a relatively low cost. The fabrication methods allow good control over the geometrical parameters of these structures, which should allow the fabrication of hierarchical structures involving both metal and semiconductor nanoparticles. Preliminary results on the confinement of metal and semiconductor particles in these templates are presented.

040 BCL-2 FAMILY MEMBERS AS A PROGNOSTIC MARKER FOR ABT-737 TREATMENT IN CHRONIC LYMPHOCYTIC LEUKEMIA (CLL)

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Chronic lymphocytic leukemia (CLL) is the most common leukemia in the Western world and is characterized by over-expression of anti-apoptotic Bcl-2 family members. ABT-737 is a small molecule antagonist that selectively targets anti-apoptotic proteins such as Bcl-2, Bcl-xL and Bcl-w but not Mcl-1 and Bfl-1. We investigated whether expression profiling of Bcl-2 family members could be very effective for predicting the sensitivity of CLL patients samples to ABT-737. Our data indicate that there are two distinct groups of CLL patients based on expression of Bcl-2 mRNA as measured by real-time PCR. A

Bcl-2 dependent group is characterized by significantly higher Bcl-2 mRNA and protein expression and sensitive to ABT-737. Interestingly, the Bcl-2 independent group is less sensitive to ABT-737 and exhibits lower expression levels of Bcl-2 comparable to those in lymphocytes derived from healthy donors. Moreover, ABT-737 is highly potent as a single agent in the Bcl-2 dependent group irrespective of p53 function as well as expression of Mcl-1 and Bfl-1. This could be due to release of BIM, PUMA and NOXA from protein complexes that contain Bcl-2, Bcl-xL and Bcl-w, thus leading to apoptosis. Following ABT-737 treatment, we observed substantial increase in BH3 only proteins such as BIM, PUMA and NOXA in most CLL samples. Furthermore, we examined the mechanism of acquired ABT-737 resistance as previous reports show significant increase of Mcl-1 levels in CLL. We have generated ABT-737 resistant cell lines and found that these cell lines have higher levels of Mcl-1 and Bfl-1 protein. This increased expression of Mcl-1 and Bfl-1 was critical in preventing cell death induced by ABT-737, with the excess Mcl-1 being associated with Bim. These results emphasize the importance of Bcl-2 family proteins as a potential prognostic markers for ABT-737 treatment. Moreover, our data reveal that targeting Mcl-1 and Bfl-1 could be a powerful strategy to treat the resistant CLL patients.

041 A NOVEL SPHERICAL GLYCOSURFACE ASSEMBLING BASED ON STAUDINGER

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We describe a versatile approach for spherical glycosurface assembling based on chemically selective and biocompatible immobilization and further glyco-modification of intact liposome through Staudinger ligation. Liposome carrying PEG-triphenylphosphine was chemoselectively immobilized onto azide-PEG modified glass slide through Staudinger ligation and was further modified with azide-modified glycans through Staudinger ligation with triphenylphosphine localized on the immobilized liposome exterior surface. The intact liposome immobilized and modified and its stability as well as protein binding activity were confirmed by fluorescence imaging, fluorescent dye releasing kinetics and AFM techniques. The spherical glycosurface showed sustained stability and fluorescent dye releasing kinetics. The reported method will provide a robust platform for preparation of complex immobilized liposome system with multifunctional components, which mimics cell surface in both geographical and content features.

042 PROTEASOMAL INHIBITION MODULATES PLATELET FUNCTION

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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 low platelet count (thrombocytopenia). However, this is not because of megakaryocyte (platelet precursors) toxicity, suggesting a direct effect on platelets. Platelets are small, short-lived, anucleate cells involved in hemostasis and upon activation undergo rapid aggregation, shape change, degranulation and they 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 functional proteasome machinery we hypothesized that proteasome-dependent degradation of platelet proteins plays a role in platelet function. **Methods:** To identify ubiquitinated proteins, washed platelets were incubated with proteasomal inhibitor before agonist [thrombin, ADP or lipopolysaccharide (LPS)] treatment. Mass spectrometry was used to identify proteins modulated after proteasomal inhibition. Effects of proteasomal inhibition on platelet morphology and occlusive thrombosis was studied using electron microscopy and *in vivo* thrombosis model respectively. Microparticles were quantified using flow cytometry. Real time PCR was used to assess IL-1 β message and IL-1 β protein levels were determined by ELISA. **Results:** Our data showed that platelets have

ubiquitinated proteins and their levels change after proteasomal inhibition. Proteasomal inhibition caused changes in platelet morphology after ADP treatment, reduced stimulated microparticle release and increased time to occlusive thrombosis and clot retraction. Proteasomal inhibition also caused reduced IL-1 β splicing and protein expression after LPS treatment. **Conclusion:** Protein turnover regulates important platelet functions.

043 CALCULATED BOND DISSOCIATION ENERGIES OF THE METAL-CARBON BOND AND THE CARBON-OXYGEN BOND OF METAL CARBONYLS CONTAINING METALS USED IN FISCHER-TROPSCH SYNTHESIS

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As fossil fuel stocks continue to diminish and petroleum costs continue to rise, there is a growing interest in the research and development of alternative energy technologies. One such technology is the Fischer-Tropsch synthesis in which syngas (CO and H₂) is converted to higher molecular weight hydrocarbons. Many different catalysts and promoters must be explored in order to maximize the efficiency of this synthesis. Models of metal carbonyls of iron [Fe(CO)₅], cobalt [CoH(CO)₄] and nickel [Ni(CO)₄] were used as analogs to metal surfaces with adsorbed carbon monoxide. Ab initio bond dissociation energy (BDE) calculations were performed on the metal-carbon bond (M-C) and the carbon-oxygen bond (C-O). Results indicate that the iron-carbon bond is the strongest while the C-O bond on the iron carbonyl is the weakest. The nickel-carbon bond is the weakest of the metal carbonyls and C-O on the nickel carbonyl is the strongest. The promoted-cobalt analogs indicate a trend in which the strength of the M-C bond and weakness of the C-O bond increases with the size of the Group 1b metal.

044 DOES PROPRIOCEPTION INVOLVE SEPARATE REPRESENTATIONS FOR ACTION AND PERCEPTION?

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Studies have found support for dichotomous representation of sensory information in both the visual and auditory systems. Sensory input is thought to diverge into two discrete pathways. One pathway is used for spatial/action representation (i.e., location of objects in space) and the other for perceptual representation (i.e., object description and characteristics). The purpose of the present study is to explore whether proprioception (the sense that conveys information about the position and motion of one's own body) also exhibits this representational dichotomy. Our experiment is designed to isolate these discrete modes of representation by using proprioceptive distance perception tasks. Participants are guided along a linear path (1-6 m long) without vision, and then asked to give estimates of walked distance in two distinct ways. In one type, participants indicate the walked distance either by tossing a beanbag to the starting position or by pulling a tape measure so that the length pulled will match the distance walked. These action-based responses presumably tap into the action representation. The other type of response is a verbal estimation of the traveled distance. The verbal report is thought to be primarily based on the perceptual representation of the walked distance. Currently we have established baseline data in which participants performed these tasks under optimal conditions. In the future, we will manipulate these tasks by having participants wear a backpack while they perform the tasks. In this manipulation, we intend to observe how differently the action representation and the perceptual representation are affected by the external load. We hypothesize that the action-based responses will be more resistant to the additional weight, whereas the verbal report

will be more susceptible to it. Such a finding will suggest a similar dichotomy in proprioception that has been found present in other sensory modalities.

045 OPTICAL MEASUREMENT OF THE INDEX OF REFRACTION FOR AIR

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Using the Michelson Interferometer, we will be measuring the index of refraction for air; that is, the measure of how much a wave is bent when passing through air. The Michelson Interferometer consists of a unique set up of two mirrors, a lens, vacuum cell, and beam splitter through which a laser beam passes and projects an interference pattern of dark rings, or fringes, on a viewing screen. By changing the pressure inside the vacuum cell, we may produce a varying pattern of fringes on the viewing screen. This project will analyze the phase relationship between two interfering laser beams by changing the pressure inside the vacuum cell.

046 L-CARNITINE IMPROVES HUAMN SPERM QUALITY DURING SPERM PREPARATION FOR IVF

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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 in the intensity of fluorescence, and thus lower DNA damage, for sperm centrifuged with LC compared to those processed without LC.

047 SYNTHESIS AND STRUCTURE OF FOUR RELATED MIXED-LIGAND 4-METHYLPICOLINE INDIUM HALIDE COMPLEXES

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Indium halides were reacted with chalcogenide complexes in 4-methylpyridine in order to produce precursors for indium-containing semiconductors. Crystals obtained in four of these reactions were studied by X-ray crystallography. We describe the structures of two six-coordinate adducts $\text{InX}_3(\text{pic})_3$ ($X = \text{Cl}, \text{Br}$; pic = 4-methylpyridine). The crystal structure of both compounds consists of octahedral molecules with mer geometry. The crystals of $\text{InCl}_3(\text{pic})_3$ (**1**) are triclinic, space group P1, with $a = 9.3240(3)$, $b = 13.9580(6)$, $c = 16.7268(7)$ Å, $\alpha = 84.323(2)$, $\beta = 80.938(2)$, $\gamma = 78.274(3)$ Å°, $Z = 4$, $R = 0.035$ for 7117 unique reflections. The crystals of $\text{InBr}_3(\text{pic})_3$ (**2**) are monoclinic, space group P21/n with $a = 15.010(2)$, $b = 19.938(2)$, $c = 16.593(3)$ Å, $\beta = 116.44(1)$ Å°, $Z = 8$, $R = 0.053$ for 4360 unique reflections. Related structures with phenylsulfide (chloride) (**3**) and hydroxide (bromide) (**4**) substitutions are also described.

048 DRUG LOADING CAPACITY OF POLYMERIC MICROGELS

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Microgel nanoparticles consisting of cross-linked polymer (hydroxypropylcellulose, HPC) chains have a temperature dependent volume phase transition, a property which prompts investigation of microgels as a controlled drug transport mechanism. HPC is a polysaccharide FDA approved for human consumption. Slightly hydrophobic interior of microgels is expected to attract small molecule drug particles at temperatures below the phase transition. These particles are stored in equilibrium until the critical temperature (T_v) is reached and the volume phase transition limits available space, thus expelling the drugs. Our study was designed to test this property of microgels using amperometric electrochemical methods. A critical assumption was that small molecules inside microgels would not interact via diffusion with the electrode surface and thus total current would be decreased across the electrodes in a microgel sample. A room temperature (T_{room}) flow amperometric measurement comparing microgel infused tylenol solution with control tylenol samples yielded about 20% tylenol concentration reduction of the microgel sample. Results from the steady state electrochemical experiment confirm the presence of about 20% tylenol concentration drop of the microgel sample compared to control sample at T_{room} . Using the steady-state experiment with a cyclic temperature ramp from T_{room} to beyond T_v showed that the tylenol concentration change between the temperature extremes was more significant for the microgel solution than for the control solution.

049 THE UTILIZATION OF PASSIVE SOLAR HEATING

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The use of passive design elements in new buildings that are constructed can reduce the expanding needs of electricity. The utilization of solar passive building designs will prevent and increase in the demand on local power companies. With an increasing population, the power demand is bound to increase. Buildings currently account for a substantial amount of energy consumption that a simple design change can eliminate. The passive solar design will decrease heating needs by 50-80%. For the passive solar design, precision is of the utmost importance. To maximize the solar passive efficiency, proper site analysis is necessary. This analysis includes shade sources, air quality and mass, microclimates, and window objectives to aid in design. Additional practices increase the effectiveness of the passive design such as ventilation for cooling and sun spaces for heating.

050 DISTINCT ROLES OF PKR AND RNASEL DURING VIRUS INDUCED DEMYELINATION

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IFN- α/β is vital in limiting dissemination and viral tropism within the CNS following infection with the neurotropic coronavirus JHMV. However, the downstream innate antiviral factors are poorly characterized. RNaseL does not affect overall control of viral replication or the extent of inflammation; however, viral replication was elevated in microglia and macrophages. These subtle alterations in tropism unexpectedly coincided with increased mortality, accelerated demyelination and axonal degeneration. Nevertheless, comparable early JHMV replication in RNaseL^{-/-} compared to wt mice indicated involvement of other innate antiviral pathways in limiting early virus spread in neurons and glial cells. We thus explored the contribution of Protein kinase R (PKR), an antiviral factor for various RNA and DNA viruses, in controlling JHMV infection utilizing mice dually deficient in RNaseL and PKR (DRP^{-/-}). Similar to RNaseL^{-/-} mice, DRP^{-/-} mice succumb to infection without overt differences in clinical disease or CNS inflammation relative to wt mice. Although viral mRNA is increased in DRP^{-/-} mice by ~2-fold throughout acute infection and decreased with kinetics similar to wt mice. Replication was significantly increased in oligodendrocytes in DRP^{-/-} mice. This is distinct from wt and RNaseL^{-/-} mice and implicates a role of the PKR pathway in oligodendrocyte anti-viral activity. However, virus in oligodendrocytes was reduced coincident with T cell infiltration, indicating that mortality was independent of viral load. Surprisingly, despite enhanced oligodendrocyte infection demyelination was not accelerated in DRP^{-/-} mice and progressed with similar kinetics as in wt mice. These results highlight the complexity and cell type specific function of innate antiviral mediators during acute CNS infections and suggest a novel interaction between RNaseL and PKR. Supported by NIH grant NS064932

051 MENTAL HEALTH PROMOTIONSERVICE LEARNING PROGRAM FOR COLLEGE AND UNIVERSITY STUDENTS BASED ON THEORIES BY WILCOCK, CHICKERING, REISSER AND MANDEL

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The purpose of this literature review was to determine a need for the development of a service-learning program addressing positive mental health promotion for freshman college and university students experiencing anxiety and stress in order to enhance their overall sense of well-being. The seven vectors of college student development (Chickering and Riesser, 1993), the occupational perspective of health (Wilcock, 1998, 2006) and the lifestyle redesign model (Mandel et al, 1999) provide the framework for the nine week program. Based on the growing mental health needs of college students and the lack of resources available through campus counseling services, a service learning program was designed to increase overall mental health literacy, promote positive mental health and occupational balance among students, and to encourage collaboration among various college and university departments. This service learning program should be viewed as a general model that can be tailored to meet the specific occupational needs of various college and university settings.

052 STORAGE CONDITIONS AND PROTEOSOMAL INHIBITION AFFECT PLATELET APOPTOSIS

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Platelets are anuclear blood cells derived from megakaryocytes and are important in hemostasis, thrombosis, regulation of inflammation and others. The average life span of platelets *in vivo* ranges from 8 to 10 days but when stored under blood bank conditions at 22°C they lose their viability after 5 days, a process believed to be triggered through programmed cell death. Apoptosis is well studied in the nucleated cells and is a balance between the pro and anti-apoptotic proteins. The apoptotic markers like lactate dehydrogenase increase, mitochondrial potential decrease and others have been shown to be changed towards PCD during platelet storage and are accelerated when the platelets are stored at 37°C. A marked decrease in pH has been reported during storage. Here we show that when platelets are stored in isotonic buffers with different pHs and at different temperature (22°C & 37°C) behave differently and undergo apoptosis at a different rate. This process might be mediated through intrinsic apoptotic pathway involving the mitochondria and the apoptotic proteins. The levels of anti and pro apoptotic Bcl-2 family proteins are vital in this process and we hypothesize that proteasome helps maintain this delicate balance. Aliquots of washed platelets were incubated in different pHs ranging from 7.4 to 6.5 with and without the presence of the proteasomal inhibitor MG132 at 22°C & 37°C. The levels of Bcl-xL, BAK, BAD and BAX were influenced by the pH change and temperature and were protected in the presence of MG132 and a decrease in Caspase-3 activation, calpain cleavage and its substrate was observed. A decline in mitochondrial membrane potential was observed as the pH decreased and also from 22°C to 37°C. The presence of MG132 helped moderately to recover the potential. Thus, the temperature, pH along with the proteasome influences the rate of apoptosis in stored platelets.

053

INVESTIGATION OF BIOAVAILABLE PHOSPHORUS: A CASE STUDY OF PHOSPHORUS INPUT TO LAKE ERIE FROM CUYAHOGA RIVER, OH

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There is a growing public concern on the eutrophication of Lake Erie even though the targeted 11,000 ton/yr of total phosphorus loading from point sources and diffusive sources is under control. The total loading of bioavailable phosphorus (BAP) is likely the key factor causing the eutrophication of Lake Erie from the study of phosphorus input from the Cuyahoga River. Algal bloom is triggered when total amount of BAP reaches a threshold due to the newly input of phosphorus or the reprocess of phosphorus stored in Lake Erie.

It is of consensus among scientists that excessive input of phosphorus, the nutrient-limiting element, is the cause of the Lake Erie's eutrophication. Previous studies mainly focused on total phosphorus (TP) input and soluble reactive phosphorus (SRP) concentration. SRP is believed to be nearly 100% bioavailable, but studies found that dissolved organic phosphorus (DOP) and particulate phosphorus (PP) are partially bioavailable, estimated about 35-40% and 20-30% respectively. The three forms of phosphorus in water are readily transformable between them when stream physicochemical conditions and chemistry change, and/or biological intervention takes place.

Water samples were collected from 12 stations along the main stream of Cuyahoga River and the biggest tributary, Tinker Creek in different seasons. The water samples were analyzed shortly after collection with a discrete analyzer (AQ2+) in the ERIE Laboratory, CSU. Based on our study, the DOP and PP concentrations of Cuyahoga stream water vary considerably from station to station and season to season. At the lowest station to Lake Erie the mean of DOP/TP and PP/TP are 24.0% and 68.1% respectively in

the dry seasons, and 7.2% and 86.7% respectively in the wet seasons. The contributions of DOP and PP to BAP are comparable to SRP (29.6% in the dry seasons and 6.1% in the wet seasons). Further study is needed.

054 CHARACTERIZATION OF THE FUNCTIONS OF *TRYPANOSOMA BRUCEI* TIN2

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Trypanosoma brucei, the causative protozoan parasite for African sleeping sickness, evades the host immune response by regularly switching its surface antigen - Variant Surface glycoproteins (VSG). Although there are more than 1000 VSG genes in *T. brucei* genome, VSGs are exclusively expressed from subtelomeric expression sites (ES). There are ~ 20 nearly identical ESs, yet only one is fully active, resulting in a single VSG being expressed at any time. An antigenic switch can be achieved by simultaneously turning off the originally active ES and activation of a silent ES (an *in situ* switch), by a reciprocal homologous recombinant crossover between two ESs, or by copying a silent VSG into the active ES through duplicative gene conversion. Little is known about VSG switching regulation, although recent studies showed that extremely short telomere at the active ES may force VSG switching, presumably due to the unstable telomere structure. We have recently identified a *T. brucei* Tin2 homologue in the duplex telomere DNA binding factor tbTRF protein complex. We have confirmed that tbTin2 interacts with tbTRF directly using the yeast 2-hybrid analysis. Knocking-down of tbTin2 in *T. brucei* cells by RNAi led to cell growth arrest, indicating that tbTin2 is essential for normal cell growth. In addition, depletion of tbTin2 led to a decrease in tbTRF protein amount without affecting its mRNA level, indicating that tbTin2 is important for tbTRF protein stability. Furthermore, depletion of tbTin2 led to rapid telomere length elongation, indicating that tbTin2 plays an important role in telomere length maintenance. We are currently investigating whether depletion of tbTin2 will influence VSG switching.

055 PROTEIN DOMAIN ANALYSIS OF *TRYPANOSOMA BRUCEI* RAP1: AN APPROACH

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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, the variant surface glycoprotein (VSGs), and thereby evading immune elimination. Although there are more than 1000 VSG genes in *T. brucei* genome, VSGs are exclusively expressed from one to ~ 20 identical subtelomeric expression sites (ESs). To maximize VSG switching efficiency, only one ES promoter is fully active, results a single VSG being expressed at any time. We have identified tbRAP1 as an intrinsic component of the *T. brucei* telomere complex. Most importantly, we have shown that tbRAP1 is essential for silencing ES-associated VSGs, demonstrating for the first time that the telomere structure is important for VSG silencing. To further elucidate the mechanisms of tbRAP1-mediated VSG silencing, we would like to determine which domain(s) of tbRAP1 is essential for VSG silencing or for its localization at the telomere. TbRAP1 contains five different domains, and we aim to examine phenotypes of *T. brucei* cells carrying mutant tbRAP1 alleles that deleted various functional domains in a background without any WT tbRAP1 alleles. Three different approaches are attempted and will be presented. The advantage and disadvantages of each approach will be discussed and compared.

056 MULTIVALENT INTERACTION BASED CARBOHYDRATE BIOSENSORS FOR SIGNAL AMPLIFICATION

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A sensitive carbohydrate biosensor based on the multivalent interaction between boronic acids immobilized on QCM sensor surface and the carbohydrates modified Au - nanoparticle (AuNPs) has been developed. Briefly an O-cyanate chain-end functionalized boropolymer was synthesized via arylamine initiated cyanoxyl-mediated free radical polymerization in one-pot fashion. The chain end O-Cyanate was confirmed by C13-NMR spectroscopy. Oriented and covalent immobilization of O-Cyanate chain-end functionalized boropolymer on to amine-modified solid surfaces and its specific glyco-capturing capacity was characterized by QCM and AFM techniques. To further study the multivalent interactions of the boronic acid - containing polymer (boropolymer) with carbohydrates, the boropolymer was immobilized in an oriented fashion on the cysteamine-coated electrode through isourea bond formation. Carbohydrates were conjugated to AuNPs to generate a multivalent carbohydrate moiety to amplify the response signal. Thus, the binding of the carbohydrate conjugated AuNPs to the boropolymer surface are multivalent which could simultaneously increase the binding affinity and specificity. We systematically studied the binding between five different carbohydrate conjugated AuNPs with the boropolymer. Our studies show that different carbohydrate gives different binding constant. The associated constant (K_a) was in the order of fucose < glucose < mannose < galactose < maltose. A linear response in the range from 23 μ M to 3.825 mM was observed for mannose conjugated AuNPs and the boropolymer recognition elements, with the lower detection limit of 1.5 μ M for the carbohydrate analytes. Furthermore, the multivalent binding between carbohydrates and boronic acids is reversible and allows the regeneration of boropolymer surface using 1M acetic acid for sequential capture and release of the carbohydrate analytes.

057 ROLE OF EUKARYOTIC RIBOSOMAL PROTEIN S5 IN TRANSLATION INITIATION

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Ribosomal proteins (rp) have remained largely conserved during evolution and share a very important role in ribosome function. Although, rRNA plays a major role in ribosome function like decoding and peptidyl-transferase activity, ribosomal proteins play essential role for assembly and optimal functioning of the ribosome. In prokaryotes, the role and function of these proteins have been studied extensively facilitated by the elucidation of the prokaryotic ribosome structure. However, the eukaryotic ribosome structure has not been solved to-date and function of many eukaryotic ribosomal proteins are unknown. Moreover, less is known about the position of different initiation factors on the ribosome and role played by the ribosomal proteins in their recruitment. Eukaryotic rpS5 belongs to the ribosomal protein family which includes prokaryotic rpS7. The protein forms the part of the exit (E) site on the small ribosomal subunit and has a conserved central and c-terminal region and a variable N-terminal region. Comparative study shows that yeast has the longest N-terminal region, thus longer than that of humans & *E.Coli* by 24 & ~64 amino acids respectively. To characterize the specific role played by this N-terminal extension, we obtained yeast strains expressing 13, 24, 30 and 46 amino acids N-terminally truncated rpS5. Strains expressing 30 and 46 amino acids truncated rpS5 showed impairment in translation initiation and accumulation of eIF2 α in the 43S/48S complex. Further study into the role of rpS5 in translation initiation will help us to gain mechanistic insight into translation initiation in the eukaryotes and the specific roles played by the eukaryotic ribosomal proteins in translation with respect to that in the prokaryotes.

058 **TRYPANOSOMA BRUCEI RAP1: A KEY PLAYER FOR VSG SILENCING**

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Trypanosoma brucei is a protozoan parasite that causes sleeping sickness in humans and Nagana in cattle. When in a mammalian host, bloodstream *T. brucei* cells regularly switch its surface molecule, Variant Surface Glycoprotein (VSG), to evade host immune response. VSG genes are exclusively transcribed from VSG expression sites (ESs), which are polycistronic transcription units located at subtelomeric regions. The VSG gene is the last one in any ES, within 1-2 kb from the telomere repeats. Although there are ~ 20 nearly identical ESs, only one ES promoter is fully active, resulting in a single type of VSG being expressed at any time. After being transmitted into its insect vector, *T. brucei* cells differentiate into procyclic form and express procyclins as surface molecules while all VSG genes are shut down. Therefore, VSG expression is dynamically regulated, and several factors have been shown to be important for this. A couple of proteins involved in chromatin remodeling appear to be important for ES silencing. In addition, we have recently shown that tbRAP1, an integral component of the *T. brucei* telomere complex, is essential for silencing subtelomeric VSGs in bloodstream form cells. Subsequently, we found that tbRAP1 also keeps VSG silent in procyclic form cells. Most interestingly, we found that tbRAP1 is preferentially located to silent ES marked telomeres than the active ES telomere, and that loss of tbRAP1 led to a more opened ES chromatin structure, suggesting that tbRAP1 is a key player differentiating the active and silent ES states.

059 **WATER QUALITY**

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Comprising over seventy percent of the Earth's surface, water is the most worthwhile natural resource. It is essential for everything on our planet to grow. It is a food source for flora and fauna. It is quoted as a "universal solvent". With a rapid growing global population and tremendous growth in urban expansion, water resources will be under an enormous strain. Yet even though humans recognize this fact, the population has disregarded it by polluting the rivers, lakes, and oceans of the world. Consequently, we are harming our planet. It is important that water quality is maintained to ensure safe drinking water and water suitable for food production as well as considering the implications for the wider environment. Agricultural runoff, storm water runoff, untreated sewage and industrial pollution are the major cause for the degradation of water quality. This paper begins by defining water quality and continues with the explanation of important water quality factors effecting water quality and explicates that there are three main types, those of a physical nature, chemical nature, and biological materials that degrade water quality. The paper then explains how each of these classifications has its own set of problems and hazards and specifies its solutions. This paper also analyzes how there is a chronology of water policies that concentrates on various uses.

060 **THE BRACHISTOCHRONE CHALLENGE**

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The Brachistochrone problem involves finding a curve from one point to another down which a bead will descend without friction and with only the acceleration caused by gravity in the least amount of time. In order to accomplish this, we developed a function to solve for this travel time. Using this function, we tested various equations to determine which took the least amount of time to follow the path. Using the

calculus of variations, we found that the cycloid is the curve which took the least amount of time and we then solved for exactly how long it took. The solution to the problem, the cycloid, is the path traced out by a point on the radius of a rolling disc.

061 A REVIEW OF THE BIODEGRADATION PATHWAY OF ALKYLPHENOL ETHOXYLATES – THE ENVIRONMENTAL PERSISTENCE AND SIGNIFICANCE OF ALKYLPHENOL ETHOXYLATE METABOLITES.

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Product development R&D is focused on prioritizing the removal or restriction of certain chemicals in order to develop “greener” products. An understanding of the environmental fate and significance of chemicals helps us to assign priority and make more strategic decisions. Alkylphenol ethoxylates (APE) have received attention in the literature, because their metabolites are endocrine disruptors. I will review the biodegradation pathway of APE and endocrine disruption mechanism of its metabolite alkylphenol (AP) as an example of the mechanistic understanding that is required to better prioritize the removal or restriction of certain chemicals.

062 KYOTO PROTOCOL AND THE UNITED STATES

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Since adoption date of Kyoto Protocol -11 December 1997-, environmentalists divided into two groups: pessimists and optimists. Pessimists defended that "the protocol will not be accepted and approved by most of the world." Optimists defended that "it will be a well intended step to reduce greenhouse gases and make more livable world." Firstly optimists won because the article 25 of the protocol needed 55 Parties accounting in at least 55% of total carbon dioxide emissions for the year 1990 and that number was reached with approval of Iceland and Russia. The protocol became effective after three months of their approval on February 2005. Secondly pessimists won because some of big emitters did not accept the protocol and more some developing countries became bigger current emitters than old ones. Finally neither optimists nor pessimists won since green house gases keep increasing dramatically. As we see from graphics prepared by Earth System Research Laboratory, rates are far beyond of scope of the protocol. Although nice intentions, global warming and pollution have been going on and whole humanity suffering with floods, poverty, famine, mass displacement etc.

063 REGULATORY IMPEDIMENTS TO OFFSHORE WIND ENERGY ON THE GREAT LAKES: LAKE ERIE & OHIO AS A CASE STUDY

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Wind energy is an established form of alternative energy that can satisfy the United State’s energy demand. To date there are no fresh water wind farms in the world. Additionally, there are no offshore wind farms in the United States. Bringing offshore wind energy to Lake Erie would usher Cleveland, Ohio, into the forefront of the offshore wind energy market, both policy wise and in the manufacturing industry. Lake Erie is a prime source for offshore wind farms due to high velocity wind speeds, lack of conflicting water uses, shallow water depths, and close proximity to the end consumer. Nonetheless, numerous regulatory obstacles hinder the development of offshore wind farms on Lake Erie. Numerous agencies and entities have jurisdiction over the waters of Lake Erie and the development of wind energy projects on Lake Erie. In this article those regulatory impediments are addressed. There is no single lead

agency in which a developer can turn to in order to bring a project to fruition. The lack of a lead agency has created excessive compliance costs and uncertainty due to overlapping statutes. And this is one of the largest problems. Denmark, however, has a single lead agency, the Danish Energy Agency. Currently Denmark has eleven offshore wind projects and two more planned. What can be learned from the Danish Energy Agency is of great import. The State of Ohio, and other Great Lakes States, should establish a Great Lakes Wind Service to advance the development of offshore wind farms on Lake Erie. The Great Lakes Wind Service would be the lead agency for which developers could turn to and ensure compliance. Otherwise the advancement of offshore wind energy on the Great Lakes will never reach its potential.

064 INDUSTRIAL ENERGY EFFICIENCY: THE PRECURSOR TO ALTERNATIVE ENERGY ADAPTATION

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Reducing fossil fuel consumption within the United States is an issue that affects many areas of our nation including our environment, financial and national security. The best case scenario would be to reduce the amount of energy production from fossil fuels to nominal levels so that clean energy alternatives such as wind, geothermal and solar become the main sources of energy production. Unfortunately production of energy from alternative sources is inadequate to meet current energy demands within the United States making this switch more complicated. Therefore we must take additional steps ensure the success of alternative energy initiatives. It will become increasingly important to focus on the larger energy consumers within the United States in order to have the greatest impact on the reduction of fossil fuel consumption. One of the major culprits of energy usage within the United States is the industrial sector, utilizing over 33% of total energy consumed. To aid the switch to clean energy sources it will be imperative to increase energy efficiency within the industrial sector. Energy efficiency means maintaining the same level of energy output while reducing the level of energy input. This paper will explore both the environmental and non-energy benefits of improving energy efficiency and exemplify that energy efficiency can have a positive effect on industries bottom line and increase productivity while improving external conditions such as reduction of pollutants.

065 CHIMERIC GLUTATHIONE S-TRANSFERASES; THE STUDY OF PROTEIN THERMOSTABILITY

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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 a 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°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.

066 INVERTEBRATE SIGNATURE INDICATING BODY MOVEMENT FROM URBAN TO RURAL AREAS IN NORTHEASTERN OHIO

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An understanding of the invertebrate community in an urban or a rural setting may help to determine if a body has been moved from one area to another during forensic entomological investigations. The purpose of this study was to determine if an invertebrate signature is associated with a body moved from an urban location in northeastern Ohio to a more rural location. Six domestic pig carcasses, approximately 16 kg each, were obtained and placed in the following locations: two in a rural area of Cuyahoga County, and four in an urban area on Cleveland State University campus. After 24 hours, two of the carcasses from the urban location were moved to the rural location. Each carcass was sampled from 16 June 2009 to 1 August 2009. Hand sorting, aerial sweep netting, and pitfall traps were employed for each pig. Most of the specimens were collected within the first four weeks of the study and included both adult and larval samples. All three carcass types supported the same array of blow flies (Diptera Calliphoridae) and beetles (Coleoptera). Our analysis reveals that while species dominance and presence/absence of taxa may not indicate body movement in northeast Ohio, it does provide a database of forensically important insects which may be useful in future investigations.

067 DESALINATION AS A MEANS TO ADDRESS GLOBAL WATER NEEDS

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In ongoing efforts to provide safe drinking water for many regions of the globe that face a limited supply in addition to providing water suitable for irrigation, desalination has become a vital technology. Millions of gallons of seawater and brackish groundwater are processed through desalination facilities each year, serving municipalities and industry. The bulk of desalination facilities exist in the energy rich nations of the Middle East. The energy needed to power a desalination plant is often too expensive for poorer countries. Cost and maintenance of desalination plants become prohibitive issues for many developing countries that want or need desalination technologies in their area. Even though the cost to produce desalinated water has fallen dramatically, desalination plants still pose environmental threats. Management strategies that minimize the effects on marine life during intake along with mitigating damages from desalination byproducts should be of concern for current and future development. Of equal importance are the long-term water needs of cities and countries looking for a more sustainable future, especially those located on coasts and in arid regions. As human population grows worldwide and the sources for fresh water diminish, desalination processes might be the most resourceful way of attaining water suitable for consumption and irrigation.

068 CHEMICAL SELECTIVE AND BIOCOMPATIBLE APPROACH FOR LIPOSOMAL GLYCO-CONJUGATES PREPARATION

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Liposome, a spherical closed self-assembled lipid, has been extensively studied as model of cell membrane and mostly as carrier for drug/gene delivery application. Liposome surface functionalization

with carbohydrate has been a versatile membrane mimetic approach and facilitates enormous potential applications of liposomes such as for glyco-model system, targeted drug and gene delivery as well as multivalent inhibitors. Conventional methods such as using amide or thiol-maleimide coupling as well as by imine or hydrazone linkage are less efficient and harmful for integrity and thus limit the liposome's biological application. Herein, we developed an efficient and chemoselective liposome surface glyco-functionalization method based on Staudinger ligation, in which carbohydrate derivative carrying a spacer with azide is conjugated onto the surface of preformed liposomes carrying a terminal triphosphine in PBS buffer (pH 7.4) and at room temperature. Specifically, by using lactose and heparin as the model of carbohydrates, the effect of reaction conditions on integrity and stability of liposome was investigated by dynamic light scattering and the leakage of entrapped 5,6-carboxyfluorescein, respectively. Furthermore, the density and accessibility of grafted carbohydrate residues on the liposome surface were evaluated. The high specificity and high yield as well as biocompatible reaction condition natures of the Staudinger ligation approach make it an attractive alternative to all current protocols for liposome surface functionalization.

069 LARVAL FISH MIGRATION AND THE EFFECT OF ARTIFICIAL HABITAT IMPLEMENTATION WITHIN THE NAVIGATIONAL CHANNEL OF THE CUYAHOGA RIVER

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The Cuyahoga River functions as a fish spawning location, but the lack of habitat, low dissolved oxygen levels, and high temperature events downstream of spawning beds, and within the bulkheaded, navigational channel, result in a high level of larval fish mortality. The introduction of planted, floating habitat structures, within the navigational channel will occur through the Green Bulkhead portion of the Cuyahoga River Remedial Action Plan. This study will examine the migration of larval fish along the navigational channels of the Cuyahoga and Grand (reference site) rivers, and the effect of artificial habitat structures on larval fish survivability in the Cuyahoga river. This study will utilize a variety of sampling procedures including; ichthyo-, zoo-, and, phyto-plankton net tows, larval fish light traps, water quality sampling and analysis, and electroshocking to evaluate adult fish populations. Standardized sampling protocols will be used to allow for meaningful statistical analysis.

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070 DO SCHIZOTYPAL TRAITS AFFECT DISTANCE PERCEPTION VIA SELF-MOTION MONITORING?

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The present study will examine whether distance perception through nonvisual self-motion monitoring is associated with pre-morbid schizophrenia (schizotypy) traits. Schizophrenia is a complex disease, but one approach to giving a coherent description of the disease sees schizophrenia as a self-monitoring deficit. For example, some schizophrenia patients feel like their body movements are controlled by external forces, even though they are voluntarily generating the actions. This abnormality is attributable to the failure of utilizing information about self-produced motor commands and the goal of the actions for perceiving self-motion, which is considered as a manifestation of a larger self-monitoring problem. In

order to explore this idea, we will recruit a group of healthy young adults who have varying degrees of schizotypy (measured by standardized questionnaires) and ask them to perform various distance perception tasks. These tasks are designed so that they will involve different levels of self-control. In one task, participants will be visually presented with a target and walk to it without vision. This task involves the greatest degree of active control of body movement and a clear representation of the action goal. In another task, blindfolded participants will be guided along a linear path and asked to estimate the distance walked. In this task, although the participants generate movements by themselves, their locomotion itself is controlled by an experimenter. Finally, in a task that involves the least amount of active control, participants will sit in a wheelchair and be pushed along the linear path, and then estimate the distance traveled. One potential finding is that schizotypal participants will show smaller differences in performance among the tasks because for these participants active and passive tasks are more similar to each other than for participants who have less schizotypal traits. Such a finding will provide novel clues for better understanding schizophrenia.

071 REVIEW OF TWO TECHNIQUES FOR MEASURING WATER QUALITY AND ASSESSMENT OF THEIR EFFECTIVENESS IN EVALUATING WATER QUALITY IN AN URBAN ENVIRONMENT

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Water is one of the fundamental elements in most biological systems. It is also a necessity for human survival and as societies continue to grow and develop, there has been growing concern regarding the availability of usable water to human populations. In addition to the harmful effects of poor water quality on wildlife and natural ecosystems, it can also have a detrimental effect on human populations including disease and economic issues. Before work can be done on how to improve water quality in a given area, one must first determine what the current status of the water is. To do this, various techniques have been developed to measure the quality of water in a given environment. Some of these techniques look at the level of oxygen available as it has significant effects on the types of organisms that can survive. Measuring nutrient levels like nitrogen and phosphorus can also provide insight into quality of water. In this review, I examine different techniques for measuring these two factors that influence water quality. Because these techniques are used in a variety of environments, I also discuss if and how they can be used to assess water quality in an urban environment.

072 CONTEXTS AND CORRELATIONS OF SUBSTANCE USE AND ABUSE AMONG GLBT YOUTHS

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Recent studies have indicated that substance abuse is a growing problem for all adolescents and that the problem is even greater among gay, lesbian, bisexual, transgender and questioning (LGBTQ) youth. The odds of substance use for sexual minority (LGBTQ) youth are on average 190 percent higher than for heterosexual youth (Marshal et al, 2008). There are many different theories as to why this difference exists. These theories range from societal homophobia, discrimination resulting in feeling of isolation, increased rates of depression and anxiety, and stressors from coming out. However, compared to LGB adults, and heterosexual youths, much less is known about substance use disparities among LGB adolescents, and large gaps exist in the literature in understanding who is most vulnerable within the LGB adolescent community and the associated psychosocial risk factors. Substance abuse has been correlated with increasing HIV/STI infections, teenage pregnancy and other problem behavior among adolescents. With this in mind, using both qualitative and quantitative approach, the proposed study aims at cross- cultural exploration of contexts, and risks associated with substance abuse among LGBTQ youths in Cuyahoga County. The proposed study will employ a respondent driven sampling (RDS) method to

recruit participants. Cross-cultural comparison on contextual factors associated with substance use and abuse and its impact on HIV risk behavior will be made between African American, White and Latino youths (14-21 years) in Cleveland area.

073 SYNAPTIC PLASTIC AND BEHAVIORAL CHARACTERIZATION OF A RAT MODEL OF DEPRESSION BASED ON MILD CHRONIC STRESS.

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CMS or the Chronic Mild Stress technique is used in animal experimentation in order to induce depressive like symptoms. CMS applied over an 8 week period has been shown to produce depressive behavior in rats (Xu et al, 2008). Prolonged stress and depression can also lead to severe neurological impairment and lack of growth. Environmental enrichment in the form of exercise, socialization, and novelty are proven to be effective in reversing the neurological and behavioral symptoms of depression (Rosenzweig & Bennett, 1996; Kempermann, Kuhn & Gage, 1997; Li et al, 2003; Markham & Greenham, 2004). The current study aims to identify if overall enrichment experienced during the CMS treatment period is capable of minimizing the intended long-term effects of the unpredictable stress. 24 Long Evans rats will be divided into 3 groups. Group 1 will receive maximum enrichment as well as CMS for 8 weeks. Group 2 will receive no enrichment but will be stressed. Finally, Group 3 will be used as controls and will experience no stress or enrichment. Measurements such as weight, distance ran, and sucrose consumption will be used as indexes to identify the extent of the depressive symptoms. After the 8 weeks of CMS the rats will be tested using a Morris Water Maze in order to test their spatial ability. The rats will also be sacrificed in order to perform an electrophysiological examination of their hippocampi as a means of measuring any changes in neuronal size, plasticity and/or rate of firing. The data from both behavioral and neurological tests will be consolidated and analyzed in order to determine if rats receiving CMS with concurrent enrichment show any significant improvement over the group receiving stress alone.

074 COMPUTER ALGORITHMS IN LINEAR ALGEBRA

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In the project, we implement a Gauss-Jordan matrix row-reduction algorithm in Java. We use this algorithm to create routines to solve systems of linear equations, to invert square matrices, and to calculate the determinant of a square matrix. The efficiency of the row-reduction technique for computing determinants is compared in benchmark tests to the cofactor-expansion algorithm.

075 ARSENIC CONCENTRATIONS IN CCA TREATED WOOD

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Pressure treated wood, also called CCA wood, is resistant to rotting and insects, as opposed to conventional wood. CCA wood contains Copper, Chromium, and arsenic. It has been used for decades since 1970 until it was banned in 2003 by the EPA from being used in residential areas. CCA wood contains toxic substances which, if released into the environment, can cause serious diseases to the people around. In this research, we will be concentrating on the effects of arsenic. Arsenic is a toxin, also considered to be a carcinogen. Minute exposures of arsenic have many hazardous effects on humans, such as problems regarding respiration, tachycardia, hypertension and if chronic, can cause damage to kidneys, heart and brain. The lethal dose of arsenic in adults is between 70mg-200mg and less in children. Samples

of wood will be taken from residential areas and tested for CCA by qualitative analysis using ICP (Inductively Coupled Plasma) .Following a positive result, a quantitative analysis will be carried for arsenic, measuring its concentration to see if it is present in alarming amounts that are dangerous to humans and the environment.

076 DYSFUNCTIONAL COGNITIONS AND NIGHTMARE FREQUENCY AMONG THOSE WHO HAVE EXPERIENCED TRAUMA

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Among individuals with posttraumatic stress disorder (PTSD), sleep disturbances are a common problem that can have a broad negative impact in general functioning and overall health (Clum, Nishith, Resick, 2001). Nightmares are one common type of sleep disturbance in PTSD and research suggests that the subjective distress of nightmares is moderately correlated with frequency of occurrences (Krakow et al., 2002). There are numerous cognitive models stressing the importance of negative cognition, post trauma schema, and negative self-appraisal as factors contributing toward the maintenance of PTSD (Foa, Ehlers, Clark, Tolin, Orsillo, 1999). Though a large body of research has examined the role of trauma-related cognitions in the development and maintenance of PTSD (Ehlers & Clark, 2000; Foa & Rothbaum, 1998), no research has been done to evaluate whether trauma-related cognitions may also contribute to nightmares that are frequently associated with this disorder. This proposed research will investigate the relationship between negative trauma-related cognitions and nightmare frequency in those with PTSD. We hypothesize that negative cognitions about the self, blame, and the world, share a relationship with the subjective distress / frequency of nightmares in a trauma and PTSD sample.

077 THE SOCIAL AND EMOTIONAL EFFECTS OF DEMENTIA CAREGIVING: AN EXAMINATION OF CARE PARTNER'S PERSPECTIVES

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Individuals with dementia (IWDs) and their family caregivers (CGs) face a variety of challenging care-related issues, such as relationship strains, changes in their daily routines, and concerns about the future. Several studies have begun investigating IWDs' perceptions and concerns about these issues and how CGs' perspective can impact the quality of caregiving. Newsom and Schulz (1998) examined caregiving in many forms and found that individuals had negative experiences with greater numbers of ADL & IADL impairments, external locus of control, marital discord and low self-esteem. Smyth and colleagues (2002) examined how deficit identification affects quality of life (QoL) in dementia patients—they surmised that interventions target deficit identification as an interpersonal challenge and the CGs and IWDs must work to identify deficits and build strategies to work with the deficits in order to improve QoL. In addition, Hellostrom et. al. (2005) sought to apply Awareness Context Theory to IWDs in spousal relationships and concluded that a supportive marital relationship and mutual awareness of the illness determines a nurturing environment for the IWD. Lewis and colleagues (2005) examined CG perspectives, but they concluded that interventions must be tailored to the caregiving perspective that the CG subscribes to. However, limited research exists that examines the congruence or incongruence between IWD's and CG's perspectives on these issues and the extent to which IWD's insight or awareness impacts the experience of their illness. Using a set of open-ended questions, the following qualitative study examined 1) the concerns and perceptions of IWDs and family CGs and 2) how these responses were congruent across IWDs and CGs. Discussion will focus on the need to develop interventions that address the needs and concerns of both the IWDs and CGs by including the perspectives of both care partners.

078 A QUALITATIVE INVESTIGATION OF BARRIERS TO THE USE OF JOB-SEEKING STRATEGIES

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A total of 77 local job seekers (48 male, 29 female) participated in one of nine anonymous focus group sessions held by research team members. The purpose of these sessions was to reveal opinions, perceptions, and beliefs held by the job seekers regarding their use of 22 possible strategies that could be used as a part of the job search process. Discussions within each of the sessions touched upon the frequency of use of various strategies, perceived efficacy in achieving employment, potential benefits, disadvantages, and costs of the strategies, as well as possible changes to strategies that may increase job seekers' likelihood of adoption/use. The detailed feedback from the sessions was then combined by the research team into a total of 21 universal dimensions that a job seeker could consider when deciding which strategies to use. Examples of participant feedback, the 21 dimensions, directions for future research, and possible implications are discussed.

079 ROLE OF *TRYPANOSOMA BRUCEI* ORIGIN RECOGNITION COMPLEX 1 (TBORC1) IN VSG SILENCING

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Trypanosoma brucei is a protozoan parasite that causes African trypanosomiasis in humans and nagana in cattle. In mammalian host, *T. brucei* cells regularly switch its surface antigen, Variant Surface Glycoprotein (VSG), to evade host immune system response. To maximize the efficiency of VSG switching, *T. brucei* expresses a single type VSG exclusively from one of ~20 nearly identical VSG expression sites (ESs) located next to the telomere. Telomeres are specialized nucleoprotein complexes located at the ends of linear chromosomes. We have recently demonstrated that *T. brucei* RAP1, an intrinsic component of the telomere complex, plays an essential function in silencing subtelomeric VSG expression, indicating that the telomere structure is important for VSG silencing.

In eukaryotic cells, origin recognition complex proteins (Orc1-Orc6) are essential components in the pre-replication complex and play critical roles in DNA replication and establishment of heterochromatin structures at specific loci. Recently, a *T. brucei* homolog of Orc1 has been identified. Because Orc1 interacts with telomere proteins in mammalian cells, Orc1 is important for yeast HM silencing, and blocking DNA synthesis in *T. brucei* cells led to subtle derepression of silent ES promoters, we tested whether tbOrc1 plays an important function in VSG silencing. We established tbOrc1 RNAi cells and were able to deplete tbOrc1 protein under induced condition successfully. Interestingly, we found that depletion of tbOrc1 led to a mild but robust de-repression of subtelomeric silent VSG genes, suggesting that the functions of Orc1 may be conserved from protozoa to mammals.

080 BIRD-WINDOW COLLISIONS ON AN URBAN UNIVERSITY CAMPUS

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Bird mortalities due to bird-window collisions were assessed amongst a complex of commercial buildings in Cleveland, Ohio, over a 12-month period. A total of 271 dead birds representing 50 species was found, 89% of which occurred during spring and fall migrations. Individuals from migratory species comprised a disproportionately high number of mortalities and were exemplified by warblers (34% of species diversity, 30% of mortalities) and sparrows (14% of diversity, 35% of mortalities). High collision frequency was associated with a large surface area of glass and close proximity of trees to windows. Because migrating birds congregate on the shores of Lake Erie during migration and cluster in small green spaces within the urban environment, low-profile buildings may be as dangerous as taller skyscrapers with respect to bird collisions and subsequent deaths. Therefore, the cumulative effect of urban areas bordering the Great Lakes and traditional stopover sites on bird mortality may be nontrivial.

081 EFFECTS OF THE CYANOBACTERIAL TOXIN, MICROCYSTIN-LR, ON THE MORPHOLOGY AND DEVELOPMENT OF THE AMBER-WINGED SPREADWING DAMSELFLY, *LESTES EURINUS* (ODONANTA: LESTIDAE)

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Cyanobacterial blooms are known to produce significant amounts of hepatotoxins, which are major concerns for eutrophic and hypereutrophic systems. Toxicity studies have shown aquatic insects to be at risk during blooms, however the lethal range exceeds typical concentrations measured for bloom conditions around the world. We examined the effects of Microcystin-LR on the Amber-Winged Spread Wing Damselfly, *Lestes eurinus*. 120 nymphs were divided evenly into six groups and then placed individually into 100ml of water containing different concentrations of Microcystin-LR, 0 $\mu\text{g L}^{-1}$, 1 $\mu\text{g L}^{-1}$, 10 $\mu\text{g L}^{-1}$, 20 $\mu\text{g L}^{-1}$, 35 $\mu\text{g L}^{-1}$, 60 $\mu\text{g L}^{-1}$. In addition, half of the nymphs were given food that had been previously exposed to Microcystin-LR, the other half were given food that had never been exposed. Treatments lasted for 6 wk. We looked at three major developmental aspects based on these treatment groups: Survivability, Developmental Time, and Fluctuating Asymmetry (FA). Survivability was significantly affected by the immersed concentration, with an LC50 of 40.1 $\mu\text{g L}^{-1}$, however no differences in survivability occurred based on the food treatment. Mortality did not occur before the 5th instar and a significant proportion of mortality occurred within the final instar. Developmental time was not affected by the immersed concentrations but nymphs took on average between 10 and 11 days longer to reach final instar when they received treated food. Finally, no significant differences in FA occurred based on either treatment. These data indicate that typical bloom conditions have high enough concentrations of extracellular microcystin to induce mortality in these large bodied aquatic insects. They also point to the ability of these toxins to remain active within the insect's body long after exposure has occurred.

082 UTILITY OF FLUCTUATING ASYMMETRY IN CADDISFLIES (TRICHOPTERA) AS AN INDICATOR OF COASTAL WETLAND HEALTH IN LAKE ERIE.

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Fluctuating asymmetry (FA) in caddisflies can serve as a tool to determine ecosystem stress. Eight Lake Erie coastal wetlands were sampled to determine if biotic differences between impacted and un-impacted wetlands of two types (protected embayments and open lacustrine wetlands) could be detected. Adult caddisflies were sampled with modified UV light traps. *Hydroptila waubesiana*, *Agraylea multipunctata*, and *Oecetis cinerascens* were the most abundant trichopterans collected. We investigated whether levels of FA in the three species are correlated with wetland quality. We calculated diversity and richness of caddisflies for wetlands of differing quality in order to investigate how FA correlates with these measures. We assessed whether habitat generalist species, such as *H. waubesiana*, exhibit less symmetry than habitat

specific species, such as *A. multipunctata*. Measurements of the FA on the length of three morphological characters were assessed, 1) front tibia, 2) front wing costal vein, and 3) antennal scape. In order to calculate FA, the absolute value of log right measurement minus log left measurement were taken for each character ($FA = |\log R - \log L|$). There was a significant increase of FA in the tibial length of *H. waubesiana* in impacted wetlands, implying that FA in *H. waubesiana* may be useful as an indicator in wetland quality. Neither character in *A. multipunctata* or *O. cinerascens* exhibited a significant difference in FA between unimpacted and impacted wetlands. There is no evidence that habitat specialists are more susceptible to asymmetry than habitat generalists. There was no significant difference in species richness, species diversity, species composition, and community structure between impacted and un-impacted wetlands.

083 AN AUTOMATED ALGORITHM FOR SPECTROSCOPIC BAND IDENTITY MAPPING (BIM)

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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. Base line 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 features that sometimes obscure 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, independent of the peak intensities. Thus scale invariant data analyses are needed. As part of our work to develop turnkey Raman solutions, we have developed a robust data analysis method based on feature recognition strategies that are scale invariant in two dimensions, scattering intensity and wavenumber bandwidth. Thus, the appearance of specific spectral features is given precedence over baseline shifts, small deviations in bandwidth, and widely varying spectral resolutions. While universally useful to many types of spectroscopists, the algorithm we present here demonstrates its effectiveness for a variety of Raman applications.

084 SEX-LINKED GENE EXPRESSION IN GRANULOCYTES OF LUPUS-PRONE BWF1 MICE

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Systemic Lupus Erythematosus (SLE) is a prototypic systemic autoimmune disorder. The disease targets women more frequently than men and most often during the childbearing years. Although sex hormones are known to play a large role, recent studies have suggested that sex chromosome-linked gene expression may be involved. Using a spontaneous mouse model of SLE, the (NZB x NZW)F1 (BWF1) mouse, we have previously found that bone marrow (BM) cells from female prepubertal BWF1 mice transfer disease to male and female lethally irradiated age-matched BWF1 recipients faster than male BWF1 BM and in a hormone independent manner.

In the current study, we analyzed young prepubescent BWF1 male and female mice for sex-dependent differences in immune cell subsets and, determined, when sex-linked gene expression differences first occurred. Despite the known role of estrogen on lymphocyte development, we were unable to detect any differences in the numbers of any lymphocyte cell population. In contrast, we found consistently more Gr1⁺CD11b⁺ cells in the spleens of male than female BWF1 mice. Interestingly, Gr1⁺CD11b⁺ cells have

previously been found to be immunosuppressive in cancer and other autoimmune diseases such as rheumatoid arthritis and inflammatory bowels disease. Thus, we hypothesized that increased numbers of Gr1⁺CD11b⁺ in male BWF1 mice could be suppressive towards early lupus development as well. We therefore analyzed the gene expression pattern of splenic Gr1⁺CD11b⁺ cells and found ~600 genes differentially expressed between male and female cells. In contrast, when we sorted and analyzed BM progenitor cell populations, no genes were found to be differentially expressed. Thus, during the development of Gr1^{high}CD11b⁺ cells and their relocation to the spleen, these cells may be exposed to sex-dependent stimuli driving gene expression patterns differentially in males and females. This may represent an important mechanism protecting male BWF1 mice from lupus-like disease.

085 STEM POSTER:USING CALCULUS IN THE REAL WORLD

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A small airline company was posed with the problem of investigating two flights to see if they met all public safety requirements. We acted as calculus consultants to solve the problem. We wanted to find out the speed the planes were moving towards each other and if they violated the rule of being any closer than 5 nautical miles apart. Also, we had to determine, when the planes were at their closest, how close were they and whether or not air traffic control had enough time to take appropriate action. Finally, we were asked if a change in altitude would avoid any dangerous flights. We used a series of different calculus and trigonometry equations to help us figure out this problem.

086 A SURFACE PLASMON-BASED TUNABLE WAVELENGTH FILTER

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Hyperspectral instrumentation is evolving at a fast rate. Modern wide-field hyperspectral imagers employ either a series of fixed bandpass filters or a single tunable bandpass filter. Fixed filters have the advantage of narrow pass bands and high throughput but limits the number of wavelengths it can resolve. Alternatively, pass band tunable filters can be adjusted over a large free spectral range with band widths from 0.1nm to 50nm , consequently ,there are limitations on this type of filter such as the effects of polarizers and inefficient coupling of light. We are developing the next generation of electronically tunable filters for hyperspectral imaging that take advantage of recent advances in surface plasmon resonance. We present preliminary data and a theoretical discussion of this novel surface plasmon tunable filter and compare its performance with that of the acousto-optic tunable filter and liquid crystal tunable filter.

087 A GENARALIZED UNIAXIAL ANISOTROPIC DISPERSION FOR VIRTUALLY IMAGED PHASED ARRYAS

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Electronically tunable optical filters like the acousto-optic tunable filters, liquid crystal tunable filters, and etalon-style filters rely on optical phenomena such as polarization state and interference to suppress wavelengths beyond the selected passband. In demanding applications like Brillouin scattering, narrow passband filters can be developed using these approaches, but at the cost of reduced performance. Most notably, as the full width at half maximum (FWHM) of the passband is reduced, so is the usable free spectral range of the device. Thus the development of electronically tunable filters for visible Brillouin scattering (FWHM<<1nm) is extremely challenging. The conventional approach is to employ a series of

stagger-tuned etalon filters. In the work presented here, we explore the use of uniaxial anisotropic crystalline materials to suppress off-axis rays and side-band contributions to the passband of conventional filter technologies. In particular we have investigated the use of uniaxial anisotropic material as an additional dielectric element in several filter designs. We present our preliminary results as well as a theoretical treatment of the calculated free spectral range and achievable pass-bandwidths.

088 CHILDREN'S DIETARY REPORTING ACCURACY IS RELATED TO COGNITIVE ABILITY

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Dietary reporting accuracy may be related to cognitive ability. In a validation study of the effect of retention interval on children's dietary reporting, we observed fourth-grade children eating school meals and collected 24-hour dietary recalls about what they had eaten. We also obtained the children's standardized achievement-test scores. We used the common factor extracted from four subject-area tests as a measure of cognitive ability, and analyzed the relation of dietary reporting accuracy to cognitive ability. For each of two dietary recall accuracy measures, we removed what was predictable from the variables that determined retention interval and examined the relationship of the resulting residuals to achievement-test factor score. For each reporting-error measure, as measured cognitive ability increased, reporting error decreased. For 10-year-old children, reports about as seemingly mundane an activity as eating—collected under circumstances expected to optimize performance—are related to cognitive ability. Survey data quality may depend systematically on the cognitive ability of respondents. (R01-HL074358)

089 AGE, GENDER, AND ETHNIC DIFFERENCES IN DEPRESSION AND TRAIT ANXIETY AMONG DIFFERENT PRISON POPULATIONS

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This research examined age, gender, and ethnic differences in trait anxiety and depression among prison populations. Participants comprised 140 males and females aged 25 to 81. Researchers submitted criteria for participation to the Ohio Department of Rehabilitation and Correction's (ODRC) office of Human Research. Inmates were randomly selected from four correctional institutions. They completed a semi-structured questionnaire consisting of demographics, established measures of depression and trait anxiety, and open ended questions related to health, religiosity, family, and social support. To examine age (young, middle age, and older adults), gender, and ethnic differences in trait anxiety and depression, a MANOVA was conducted. The results revealed no significant gender and ethnic differences in trait anxiety and depression. There were no significant age differences in depression. When the younger group was excluded, the results were statistically significant $F(1, 124) = 4.28, p = .04$; older adults as opposed to middle aged adults reported significantly lower levels of depression ($M = 17.05, SD = 11.58$; $M = 22.00, SD = 12.77$ respectively). Significant age differences existed in trait anxiety $F(2, 135) = 3.90, p = .02$. Older adults in contrast to middle aged adults reported significantly lower scores on trait anxiety ($M = 38.64, SD = 13.67$; $M = 45.44, SD = 13.01$ respectively). In summary, of three age groups, older inmates scored lowest on trait anxiety and depression. These results suggest that it is possible that older inmates acquired mechanisms which helped them cope with life in prison.

090 THE EFFECT OF EDUCATION, SOCIAL SUPPORT, SPIRITUALITY, MENTAL AND PHYSICAL HEALTH ON THE PREVALENCE OF DEPRESSION AND ANXIETY IN PRISON POPULATIONS

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This research explored the prevalence of depression and trait anxiety in prison populations. It further examined the relationship between social support, spirituality, physical and mental health, and the factors of depression and trait anxiety in three age groups, Young (age 18-30, $N=11$), Middle (age 31-55, $N=87$), and Older (age 56+, $N=39$). One hundred thirty-seven inmates from four Ohio prisons completed a questionnaire consisting of the State-Trait Anxiety Inventory (STAI), Center for Epidemiologic Studies Depression Scale (CES-D), and questions regarding education, social support, spirituality, and mental and physical health. Descriptive results show that 8 (72.8%) young, 55 (63.2%) middle aged, and 19 (48.7%) older adults reported significant levels of psychological distress. Trait anxiety mean scores for all groups exceeded scores of normative data. Correlation results revealed that for the middle-aged adults, physical health, social support, and spirituality had a significant negative relationship while mental health had a significant positive relationship with trait anxiety. Learning problems and mental health were significantly and positively related to depression, while relationships between fellow inmates and depression was negative and significant. For older adults, education had a significant positive relationship with depression and significant negative relationship with trait anxiety. Spirituality had a significant negative relationship with depression and trait anxiety, and mental health was significantly and positively related to depression and trait anxiety. In addition, having friends in the institution had a negative significant relationship with trait anxiety. For the young adults, only physical health had a significant negative relationship with trait anxiety. In summary, these results indicate that significant number of inmates reported high levels of trait anxiety and moderate to high levels of psychological distress. Even in this population, spirituality and social support helped in dealing with psychological distress. This relationship was different for each age group.

091 SYNTHESIS AND STRUCTURAL STUDY OF TWO NEW HETEROLEPTIC GALLIUM AND INDIUM CHLORO-BENZOATO COMPLEXES: AN UNUSUAL SEVEN-COORDINATE INDIUM COMPLEX

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Two new heteroleptic chloro-benzoato- indium (III) and gallium (III) complexes have been prepared and structurally characterized. The molecular structures of $[\text{GaCl}_2(4\text{-Mepy})_2(\text{O}_2\text{CPh})] \cdot 4\text{-Mepy}$ (**1**) and $[\text{InCl}(4\text{-Mepy})_2(\text{O}_2\text{CPh})_2] \cdot 4\text{-Mepy}$ (**2**) have been determined by single-crystal X-ray diffraction. The gallium compound (**1**) has a pseudo-octahedral structure with *cis*-chloride ligands co-planar with the benzoate and the 4-methylpyridines *trans* to each other. The indium compound (**2**) adopts an unusual pentagonal bipyramidal structure with the two benzoates and one 4-methylpyridine in the plane and the chloride *trans* to the other 4-methylpyridine.

Crystal data: **1** space group P-1, $a = 10.599(1)$, $b = 11.371(2)$, $c = 12.666(2)$ Å..., $\alpha = 104.53(1)$, $\beta = 101.98(1)$, $\gamma = 111.98(1)$ Å°, $V = 1290.7(3)$ Å...³, $Z = 2$, $R = 0.044$, $wR = 0.084$; **2** space group P21/n, $a = 13.157(1)$, $b = 8.212(1)$, $c = 28.796(3)$ Å..., $\alpha = 94.460(2)$ Å°, $\beta = 94.460(2)$ Å°, $\gamma = 94.460(2)$ Å°, $V = 3101.6(5)$ Å...³, $Z = 4$, $R = 0.053$, $wR = 0.119$.

092 CHAIN END-FUNCTIONALIZED GLYCOPOLYMER FOR PROTEIN CONJUGATION

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Covalent attachment of synthetic macromolecules is an effective way to improve protein stability with reduced immunogenicity and extended plasma half-lives. In addition, secondary property can be introduced, such as for protein targeted delivery. Glycoengineering aimed adding carbohydrates to proteins to alter pharmacokinetic properties of proteins such as increasing *in vivo* activity and prolonging the duration of action have been a promising approach for protein therapeutics. In this presentation, a facile synthesis of chain end-functionalized glycopolymer for well-defined protein- glycopolymer conjugation is reported. Briefly, an *O*-cyanate chain end-functionalized glycopolymer presenting multiple copies of lactose epitope units was synthesized *via* cyanoxyl-mediated free-radical polymerization in one-pot fashion. Bovine serum albumin (BSA) was employed as amine-containing model protein, and the resulting protein-glycopolymer conjugate was characterized by SDS-PAGE. The versatility of the synthetic strategy presented in this work was the oriented multivalent carbohydrate modification of protein in straightforward approach and in aqueous mild conditions.

093 IRON AND NICKEL SULFIDES FROM METAL DITHIOCARBAMATES AND THEIR POSSIBLE AEROSPACE APPLICATIONS

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Several related studies are described where simple nickel and iron dithiocarbamate complexes were prepared, characterized, and further processed to sulfides. We determined the structures of the following three homoleptic mixed-organic bis-dithiocarbamates: Ni(S2CN(isopropyl)(benzyl))₂, Ni(S2CN(ethyl)(benzyl))₂ and Ni(S2CN(phenyl)(benzyl))₂ and the mixed ligand complex, Ni(P(phenyl)₃)Cl(S2CN(phenyl)(benzyl)). Decomposition resulted in a somewhat complicated product mix with NiS predominating. The thermogravimetric analysis of fifteen tris(diorganodithiocarbamate)iron(III) has also been investigated. Each undergoes substantial mass loss upon pyrolysis in a nitrogen atmosphere, with major mass losses occurring between 279o and 324oC. The product of the pyrolysis was usually consistent with being either FeS or Fe₂S₃ or a combination of these. Several minor constituents, namely iron nanoparticles in a silica matrix and metal sulfides should be introduced into a commercial lunar dust simulant in order to more closely simulate actual lunar regolith. Inexpensive catalysts for reforming Fischer-Tropsch-processed waxes are needed to blend non-petroleum feedstocks into commercial jet fuels. Newest data from our labs that are currently being investigated will additionally be presented.

094 COBALT NANOPARTICLES SUPPORTED ON SILICA SCAFFOLD OXIDES FOR GTL CATALYSIS

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Catalytic Fischer-Tropsch processing of synthesis gas is a versatile gas-to-liquid (GTL) technology producing a complex product stream of paraffins, olefins, and oxygenated compounds such as alcohols and aldehydes. One approach to insuring stable supplies of jet fuels is using blends of petroleum-based, GTL-produced and Bio- Fuels. The catalyst (cobalt or iron), support and reaction conditions have a direct impact on the product mix. In this report we will describe our preliminary efforts to produce novel catalysts designed to preferentially produce C₈ to C₁₈ paraffin compounds in a GTL process. Co nanoparticles were synthesized by several different routes. SiO₂ supports have been fabricated via sol-gel processing of tetraethylorthosilicate (TEOS) in the presence of various structure directing agents. Co nanoparticles and SiO₂ supports were characterized by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), x-ray diffraction (XRD), selective area electron diffraction (SAED), convergent beam electron diffraction (CBED), and high-resolution transmission electron microscopy (HRTEM). Additional newest materials and data will be presented.

095 STUDY OF COBALT NANOPARTICLES AND COBALT ON ALUMINA FOR FISCHER TROPSCH SYNTHESIS

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At the NASA Glenn Research Center, efforts are concentrated on using alternative fuels to reduce emission in advanced jet engine designs in addition to reducing capital costs associated with synthetic jet-fuel production from nonconventional sources. One method involves Fischer-Tropsch (FT) processing of synthesis gas. The FT process is a versatile gas-to-liquid (GTL) technology that facilitates the production of a complex product stream of paraffins, olefins, and oxygenated compounds useful as transportation fuels. The catalyst (cobalt or iron), support and reaction conditions have a direct impact on the product mix. We will describe our preliminary efforts to produce novel catalysts designed to preferentially produce C₈ to C₁₈ paraffin compounds in a GTL process. In this study, we investigate the effect of variations in the preliminary reaction conditions that result in the production of heterogeneous catalysts composed of cobalt supported on alumina (Al₂O₃). We are interested in determining the optimal method of synthesis to obtain successful loading of Co at target weight percents as well as achieving Co dispersion with a maximum available surface area. We have also enhanced the catalytic properties of the FT catalysts by adding transition metal promoters. Co nano-particles were synthesized by several different procedures. Co nanoparticles and Co on Al oxides were characterized by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), x-ray diffraction (XRD), and (high-resolution) transmission electron microscopy (HR-TEM).

* - JNW (CSU), SJ (CSU), and JEC (CWRU) are currently graduate students

096 SYNTHESIS, CHARACTERIZATION AND PROCESSING OF COPPER, INDIUM AND GALLIUM DITHIOCARBAMATES AND THEIR USE TO FABRICATE THIN FILM SOLAR CELL MATERIALS

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A number of dithiocarbamate complexes of indium(III) and gallium(III) have been prepared and characterized by elemental analysis, infrared spectra and melting point. Each complex was decomposed thermally and its decomposition products separated and identified with the combination of gas chromatography/mass spectrometry. Their potential utility as photovoltaic materials precursors was assessed. $\text{Cu}(\text{S}2\text{CN}(\text{CH}_2\text{C}_6\text{H}_5)_2)_2$ and $\text{Cu}(\text{S}2\text{CN}(\text{C}_2\text{H}_5)_2)_2$ respectively, have also been examined for their suitability as precursors for copper sulfides for the fabrication of photovoltaic materials. Each complex was decomposed thermally and the products analyzed by GC/MS, TGA and FTIR. The dibenzyl derivative complex decomposed at a lower temperature (225-320°C) to yield CuS; the diethyl derivative complex decomposed at a higher temperature (260-325°C) to yield Cu₂S. Tris (N,N-dibenzylthiocarbamato)indium(III), $\text{In}(\text{S}2\text{CNBz}_2)_3$, was synthesized and characterized by single crystal X-ray crystallography. Upon heating, the material decomposes to release CS₂ and benzyl moieties, resulting in In₂S₃. Spray CVD experiments indicate that $\text{In}(\text{S}2\text{CNBz}_2)_3$ decomposed on a Cu substrate yielding CuInS₂ films. Additional newest materials and data will be presented

097 DETERMINATION OF TRIAPINE, A POTENT INHIBITOR OF RIBONUCLEOTIDE REDUCTASE, BY LIQUID CHROMATOGRAPHY WITH ULTRAVIOLET (LC-UV) DETECTION

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Ribonucleotide reductase (RNR) plays a central role in cell proliferation. It catalyzes the formation of deoxyribonucleotides, which are used in DNA replication and damage repair. RNR has been an important target for cancer chemotherapy. Triapine (also known as 3-aminopyridine-2-carboxaldehyde thiosemicarbazone, or 3-AP) is a novel RNR inhibitor, which can remove iron ion from the essential di-iron-tyrosyl radical center on RNR due to its chelate effect. Preclinical study showed that triapine significantly decreased RNR activity and enhanced radiation-mediated cytotoxicity in cervical and colon cancer cells by impairing DNA repair process that rely on the production of deoxyribonucleotides, thereby sensitized the radiation therapy of human cancers. These preliminary findings warrant further clinical study of this compound.

In this work, a quantitative LC-UV method for the determination of triapine has been developed. Hydrazinecarbothioamide, 2-[(3-methoxy-2-pyridinyl)]-methylene was used as internal standard. The triapine and the internal standard were separated on a Waters Xterra RP18 column (2.1 x 150 mm, 5 μm particle size), and detected at wavelength of 365 nm by a photodiode array detector. The mobile phase for chromatographic separation consisted of 20.0% acetonitrile, and 80% ammonium bicarbonate buffer [10 mM, pH 8.5, containing 1 mM EDTA (v/v)]. This method had a linear calibration range of 10.0-1.00 x 10³ ng/mL with correlation coefficient of 0.999. The lower limit of quantification (LLOQ) of the method was 10.0 ng/mL. This method will be tested in preclinical and clinical studies of triapine.

098 CAN NUCLEAR POWER MAKE ITS HOME IN CLEVELAND, OHIO? A FEASIBILITY STUDY

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The purpose of this research is to explore the possibility of building and maintaining a fully functional nuclear power plant in the city of Cleveland that will serve the electricity needs of the city. Currently, Ohio is one of thirty one states in the United States that has operational nuclear power plants. This project looks to both the political feasibility and the technical feasibility of building a nuclear power plant in Cleveland. An understanding of how nuclear power plants operate, a cost-benefit analysis, as well exploring the multitude of environmental benefits a nuclear power plant could bring to the city and why

nuclear is the most appropriate sustainable alternative energy option for Cleveland are among the subjects included in this research. As of 2007, coal accounted for eighty five percent of the electricity generated by the state, and the electric industry of Ohio ranked second highest in carbon dioxide emissions in 2007 out of the fifty states plus the District of Columbia. Cleveland is the optimal location for a nuclear power plant because of its greatest natural resource: Lake Erie. In order to properly function, nuclear power plants require a constant source of water for the massive cooling towers, a source that Lake Erie can provide. This research also addresses the weaknesses of such an endeavor, such as where possible funding could come from, how to ensure the safe transport of spent nuclear fuel rods, and the massive amount of opposition that will come from both the private energy sector and the public at large.

099 RELATIONSHIP BETWEEN IMPERVIOUS SURFACES, NUTRIENT AVAILABILITY, AND NUTRIENT RETENTION IN CLEVELAND METROPARK WETLANDS

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Impervious surfaces in a watershed increase surface runoff when there is precipitation. This surface runoff can wash large amounts of nutrients from lawn and agricultural fertilizers, soil, and other sources into streams and other bodies of water. Wetlands can serve as sinks for nutrients in a watershed; therefore increased nutrient loads from surface runoff may highly affect nutrient availability and retention in wetlands. I hypothesize that nutrient availability in a wetland will be positively correlated with the amount of impervious surface in the watershed of that wetland. Ten Cleveland Metropark wetlands of different surrounding land use will be studied to test this hypothesis. The amount of impervious surface in the wetlands' watersheds has been determined using remote sensing imagery. Total nitrogen, phosphorus, and carbon content will be measured in water and soil samples from the wetlands to determine nutrient availability and nutrient retention. Plant nutrient uptake during the growing season is also related to nutrient availability. My second hypothesis is that plants in wetlands with higher nutrient concentrations in the soil and water will have higher nutrient uptake than plants in wetlands with lower nutrient concentrations. Cattails in the wetlands were collected in June, July, and September 2009 and will be analyzed for nutrient content of their tissues to determine plant nutrient uptake. Some studies have used mesocosms that mimic urbanized wetlands to investigate influences on plant nutrient uptake and nutrient availability, but very few studies have used wetlands in actual urban areas to determine the impacts of impervious surfaces on plant nutrient uptake and nutrient availability. This research will demonstrate how nutrient availability and nutrient retention differ between wetlands in urbanized areas with high amounts of impervious surfaces and wetlands in areas with low amounts of impervious surfaces.

100 NITRIC OXIDE DIFFUSION IN THE RAT AORTA

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Nitric oxide (NO) is known to cause the smooth muscle cells of the aorta to relax. Its production in the endothelial cells that line these blood vessels places nitric oxide in close proximity to the smooth muscle cells. The effective diffusion distance, which characterizes the amount of NO that reaches the muscle cells, is affected by many factors including the distance across the smooth muscle and the amount of oxygen in the blood. If the amount of oxygen in the blood drops, then more NO reaches the muscle and causes the blood vessel to relax which in turn allows more blood to flow and with it, more oxygen. Previous work by Parthasarathy Srinivasan, Xiaoping Liu, et al. produced a method for discovering this effective diffusion distance and the reaction rate of NO with oxygen. We extend this work further by considering the changes caused to the availability of NO under changes to various biophysical parameters.

101 RECOMBINATION AND CHROMOSOME DYNAMICS DURING YEAST MEIOSIS

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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. The widely conserved Pch2 protein plays an important role in controlling the positioning of crossover designation marker Zip3 and meiotic axis protein Hop1, thereby contributing significantly to the coordinate control of axis modification at global genome level and crossover formation at the molecular level. We propose that Pch2 facilitates crossover associated axis remodeling by reorganizing chromosome axes into a tiling array of long-range crossover control modules, thereby coordinately ensuring appropriate levels and spacing of crossovers. Current studies, directed at putative and novel members of Pch2, under wild type and mutant conditions will help us define targets of Pch2, thereby better dissecting its contribution to early steps of meiotic recombination.

102 NHEJ IMPAIRMENT AND DNA DAMAGE ENHANCEMENT DEPICT A NEW ROLE OF THE CYCLIN E THROUGH ITS PROTEOLYTIC FRAGMENT, THE p18CycE

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Exposure to genotoxic agents, such as ionizing radiation (IR) can initiate double strand breaks (DSBs) that in mammalian cells are predominantly repaired by nonhomologous end-joining (NHEJ). NHEJ requires the Ku70-Ku80 heterodimer, DNA-PK catalytic subunit (DNA-PKcs), XRCC4, Ligase IV and accessory factors, such as XLF/Cernunnos. Previously we have identified Ku70 as a novel interacting partner of p18CycE, a proteolytic fragment of Cyclin E (CycE) that is produced during IR-induced apoptosis in all tested hematopoietic tumor cells. To investigate the role of p18CycE on NHEJ, we have generated HEK 293T and H1299 cells that stably express p18CycE at a non-toxic level. Neutral comet assays that measure residual DSBs, indicative of an ineffective NHEJ, showed significant difference in the presence of p18CycE following IR and etoposide treatment. The same trend was seen with the γ -H2AX foci formation. Surprisingly, DNA pull-down assays demonstrated that the assembly of Ku70-Ku80 and DNA-PKcs on DSBs was not affected by the presence of p18CycE. However, the recruitment of XRCC4, Ligase IV, and XLF/Cernunnos was significantly impaired by p18CycE. Similarly, the number of DNA-PKcs foci observed was affected as an indicator of the protein complex activity. Likewise, the phosphorylations of 53bp1 (S1778) and Kap-1 were highly attenuated in p18CycE-expressing cells. The activity of DNA-PKcs was diminished by the presence of p18CycE, to an extent similar to its pharmacological inhibition. In the same context, previous electrochemical study in our lab with prostate cancer cells indicated that this tool is very efficient to measure the extent of DNA damage and is applicable to our cell lines. Overall, our data indicate a profound effect of p18CycE on NHEJ that is most likely dependent on its interaction with Ku70 and probably caused by interference with the activity of DNA-PKcs and subsequent recruitment of XRCC4-Ligase IV heterocomplex to the sites of DSBs.

103 ASSESSMENT OF MUNICIPAL SOLID WASTE MANAGEMENT TECHNOLOGIES

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Municipal solid waste (MSW) management is a leading environmental management concern. As the U.S. population continues to grow, efficient MSW management will continue to be a concern. MSW management technologies have varying effect in waste reduction and mitigation of pollutants, in particular greenhouse gas (GHG) emissions. This report evaluates mainstream MSW management technology (discarding in landfills, combustion, and recovery through recycling and composting) with regard to waste reduction efficiency and mitigation of GHG emissions. Each technology is assessed based on the amount of waste at the end of each process and GHG emission or storage data. As concerns with energy consumption and GHG emissions increase, advancements in MSW management technology will need to continue as to improve efficiency in reducing environmental impact. This report shows that recovery technology, in particular recycling, results in the most significant energy saving and GHG emission reduction. Assessment of MSW management technology can support personal and municipal decision making.

104 SYNTHESIS AND CHARACTERIZATION OF CHAIN-END FUNCTIONALIZABLE GLYCOPOLYMER AND ITS ORIENTED GLYCO-MACROLIGAND FORMATION

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Cell surface carbohydrates act as receptors for a variety of protein ligands and thereby play a significant role in a wide range of biological processes. Therefore, carbohydrate binding interaction by protein has provided a starting point for the development of new therapies and a new protein and cell isolation and targeting concept in biological research and applications. We report a facile synthesis of α,ω -orthogonally functionalizable glycopolymer and its oriented glyco-macrolignand formation for rapid purification and identification of carbohydrate-binding protein applications. Specifically, α -biotin, ω -O-cyanate chain end functionalized glycopolymer was synthesized *via* cyanoxyl-mediated free-radical polymerization in one-pot fashion. The glycopolymer was characterized by ^1H NMR and IR spectroscopy. Oriented glyco-macroligand formation and its glyco-affinity capturing of proteins were demonstrated by combining α -biotin end-terminated glycopolymer with streptavidin modified magnetic beads and ω -O-caynate end-terminated glycipolymer with amine modified silica gel, respectively. The one-pot synthetic approach is expected to open a versatile pathway towards heterotelechelic (bio) functionalized polymers with defined chain end groups. The α,ω -orthogonally functionalizable glycopolymer can be used for both oriented polymer-protein conjugation and polymer surface immobilization for protein drug development and biosensor applications.

105 SUSTAINABLE AGRICULTURE: MAKING IT WORK IN THE MARKET AND IN POLICY

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Over the past few decades the sustainable agriculture farming movement has strengthened, and the market share of sustainable agriculture products, both plant and livestock, accounts for a larger share of the entire agriculture sector. Sustainable agriculture integrates three main goals, environmental stewardship, farm profitability, and social and economic equity, in contrast to the industrial efficiency and yield maximization objectives of conventional methods. Sustainable practices vary from region-to-region, but in general farmers view their land as an ecosystem by employing cyclical processes, rather than as a factory with linear processes. Benefits of sustainable agriculture include, but are not limited to: reduced reliance

on non-renewable resources, decreased use of pesticides and fertilizers, enhanced environmental protection of agricultural lands such as from topsoil depletion, improved food security, enhanced product value, economic improvement in rural communities, and increased health benefits to consumers.

Although substantial research exists regarding sustainable agriculture as well as consumer and agriculture organizations that promote its many benefits, two significant obstacles limit the growth of sustainable agriculture. First, most governmental policies, such as subsidies, only benefit the use of conventional methods. Second, consumer demand limits the continued growth of sustainable practices, and unless demand increases, sustainable agriculture's market share will stagnate. My research will focus on how governmental policies limit the growth of sustainable practices and I will suggest necessary changes in law and related economic policy. Furthermore, I will explore new market possibilities to connect producers with consumers in order to increase nationwide demand for sustainably grown agricultural goods so that their many benefits to farmers, consumers, the environment, rural communities, and society as a whole may be realized.

106 SPLICING PATTERN OF IN-VIVO MUTATED U-2 DEPENDENT INTRON HARBORING MICRORNA

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Intronic miRNAs play functional role in gene regulation and are processed before the intron removal. All known miRNAs are harbored in U-2 dependent i.e. major class of introns. We are interested to study the flexibility of splice sites of miRNA encoding introns to support primary and precursor miRNA processing. We examined the splicing pattern of Myosin Heavy Chain (MYH) intron 27 and processing of miR-208 located in the same intron using both in-vivo and in-vitro assays. We observed that mutation of the 5' splice site of intron 27 does not affect the primary miRNA processing. However, cryptic splicing occurred when 5' splice site was eliminated completely. Conversion of the U-2 dependent 5' splice site to U-12 5' splice site did not affect the in vivo splicing. The 5' splice site mutation CC5/6GG which is essential for the U-12 dependent splicing neither abolished nor generated any cryptic splicing. In order to check if miRNA can be processed from U-12 dependent introns we cloned miR-208 in U12 dependent intron of P-120 minigene for in vivo splicing. Surprisingly, the intron spliced out and the miRNA underwent processing. Also, point mutations at 3 to 7 positions at the 5' splice site of intron 27 of MYH promote splicing except the A4G, G5A and G5C mutants. RT-PCR and Taq-man analysis revealed that A at the 4th and G at the 5th position are important for both splicing and miRNA processing. Moreover, mutating C to either G or T at 6th & T to A at 7th position gave us spliced product and more miRNA processed as compared to wild type. Experiments are being designed to determine if the plasticity of splice sites is an evolutionary derived feature of introns which code for miRNA gene.

107 DIFFERENTIAL EXPRESSION OF PROTEINS IN RESPONSE TO ARSENIC STRESS IN CHLAMYDOMONAS REINHARDTII

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The aim of this study was to identify proteins that are expressed in the fresh water alga *Chlamydomonas reinhardtii* in response to arsenate [As(V)] The cells exposed to 200 µM arsenic exhibited inhibition of the growth beginning second day and until the experiments were terminated on the 6th day. The approaches for extracting soluble proteins with trichloroacetic acid in combination with acetone were not effective in the removal of chlorophyll and other materials tended to produce streakiness of protein spots on two dimensional (2D) gels. On the other hand, a protocol which employs two consecutive precipitation

steps of $(\text{NH}_4)_2\text{SO}_4$ yielded high resolution mapping for proteomic studies. The 40% salt treatment removed chlorophyll and the viscous materials and the second precipitation step [60 % $(\text{NH}_4)_2\text{SO}_4$] recovered >90% of the soluble proteins. The shape of proteins spots was much more discrete and the protein distribution patterns were highly reproducible. Seventeen protein spots that are expressed in the arsenic treated samples were selected to determine their identify by LC-MS-MS analysis. The expression of these spots suggested impairments of photosystem, energy production, and some aspects of carbohydrate metabolism, and oxidant stress.

108 REGULATORY FOCUS AND IRONIC PROCESSES

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Through the motivational principle of regulatory focus, individuals utilize either promotion or prevention strategies. Prevention as a regulatory focus is characterized by the sensitivity to the absence or presence of negative outcomes, framing goals in non-loss-loss outcomes, and strategies of avoidance and inhibition. Since avoidance and inhibition are preferred strategies among those high in prevention focus, these strategies are relatively automatized, requiring less cognitive effort and subsequently easier. Individuals induced in a prevention orientation have higher task enjoyment and task performance on tasks that require concentration and thought suppression. According to the theory of ironic processes of mental control, the exact opposite result of the target goal will occur when implementing mental control under cognitive load. The current research proposes that individuals high in prevention focus will experience less rebound effects of ironic processes of mental control than those low in prevention focus when under cognitive load.

109 SEXUAL AVERSION AND EATING DISORDERS

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Multiple studies have noted an increased level of sexual difficulties in patients with eating disorders (Carnes, 1998; Faith & Share, 1993; Leon, Lucas, Ferdinand, Mangelsdorf & Colligan, 1987). Both the sample group and the control group will be recruited from the psychology 101 classes at Cleveland State University. Anorexics should be more prone to sexual aversion than control groups. In order to see if this is true, we will give all of the participants a survey asking them what their views on sexual activities are. The term aversion needs to be defined because many anorexics are simple avoidant of sexual activity because of physiological reason. Aversion should be an abhorrence or disgust to sexual activity. To discuss the possible reasons why anorexics may feel an aversion to sex, an opened ended question allowing them to elaborate on what they feel the reasons are for their dislike of sexual actions. Using an ANOVA, we can look at the differences between all three groups; the control group, anorexics and bulimics.

110 PREMELT STUDIES OF DRUGS AND OTHER SOLIDS BY DIELECTRIC AND CALORIMETRIC ANALYSIS

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Anthracene has a highly conjugated polar fused aromatic ring system and some noteworthy properties in its solid state, during its pre-melt temperatures. It has been observed to form excimers, excited molecules as dimers, in the solid state and to continue this formation into the amorphous liquid phase. Examination of drugs and other solids by Dielectric Analysis (DEA) also discovered a linear electrical conductivity in

the pre-melt temperatures through to the melt as determined by DSC. The DEA activation energy (E_a) can be calculated from the slope of plots of log conductivity vs. the reciprocal temperature in Kelvin, which had a typical correlation coefficient of 0.998.

The Differential Scanning Calorimetry (DSC) and Thermal Mechanical Analysis (TMA) defined the temperature range for melting of the solids. We further observed linear DEA electrical conductivity from below the melt temperature of a number of pure drugs well into their liquid amorphous phase. The E_a for the pre-melt charge complex for Sulfapyridine was 990 J/mole, for Acetophenetidin 1300 J/mole and for caffeine 320 J/mole. The E_a is frequency dependent and related to the degree of amorphous content in the solids. Active Pharmacy Ingredients (APIs) with known enhanced conductivity behavior include Lidocaine, Acetanilide, Carbamazepine, Nifenipine and Tolbutamide. It is our observation that the APIs studied form charged molecules as complexes just before melting. We have measured unique electrical properties of a number of pharmaceutical solids which have thermally induced dielectric viscoelastic properties as charge transfer complexes in the solid state.

111 CHARACTERIZATION AND EVALUATION OF TRANSPORT PROPERTIES OF BIPOLAR DISORDER DRUGS BY DIELECTRIC ANALYSIS AND DSC

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Characterization of appropriate drugs by Dielectric analysis and other thermal-analytical techniques will help better understand the transport properties and may pave the way for novel drug delivery method. This will aid a bipolar disorder (BPD) patient to receive their dosage in a timely manner and improve patient compliance. BPD also called as Manic Depressive Disorder results in extreme shifts in mood and behavior that may last for weeks or months, causing severe disturbances in the lives of those affected. A high percentage of BPD is untreated due to the lack of a well-tolerated and effective drug transport therapy. So, the analysis of the selected drugs by thermal analytical techniques gives support to understand the transport properties. We propose to develop a technique that implements drug delivery employing an AC frequency modulating drugs of a wide molecular range (e.g. 300 to 30,000 Daltons) with an interdigitated electrode system. We also intend to use an animal model (porcine or shedded snake skin) in our study making the therapy a potentially feasible new treatment mode for BPD in humans. In this fundamental study, we selected the most appropriate drugs (Lithium as the Carbonate and Citrate, Seroquel®, Carbamazepine®, Olanzapine®, and Risperidone®) and evaluate them by the following thermal and structural analytical techniques: Calorimetry, Dielectrics, FTIR and Marco photography. Drug purity was set by the Calorimetry and FTIR data.

112 WHY IS IMAGINED WALKING FASTER THAN REAL WALKING?

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Previous studies have shown that the time to imagine walking to a previously viewed target is shorter than the time to physically walk to the same target. By contrast, time to take other actions such as reaching is generally estimated accurately by imagining performing them. The current experiments will test three hypotheses to explain the discrepancy between real and imagined walking. Experiment 1 will test whether walking speed is generally overestimated in imagined walking. Experiment 1 will also test whether the error of anticipation (that leads to general underestimation of the time required to contact the target) takes place in imagined walking. Participants will walk or imagine walking during various time intervals provided by the experimenter and estimate how far they can go during a given time interval. According to

the first hypothesis, imagined walking should yield longer distance estimates. On the other hand, according to the second hypothesis, real and imagined walking should elicit similar distance estimates because participants have no prior knowledge about where they will be walking (and therefore the anticipation error is removed). Preliminary findings indicate that there is little difference between real and imagined walking, thus rejecting the speed overestimation hypothesis and supporting the anticipation error hypothesis. Experiment 2 will test whether faster imagined walking is due to visual under perception of target distance. In this experiment participants will walk or imagine walking to a previously viewed target placed at different distance intervals. Preliminary findings show that real walking to target is generally very accurate and that imagined walking to target is faster than real walking. These results reject the hypothesis that imagined walking error is due to visual under perception of target distance. Collectively, these findings suggest that the underestimation of imagined walking time is explained in part by the error of anticipation.

113 RNASE L IS INVOLVED IN THE PATHOGENESIS OF TYPE I DIABETES

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Diabetes mellitus is one of the major health hazards in human due to its association with life-threatening cardiovascular diseases and nephropathy. Type I diabetes is caused by autoimmune responses triggered by viral infection or endotoxins, resulting in destruction of insulin producing pancreatic β -cells and deficiency of insulin. Previous studies have shown that the onset of type I diabetes is associated with increased expression of interferon (IFN)- γ in pancreatic islets although the role of IFN- γ in the etiology of type I diabetes is still unclear. 2-5A dependent RNase L (RNase L) is an IFN- γ - inducible enzyme that plays an important role in IFN-mediated antiviral activity and cell apoptosis. In this study, we have discovered that mice deficient with RNase L were resistant to STZ-induced diabetes. Further investigation of the molecular mechanism underlying the observation revealed that RNase L mediated β -cell apoptosis and regulated the expression of proinflammatory genes. Our findings provide new insight into the pathogenesis of type I diabetes and may lead to the design of novel therapies for treatment and prevention of this disease based on the selective regulation and inhibition of RNase L.

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

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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. 23A2 myoblasts stably expressing dnDR5 exhibit both a significant increase in the amount of Mef-2 bound at this non-

canonical SRE and a decrease in MyoD protein expression levels in response to serum withdrawal 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 recruitment, and that the recruitment of HDAC(s) by Mef-2 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.

115 EFFECT OF ROOT AND LEAF HERBIVORY ON THE GROWTH AND SEXUAL AND CLONAL REPRODUCTION OF THREE WETLAND PLANT SPECIES

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Herbivory can potentially have very detrimental effects on plant survival and reproduction. Plants are faced with predation on almost all of their tissues, but the most commonly observed and studied is damage to leaves, with root damage less often investigated. In this study, I simulated root and leaf herbivory on three wetland plant species, *Lythrum salicaria*, *Eupatorium perfoliatum*, and *Penthorum sedoides*, to investigate the effects of damage on growth and sexual and clonal reproduction. My hypotheses were that simulated root and shoot herbivory will 1. decrease growth (height and biomass). 2. decrease sexual reproduction and 3. increase clonal growth structures as a means to compensate for the damage. To simulate leaf herbivory, I created holes around the perimeter of each leaf; for root herbivory I removed 1/3 of each plant's rhizosphere. After a period of acclimation following treatment, plants were measured biweekly and I recorded the height; number of branches and leaves; and the presence or absence of clonal growth, flowers and fruits. Three months after treatment was applied, I harvested the plants and divided them into leaves, stems, branches, ramets, fruits and clonal growth structures. Harvested biomass parts were dried and weighed. Contrary to my hypotheses, many aspects of growth and reproduction were unchanged by either root or shoot damage, although height was decreased in *E. perfoliatum* in the shoot-damaged plants. In other cases, plants seemed to compensate for the damage. For example, height and branch number in *L. salicaria* and *P. sedoides* and the mass of vegetative structures in *L. salicaria* were all increased by the herbivory treatments. Mass of clonal structures increased for damaged plants, but only for *E. perfoliatum*. Simulated herbivory did not affect the timing or amount of flowering and fruiting except in *P. sedoides* which had decreased fruit mass with root damage.

116 LEVERAGING THE GREAT LAKES FOR NORTHEAST OHIO'S ECONOMIC DEVELOPMENT THROUGH A FRESHWATER INSTITUTE

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In 2007, the Great Lakes Science Center commissioned the Northeast Ohio Technology Coalition (NorTech) to investigate the feasibility of creating a Freshwater Institute (FWI) in Northeast Ohio, one of several similar studies prompted by the region's direct access to Lake Erie. NorTech's investigation revealed that various parties have discussed the potential value of an applied freshwater research institute to Northeast Ohio, but none have clearly articulated a value proposition used to obtain funding for such an institute. That articulation may now be possible, given recent events such as a general shift in public, private and nonprofit attention to environmental sustainability and its impacts on human health and prosperity; increased focus on freshwater (or related) research by Ohio's prominent universities; and continued growth of business sectors in Northeast Ohio with likely interest in, influence on, or expertise regarding Great Lakes freshwater quality, particularly related to near-shore and watershed contamination. These events suggest an FWI can drive regional economic development by leveraging and benefitting Northeast Ohio's strongest industries and intellectual capital. Interviews are being conducted with key stakeholders and experts within and outside of the region, to identify assets and opportunities to differentiate the FWI from any other organizations, as well as efforts already underway as a potential baseline of FWI activity supporting applied research, education and outreach, a regional business cluster,

and policy. These interviews are supplemented with a literature review of “state of the art” freshwater research and application related to water contamination and treatment. Analysis of findings will inform development of the FWI’s value proposition, as well as its mission, vision, organization of major goals and services, and ultimately a viable business plan. This collateral will be used to pursue public and private funding and other capital investment to make the FWI a reality.

117 IMPACTS OF THE INVASIVE HERB GARLIC MUSTARD (*ALLIARIA PETIOLATA*) ON LOCAL ANT (HYMENOPTERA: FORMICIDAE) COMMUNITIES IN NORTHERN TEMPERATE FORESTS

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Garlic mustard, an invasive shade-tolerant species introduced to North America from Eurasia in the late 1860s, now is widely distributed throughout the US and Canada. The presence of garlic mustard results in displacement of understory species and subsequent decline in native plant diversity. By displacing native plants, garlic mustard can affect resource availability and habitat quality, and thereby affect animals from different trophic levels. Although hypothesized, these impacts have been infrequently documented. Our study focused on the small-scale effects of garlic mustard invasion on an abundant and important group of forest-floor arthropods. We evaluated the effects of garlic mustard on ground-dwelling ant assemblages in invaded and non-invaded areas of two mesophytic forests of northeastern Ohio. Ants were collected from May to August 2008 via Winkler litter extraction in five invaded and five non-invaded plots for each site. Compared to uninvaded plots, plots invaded by garlic mustard showed significant reduction in leaf litter depth, and an increased abundance of nonnative earthworms. Sample-based rarefaction and similarity analyses revealed that the absence or presence of garlic mustard, and the associated decrease in the leaf litter, had no detectable effect on the observed and expected ant species richness and community composition. Rank-abundance distributions were also largely unchanged by the presence of garlic mustard. Our results suggest that regional sylvan ant communities are unaffected by the generally presumed negative effects of garlic mustard invasions, or that these effects may be more subtle or confounded by other dominating factors.

118 URBAN ENERGY SUSTAINABILITY

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The purpose of this research is to develop a plan for the city of Cleveland in an effort to integrate sustainable energy practices into its current system. This paper will focus on wind power as the most suitable for the city due to its prime location along Lake Erie, which provides fairly consistent lake breezes. The first step will be to examine the current environment in Cleveland, including but not limited to, the existing energy infrastructures, investigations into sustainability, weather, and political tendencies. How the local municipal government is involved in current energy production and supply is important to determining the ease and extent to which this project can move forward. This information will then be used to compare the city of Cleveland with other comparable cities in Europe in an effort to examine the amount of sustainable energy that can conceivably be possible in the city. Among these comparable cities, Copenhagen, Denmark will be at the top due to its similar climate and current implementation of wind farms. Once this is assessed, I can move forward to determine the best type of wind apparatuses to use throughout the city, whether it consist of offshore wind farms or rooftop turbines. In order to do so, this research will highlight the engineering, technological requirements and pros and cons of both types. In addition, GIS technology will be used to develop a mapping system which will generate the best possible locations for wind turbines based on wind speed data (both on land and Lake Erie), building height, and overall weather patterns throughout the city.

119 PUBLIC AWARENESS OF APHASIA: A SURVEY WITH COMPARATIVE DATA

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Aphasia is a neurological disorder that affects portions of the brain that are responsible for language. Primary signs of the disorder include difficulty in verbal expression, comprehension of speech, problems reading and writing. Public knowledge of aphasia in major cities of the United States (Elman, Ogar and Elman, 2009) as well as in the United Kingdom (Simmons –Mackie, Code, Armstrong, Steigler, & Elman, (2002) has been documented as low compared to knowledge of other disorders such as Parkinson’s disease. This lack of awareness may have impacted on service provided to individuals with aphasia. According to the National Institute of Neurological Disorders (NINDS, 2009) it is estimated that over one million individuals suffer with aphasia. This impressive number of documented individuals with aphasia warrants improved public awareness of the existence and more importantly the various ramifications of this disorder. A brief survey was carried out with 260 members of the general public in the Cleveland area. This survey explored the knowledge of the diagnostic term “aphasia” and its symptoms compared to the knowledge of the diagnostic term “diabetes” and its symptoms. The survey also asked participants how they had gained their knowledge and collected basic demographic information. The survey revealed that knowledge about aphasia was significantly lower than that of diabetes. Whereas most respondents had either heard of diabetes from personal experience including family or friends stricken with the disorder, very few individuals had heard of aphasia or if they heard, they had no knowledge of the symptoms. The results of this survey suggest that much work is needed to educate the public about aphasia. Reasons and implications are discussed in the study.

120 DEVELOPMENT OF AN LC/MS METHOD FOR QUANTIFICATION OF THE ANTINEOPLASTIC AGENT HMBA IN BIOLOGICAL MATRICES

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Hexamethylene Bisacetamide (HMBA), a polar basic compound, has recently been shown to have antineoplastic activity by up-regulating the expression of the endogenous antiproliferative breast cancer protein HEXIM1 (HMBA-inducible protein 1). Current tumorigenesis studies in mouse models demand a more sensitive method for the detection and quantitation of HMBA than what is represented in the literature. Our lab is working to develop and validate according the FDA Guidelines an LC-ESI-MS/MS method for the quantitative determination of HMBA in human and mouse plasma and mouse mammary tissue using heptamethylene bisacetamide (7MBA) as the internal standard.

121 PLATELETS REGULATE LEUKOCYTE AND ENDOTHELIAL CELL RESPONSES IN ANTIBODY-MEDIATED REJECTION

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Platelets have been noted in organ transplants as a feature of antibody-mediated rejection. Platelets can regulate immune response by interacting with leukocytes and endothelial cells through adhesion molecules and by releasing certain chemokines. We have reported previously that alloantibodies to major histocompatibility antigens can cause endothelial cells to exocytose von Willebrand factor (vWf) and P-

selectin in vitro. These are two known ligands for platelet receptors. Furthermore, we found that passively transferred alloantibodies can cause vWf release, platelet aggregation and leukocyte recruitment to skin allografts.

The present study was designed to study the role of platelets in antibody-mediated renal graft rejection. B10A kidneys were transplanted to SCID mice. After the grafted kidney was established and functioning, alloantibodies were transferred and the recipient was sacrificed 1 or 4 hours later. By immunohistochemistry, we demonstrated complement (C4d) deposition, vWf release and P-selectin positive platelet aggregates in the vessels 1 hour after alloantibodies were transferred, but platelet aggregates quickly disappeared from the graft and only few were left at 4 hours.

In summary, our model shows that platelets aggregation appears only for a short period of time after graft specific alloantibodies are given. The expression of molecules through which platelets interact directly with endothelial cells and leukocytes, are detected. All together, these data suggest that platelet may play a role in antibody-mediated immune responses. Currently, we are testing the effects of repeated injections of antibodies that will more closely model the continuous antibody production to transplants.

122 ESTIMATING THE BIOMASS OF INVASIVE EARTHWORMS IN NORTHEASTERN OHIO

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Earthworms have not been native to most North America since the last ice age. 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 both plant and animal biodiversity and abundance. A recently arrived invasive species of earthworm to northeastern Ohio, *Amyntas hilgendorfi*, is a particularly aggressive colonizer; it would therefore be useful to measure its potential effects. Biomass measurement of a group of organisms within an ecosystem is generally a good first estimate of its potential ecological impacts. While ash-free dry mass (AFDM) is a reliable method for standardized biomass determination, it is both time-consuming and labor intensive. The development of an allometric equation that relates worm AFDM and to its length is useful to facilitate rapid estimation of biomass since length measurements are much easier and quicker to ascertain. I present the results of an allometric equation relating AFDM and overall length of a sample population (n=160) of *A. hilgendorfi* taken from northeastern Ohio forests reliably predicts the biomass of individuals within the sample and is useful for estimating biomass of subsequent *A. hilgendorfi* samples.

123 A GENERALIZED UNIAXIAL ANISOTROPIC DISPERSION LAW FOR VIRTUALLY IMAGED PHASED ARRAYS

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Electronically tunable optical filters like the acousto-optic tunable filters, liquid crystal tunable filters, and etalon-style filters rely on optical phenomena such as polarization state and interference to suppress wavelengths beyond the selected passband. In demanding applications like Brillouin scattering, narrow passband filters can be developed using these approaches, but at the cost of reduced performance. Most notably, as the full width at half maximum (FWHM) of the passband is reduced, so is the usable free spectral range of the device. Thus the development of electronically tunable filters for visible Brillouin scattering ($FWHM \ll 1\text{nm}$) is extremely challenging. The conventional approach is to employ a series of stagger-tuned etalon filters. In the work presented here, we explore the use of uniaxial anisotropic crystalline materials to suppress off-axis rays and side-band contributions to the passband of conventional filter technologies. In particular we have investigated the use of uniaxial anisotropic material as an

additional dielectric element in several filter designs. We present our preliminary results as well as a theoretical treatment of the calculated free spectral range and achievable pass-bandwidths.

124 COMPARATIVE THERMAL ANALYSIS OF READILY AVAILABLE REFERENCE POLYMERS

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Samples of polymers from a commercial set of readily available reference polymers were characterized using TGA and DSC techniques. Thermal stability, along with glass transition states has been identified. The comparison of the reference polymers is based on a wide range of temperatures, using two reference polymer kits, published in 1979 and 2003. For some of the polymers the thermal properties have remained the same over time, but others have not. This suggests that some polymers are more stable than others and that the reference polymer kit published in 1979 should no longer be used as a reference.

125 EX-OFFENDERS AND JOB SEARCHING STRATEGIES

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The purpose of this research is to find a way to better increase the chances of ex-offenders finding employment after they are released from prison. With recidivism being closely linked to unemployment, it is imperative that ex-offenders enhance their job seeking strategies in order to combat the already challenging job market. Ex-offenders face a large amount of legal barriers as well as employer discrimination when looking for a job, so they must be even more proactive and resourceful in their approach than non-offenders. Currently, there is a large amount of literature on the barriers that ex-offenders face when seeking employment, but there is not a large amount of data on *how* this population prefers to search for a job. Through survey research, this project will examine the sources that ex-offenders most frequently use in their search for a job in comparison to non-offenders. Specifically, the questions will look at whether ex-offenders prefer sources that allow them to “sell themselves” to employers (or “self promotional sources”) over “non-self promotional” sources, as well as if ex-offenders use these self promotional sources more often than non-offenders. This research may be important in teaching ex-offenders new ways to search for jobs and encouraging them to abort their traditional ideas of job searching in order to develop the most effective strategies used by all job seekers, regardless of criminal record.

126 CRYSTALLIZING ASPARTATE TRANSCARBAMOYLASE FROM *M. JANNASCHII* WITH LIGANDS

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Aspartate transcarbamoylase (ATCase) is the enzyme that catalyzes the second step in the pyrimidine biosynthetic pathway, the reaction between carbamoyl phosphate and L-aspartate to form N-carbamoyl-L-aspartate and inorganic phosphate and is a highly regulated enzyme. ATCase is expressed in many different organisms. We crystallized the catalytic subunit of ATCase from the methanogen *Methanococcus jannaschii* in complex with the natural substrate carbamoyl phosphate (CP) and the anti-cancer drug N-phosphonacetyl-L-aspartate (PALA). 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.

127 RECOMBINATION AND CHROMOSOME DYNAMICS DURING YEAST MEIOSIS

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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. The widely conserved Pch2 protein plays an important role in controlling the positioning of crossover designation marker Zip3 and meiotic axis protein Hop1, thereby contributing significantly to the coordinate control of axis modification at global genome level and crossover formation at the molecular level. We propose that Pch2 facilitates crossover associated axis remodeling by reorganizing chromosome axes into a tiling array of long-range crossover control modules, thereby coordinately ensuring appropriate levels and spacing of crossovers. Current studies, directed at putative and novel members of Pch2, under wild type and mutant conditions will help us define targets of Pch2, thereby better dissecting its contribution to early steps of meiotic recombination.

128 PHYTOREMEDIATION AS A BROWNFIELD REMEDIATION TOOL IN CUYAHOGA COUNTY, OHIO

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This article examines the current literature on phytoremediation to determine its advantages and limitations as a “green” brownfield remediation technology for use in Cuyahoga County, Ohio. The majority of the brownfield sites in Cuyahoga County are former industrial sites. Research showed phytoremediation effective in removing common industrial contaminants such as arsenic, heavy metals and polycyclic aromatic hydrocarbons from contaminated soil. Also, phytoremediation was shown to increase the degradation rate of volatile and chlorinated volatile organic compounds in contaminated soils. In addition, phytoremediation was shown to be less expensive than other *in-situ* remediation techniques used in Cuyahoga County. However, research showed that phytoremediation had a slower rate of remediation than other methods used in Cuyahoga County. Additional research indicated a potential to contaminate wildlife that consumed plants used during phytoremediation. These findings indicate that phytoremediation has potential as a brownfield remediation technique in Cuyahoga County because of its ability to remediate industrial brownfields at a low cost, but more research needs to be done to determine the environmental risk this method may pose to area ecosystems before implemented on a large scale.

129 PUBLIC TRANSIT: ANSWER TO SOME CLIMATE CHANGE PROBLEMS

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Climate change has been an issue of concern for people and policy makers alike across the world. In United States, where transportation accounts for 28% of its greenhouse gas emissions, public transit can be viewed as one of the options to reduce the country’s greenhouse gas emissions and mitigate climate

change. Public transit is a low emissions alternative to cars. It facilitates compact land use and helps in minimizing the carbon footprint of transit operations and the need for building new roads. Apart from mitigating climate change, public transit helps the country to move towards energy efficiency. Although recent years have shown an increase in ridership, the overall contribution of transportation to greenhouse gas emissions is still a third of the total. Initiatives have to be taken at all levels- individual, household, local, state and federal. The state and federal agencies have to develop policies to incentivize public transit. An efficient public transit helps in achieving two goals in one go: mitigate climate change and move towards energy efficiency.

130 INVASIVE PLANTS IN THE CLEVELAND METROPARKS AND WHAT IS BEING DONE ABOUT IT

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Invasive plants began arriving in Ohio at the time of European exploration and settlement in mid 1700s and have been coming in ever since. Many were brought to Ohio intentionally for gardening and aesthetic reasons and some have been brought in unintentionally through transportation. Invasive plants by definition are non-native and because of this they often do not have any natural predators or diseases to limit their growth. Left alone these plants have the ability to spread and take over an area creating monocultures and hindering biodiversity. This study will focus on invasive plants within the Rocky River Reservation, a park within the Cleveland Metroparks and will examine what is being done in this park to alleviate the problem. The invasive plants that are plaguing the Rocky River Reservation are Eurasian buckthorns, multiflora rose, barberry, Norway maple, lesser celandine, garlic mustard, Norway maple, and Japanese knotweed. In order to rid the park of invasive plants several measures are currently being taken. Volunteer teams have been trained to identify and document invasive plant locations and amounts. Staff has been hired and trained to spray herbicide on infested plant areas. Wooded species are being removed with chain saws. From an education standpoint, visitors of the park as well as neighbors who live near the Rocky River Reservation are being taught to understand the negative impact that invasive plants have on the region and also how to identify the most troublesome species.

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

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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.

132 THERMAL ANALYSIS OF ALDOHEXOSE MONOSACCHARIDES

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Three aldohexose monosaccharides, D-glucose, D-mannose, and D-galactose were examined by scanning temperature dielectric analysis (DEA) from ambient temperatures through their melts. Phase transitions, including glass transition (T_g) and melting temperature (T_m), were evaluated by differential scanning calorimetry (DSC). The monosaccharides were found to exhibit thermally-induced dielectric loss spectra or in their amorphous-liquid phase prior to melting. Activation energies for electrical charging of each of the monosaccharides were calculated from an Arrhenius plot of peak frequency versus reciprocal temperature. The DEA profiles were also correlated with the DSC phase diagrams, showing the changes in electrical behavior associated with solid-solid and solid-liquid transitions. Additionally, D-galactose and D-mannose were analyzed using thermal gravimetric analysis (TGA). The results showed the thermal vaporization temperatures of the functional groups.

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

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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 Lakes via vibracoring have been split lengthwise, imaged, and described. Preliminary results of downcore magnetic susceptibility measurements indicate that post-depositional reworking may be minimal. Future analysis will involve developing a reliable sediment chronology, performing a grain size and lithological analysis, conducting elemental and isotopic analysis, and modeling the basin's hydrological balance. The main goals of the research are to reconstruct a depositional history and identify past changes, to develop a record of past changes in the basin's hydrological balance, and to evaluate the role of North American Monsoon during the Medieval Warm Epoch and the Little Ice Age.

134 OPTIMIZATION OF BIODIESEL: TRANSESTERIFICATION AND WINTERIZATION

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Biodiesel is an interesting topic as it can be an alternative fuel to replace petroleum. With the fear of overconsumption of Earth's petroleum and the effect of global warming, there is a push to make cleaner sources of fuel. The conversion of various vegetable oils such as canola, soybean, and coconut to biodiesel can be made by applying a transesterification reaction of triglycerides (the major component of vegetable oil) and convert it fatty acids methyl esters (FAMES) or essentially biodiesel. While biodiesel is beneficial

to the environment, it has poor cold temperature characteristics such as cloud point and pour point. Thus, improvements are needed to make biodiesel a viable fuel in colder climates.

To improve the cold temperature characteristics of biodiesel, we are attempting to add hydrocarbon branches to the FAMES by epoxidation of double bonds and ring opening ester derivation. A base transesterification reaction was performed using canola oil and sodium methoxide in methanol, and biodiesel was made while minimizing saponification. An epoxidation reaction was performed by taking pure biodiesel and reacting it with formic acid and hydrogen peroxide to yield epoxy fatty acids. GC/MS spectra of samples from pure biodiesel and the epoxy product showed and indicated different FAMES compositions of soybean and potential formation of epoxy fatty acids, respectively. Future work includes preparing winterized blends of biodiesel and characterizing the blends using the methods approved by the American Society of Testing and Materials (ASTM).

135 ANALYSIS OF MINERAL SPECIES BY RAMAN SPECTROSCOPY

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Mineral identification is important in a number of areas of science and engineering such as geology, materials engineering, optics, space exploration, planetary science, and forensic science. Conventional methods of mineral identification and characterization include x-ray diffraction, energy dispersive x-ray analysis, and polarization microscopy, among others. In recent years, 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. During the past six 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. This work lays the foundation of our greater mission to better understand the provenance of natural minerals and the underlying mechanisms related to their formation.

Of the approximately 4500 mineral species, we have acquired several thousand Raman spectra that include more than 100 gemstone species and varieties. One of the chief aims of our work is to develop a robust computational algorithm to match Raman spectra from unknown samples to spectra in the mineral database. While Raman spectroscopy provides a spectral fingerprint that enables rapid chemical identification, native fluorescence from the sample, variable peak heights, and non-uniform backgrounds are challenges for developing a fully automated matching algorithm. In the work presented here, we describe our progress in the formation of the Raman database of mineral spectra as well as describe our ongoing efforts to develop a robust spectral matching algorithm.

136 RNASE L PLAYS AN IMPORTANT ROLE IN INNATE IMMUNITY

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RNase L is an interferon (IFN) inducible enzyme that plays an important role in IFN functions against viruses and cellular proliferation. Tissue distribution revealed that RNase L is highly expressed in the thymus and spleen as well as in most of all immune cells such as macrophages. To determine the effect of RNase L on innate immunity, we analyzed the migration and phagocytosis of macrophages derived from bone marrow cells isolated from wild type and RNase L null mice. Interestingly, bone marrow derived macrophages (BMMs) lack of RNase L markedly reduced their ability to migrate through the membrane of the transwells in the presence of certain cytokines and growth factors. In the phagocytosis experiment, BMMs were activated by lipopolysaccharide (LPS), and then incubated with FITC-labeled E.coli. Analysis of labeled cells by microscopy found that RNase L is important for the cells to remain their ability to engulf pathogens. Furthermore, investigation of the molecular mechanism underlying the observations has shown that RNase L mediates the expression of proinflammatory genes such as

cyclooxygenase-2 and TNF- α . Our data suggest that RNase L may be critically involved in innate immunity.

137 MEASUREMENT OF PHARMACOKINETIC ENDPOINT OF METHOXYAMINE BY LC-MS/MS

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Methoxyamine (MX) is an investigational new anti-cancer drug which is currently in Phase I clinical trial. MX potentiates the drug effect of methylating agent temozolomide (TMZ) by blocking DNA base excision repair (BER) pathway and leads to tumor cell death. MX forms a stable complex with apurinic/apyrimidinic (AP) sites that are produced by DNA glycosylases via the cleavage of TMZ-damaged DNA bases (*i.e.*, N7mG and N3mA) during the initial step of BER. The MX-AP complexes halt further BER repair because AP endonuclease can't recognize the MX-blocked AP sites, and result in cell apoptosis. To assess the drug effect of MX, it is necessary to quantify MX-AP complex in DNA samples from *in vivo* experiments treated with TMZ and MX, and compare them with the controls. In this talk, the development of a quantitative analytical method for MX-AP complex will be discussed. Our preliminary work showed that using a multiple enzyme system, we could quantitatively release MX-AP complex from DNA strand as small molecules (*i.e.*, MX-deoxyribose, or MX-dR). The released MX-dR could be extracted, and analyzed with an HPLC-MS/MS method. A linear calibration curve was established by spiking blank calf thymus DNA with DNA oligomers carrying known amount of MX-AP complex. The future work will be on the method optimization and validation. The method developed will provide a quantitative measure for pharmacokinetic endpoint and dosimetric study of methoxyamine.

138 CHARACTERIZATION OF CHROMATIN STRUCTURE IN TBRAP1-DEPLETED *T. BRUCEI* CELLS

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Trypanosoma brucei is a protozoan parasite that causes African trypanosomiasis. In its mammalian host, bloodstream form *T. brucei* periodically switches its surface antigen, Variant Surface Glycoprotein (VSG), to evade host immune attack. To maximize VSG switching efficiency, *T. brucei* expresses VSG genes in a strictly monoallelic fashion from ~20 nearly identical VSG expression sites (ESs) located at subtelomeric regions. VSG is the last gene in any ES, immediately adjacent to the telomere. At any time, only one ES promoter is fully active, resulting in a single type of VSG being expressed. Monoallelic expression of VSG appears to be regulated at multiple levels. Recent data from other labs showed that silent ESs and the active ES have very different nucleosome array patterns, with only a few nucleosomes deposited in the active ES. In addition, a couple of chromatin remodeling proteins have been found to affect ES transcription level. Therefore, chromatin structure and its remodeling are important for monoallelic VSG expression. In addition, we have recently shown that tbRAP1, an intrinsic component of the *T. brucei* telomere complex, is essential for silencing VSG expression sites, demonstrating that the telomere structure is critical in VSG regulation. TbRap1 may help to maintain the silent ES chromatin through regulation of chromatin structure, because in tbRAP1 depleted cells, derepressed ESs have fewer nucleosomes than in WT cells when examined using a FAIRE analysis. We are currently analyzing the nucleosome array patterns in the active, silent, and derepressed ESs (in tbRAP1-depleted cells) to determine whether loss of tbRAP1 indeed leads to loosened chromatin structure.

139 INVESTIGATION OF BIOAVAILABLE PHOSPHORUS: A CASE STUDY OF PHOSPHORUS INPUT TO LAKE ERIE FROM CUYAHOGA RIVER, OH

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There is a growing public concern focused on the eutrophication of Lake Erie even though the total phosphorus loading from point sources and diffusive sources is under control. The bioavailable phosphorus (BAP) loading is likely the key factor causing the eutrophication of Lake Erie from the study of Cuyahoga River. Algal bloom is triggered when total amount of BAP reaches a threshold due to the new input of phosphorus or/and the reprocess of phosphorus stored within Lake Erie. It is of consensus among scientists that excessive input of phosphorus, the nutrient-limiting element, is the cause of the Lake Erie's eutrophication. Soluble reactive phosphorus (SRP) is believed to be nearly 100% bioavailable, but studies found that dissolved organic phosphorus (DOP) and particulate phosphorus (PP) are partially bioavailable, estimated about 35-40% and 20-30% respectively. The three forms of phosphorus in water are readily transformable between them when stream physicochemical conditions and chemistry change, and/or biological intervention takes place. Water samples were collected and analyzed from 12 stations along the main stream of Cuyahoga River and the biggest tributary, Tinker Creek in different seasons. The DOP and PP concentrations of Cuyahoga stream water vary considerably from station to station and season to season. At the lowest station to Lake Erie the mean of DOP/TP and PP/TP are 24.0% and 68.1% respectively in the dry seasons, and 7.2% and 86.7% respectively in the wet seasons. The contributions of DOP and comparable to SRP (29.6% in the dry seasons and 6.1% in the wet seasons). Further study is needed.

140 POLARIZATION OF MICRO-MOLECULES AND MACRO-MOLECULES WITH AC ELECTRIC FIELD TO ENHANCE DRUG DELIVERY IN AN ANIMAL MODEL WITH RESPECTIVE TO TEMPERATURE

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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. In the case of diffusion, treatment time is passively determined by the typically slow diffusion process rather than the therapeutic need. 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®, epinephrine and Lidocaine were transported by AC electrokinetic's through animal models, including porcine skin and shedded snake skins at various temperatures. 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 porcine 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 conductivity vs. frequency curve at 10 and 100 Hz for Insulin at different temperatures 27°C, 37°C and 45°C. Proof of concept for the Insulin transport was confirmed by examining a residue on the electrode by FTIR. Lidocaine and Epinephrine, as formulated drugs, in an aqueous solution were also evaluated by the AC Field to determine their transport performance. A clear result of the experimental design for Insulin was that the low frequency (<10 Hz) was significant in enhanced drug delivery.

141 PARTICLE FILTERS FOR NONLINEAR SYSTEMS

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Process control techniques have revolutionized the manufacturing aspects of many companies. The ones that utilize these techniques produce better quality products for less cost with fewer impacts on the environment. The increase use of automated manufacturing systems and use of electronic measurement sensors have created a wide range of problems to process control engineers. Traditional statistical tools based on linear systems are less useful for real nonlinear systems. One of these techniques that found widespread use over the years is the Kalman filter. The Kalman filter is a state estimation and filtering tool that has a variety of applications. They span from tracking aircrafts, to simulating musical instruments, to extracting lip motion from video, to navigation systems, and to economics. Basically, this filter is set of mathematical equations or an algorithm that implement the predictor-corrector type estimator. It minimizes the estimated error when some presumed conditions are met. It was found that this filter is the ideal estimator for linear stochastic unconstrained systems, however, most of models dealt with in chemical industry exhibit nonlinear dynamics that are constrained to meet product specifications. In order to overcome this problem, there will be a need to develop new methods that are practical with fewer barriers to the system model. Newer methods such as particle filters are more suitable for nonlinear systems but placing constraints is not straightforward. In this project, improvements of particle filters are investigated as alternatives to the Kalman filter.

142 THE REGULATORY FUNCTION OF AMINO ACID REGION 659-663 OF FACTOR VA ON PROTHROMBINASE DURING THROMBIN FORMATION

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The proteolytic conversion of prothrombin to thrombin is catalyzed by the prothrombinase complex composed of the enzyme, factor Xa (fXa), the cofactor, factor Va (fVa), assembled on a membrane surface in the presence of divalent metal ions. The incorporation of factor Va (fVa) into the prothrombinase complex results in a 300,000-fold increase in the catalytic efficiency of factor Xa (fXa) for thrombin generation. It has been demonstrated that the COOH-terminal region of factor Va contains amino acids that are crucial for its cofactor activity. Site-directed mutagenesis was performed to generate factor V molecules that contain either region Asp⁶⁵⁹-Asp⁶⁶³ (fV⁶⁶³) or the double deletion mutant containing region Lys⁶⁸⁰-Arg⁷⁰⁹ and region Asp⁶⁵⁹-Asp⁶⁶³ (fV⁶⁶³⁺⁷⁰⁹) deleted from the COOH-terminal region of the heavy chain, along with a mutant molecule containing point mutations in region Asp⁶⁵⁹-Asp⁶⁶³ where the five amino acids in this sequence are mutated to all lysines (fV^{5K}). These recombinant molecules along with wild type factor V (fV^{WT}) were transiently expressed in COS7L cells and assessed for their capability to promote prothrombin activation. SDS-PAGE analyses of prothrombin activation time courses revealed that the overall cleavage of prothrombin by prothrombinase assembled with the recombinant mutant molecules was slower. Two-stage clotting assays (PT times) revealed that fV⁶⁶³⁺⁷⁰⁹, fV^{5K}, and fV⁶⁶³ all had reduced clotting activities compared to fV^{WT} and plasma-derived fVa. Kinetic analyses demonstrated that K_d values for all the mutants showed similar values to wild-type and plasma-derived factor Va. However, k_{cat} values for the various molecules varied. The k_{cat} values for fV^{5K}, and fV⁶⁶³ had a 10-fold reduction when compared to wild-type factor Va, while fV⁶⁶³⁺⁷⁰⁹ showed a value that was 75% of the wild-type. Our data suggest that the COOH-terminus of the factor Va heavy chain plays a preeminent role in proper prothrombinase complex assembly and activity, resulting in competent thrombin formation.

143 AMINO ACID REGION 1000-1008 OF COAGULATION FACTOR V IS CRITICAL FOR THE EMERGENCE OF PROCOAGULANT ACTIVITY

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The proteolytic conversion of prothrombin to thrombin is catalyzed by the prothrombinase complex composed of the enzyme, factor Xa (fXa), the cofactor, factor Va (fVa), assembled on a membrane surface in the presence of divalent metal ions. Factor V is synthesized as a procofactor with nominal procoagulant activity. Following three catalytic cleavages by thrombin (Arg⁷⁰⁹, Arg¹⁰¹⁸ and Arg¹⁵⁴⁵) amino acids 710-1545 of the B-domain of factor V are removed and the protein becomes activated. Without the proper removal of the B-domain the factor V protein will not show cofactor activity. Appropriate binding of factor Va to factor Xa during prothrombinase function is crucial to the proper activation of the substrate, prothrombin. Both heavy and light chains of factor V have already been determined to have fXa interactive sites. A selective analysis of a region of consecutive ionic amino acids of the B-domain suggests a possible sheathing of either the heavy or light chain fXa binding site which upon removal is expected to increase cofactor activity in the unactivated procofactor molecule. Site-directed mutagenesis was performed to generate factor V molecules with deletion of amino acids 1000-1008 of the B-domain. The recombinant molecule along with wild type factor V (FV^{WT}) were transiently expressed in COS7 cells and assessed for their capability to bind factor Xa within prothrombinase. Active and unactive factor V binding was evaluated and were determined for the deletion. Two- stage clotting assays (PT times) revealed that prothrombinase assembled with unactivated FV^{Δ1000-1008} had clotting times that were similar to the activated wild-type, while the activated times for FV^{Δ1000-1008} were slightly elongated. Analyses demonstrated that K_d values for FV^{Δ1000-1008} and FVa^{Δ1000-1008} showed similar values to FVa^{WT}. The data presented provides an insight into one of the possible fXa interactive sites covered by amino acids 1000-1008 of the FV B-domain.

144 CK2 INHIBITION INDUCES CELL DEATH IN HUMAN CERVICAL CANCER CELLS

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Cervical cancer is the second most common malignancy among women worldwide. 500, 000 women develop the disease yearly and about 9 per 100,000 women die per year, mostly in developing countries. The most prominent etiologic factor in cervical malignancy is human papilloma virus (HPV) infection, specifically high risk HPV strains 16 and 18, have been found in 90% of human cervical carcinomas. HPV oncoprotein E7 interacts with protein kinase CK2 that has been identified to be overexpressed in almost all cancer types, and to play a deadly role by desensitizing cancer cells to multiple physiological checkpoints. Blocking CK2 has emerged as the most promising anti-cancer treatment. Therefore; therapeutic kinase inhibitors have been developed for the treatment of various cancers. 2-dimethylamino-4,5,6,7-tetrabromo-1H-benzimidazole (DMAT) is a CK2 inhibitor, that has shown its anti-tumor ability in multiple cancer cell lines. In this study we are investigating the effect of DMAT on HPV positive and HPV negative cervical cancer cell lines. DMAT inhibited the growth of HPV 18 positive HeLa cell line at lower concentration compared to HPV 16 positive Caski, and HPV negative C33A cell lines. In addition DMAT mechanism of action could involve apoptosis induction in some cell lines (Caski and C33A) and cell cycle arrest coupled with apoptosis in other cell line (HeLa). We also determined that inhibition induced by DMAT increases the expression of Rho GDP dissociation inhibitor protein in HeLa cell line. Our results suggest that DMAT is suitable for the prevention of HPV induced cervical carcinoma as well as non-HPV cancers.

145 ROLE OF TSP-CD36-HRGP PATHWAY IN TUMOR VASCULARIZATION AND GROWTH

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Cancer is typically thought of as an infrequent disease, in which solid tumors require a blood supply in order to grow and metastasize. Interestingly, upon autopsy a large portion of elderly individuals display numerous nonvascularized lesions throughout their bodies. Thus, the angiogenic switch in the development of cancer presents an interesting therapeutic target. Previous work by our laboratory has established an interaction between CD36, Histidine Rich Glycoprotein (HRGP) and Thrombospondin 1 (TSP-1) in the modulation of angiogenesis. Briefly, endothelial cell receptor CD36 interaction with soluble or cell bound TSP-1 leads to the induction of an apoptotic signaling cascade in vascular endothelial cells resulting in decreased proliferation, migration and tube formation, thereby inhibiting angiogenesis. Presence of soluble HRGP leads to inhibition of the antiangiogenic potential of the CD36-TSP-1 pathway through a decoy receptor function whereby TSP-1 is bound and sequestered. Previous studies have focused on this pathway with regards to wound healing. However, pathologically relevant modulation of angiogenesis is also observed in tumors. **We hypothesize that the TSP-CD36-HRGP pathway regulates vascularization in the tumor microenvironment and therefore growth.** Syngeneic Lewis Lung Carcinoma (LL2) and B16 Melanoma tumor volumes were assessed over 17 days following subcutaneous injection of 0.5×10^6 cells into wild type (WT) and HRGP or CD36 knock out (KO) C57Bl/6 mice. LL2, average tumor volume was greater in CD36 KO mice compared to WT. Additionally, LL2 tumors from HRGP KO mice showed smaller average volume compared to WT. Vascularization mirrored tumor volumes. B16 tumors showed no differences in volume or vessel infiltration. Protein and mRNA analysis suggest differences in cell lines are due to differential expression of TSP-1 or TSR containing proteins. These data suggest that the TSP-CD36-HRGP Pathway modulates angiogenesis with tumor line specific effects on growth.

146 SOLID STATE MECHANICAL PROPERTIES OF CRYSTALLINE DRUGS AND EXCIPIENTS SUBSTANTIATE NEWLY DISCOVERED DIELECTRIC VISCO-ELASTIC CHARACTERISTICS

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Thermal Mechanical Analysis (TMA) of crystalline drugs and excipients in their pre-melt temperature range corroborate their newly founded linear dielectric conductivity properties with temperature. TMA of crystalline Active Pharmacy Ingredient (API) or excipient softens 30-100oC below the calorimetric melting phase transition. Acetophenetidin melts as measured calorimetrically (DSC) at 135oC, but softens under a low mechanical stress at 85oC. Excipients, Anhydrous Lactose and Mannitol, also undergo dimensional softening up to 100oC below their melt temperature. At the melting temperature the crystals cannot support the applied load, collapse and the TMA probe moves vertically at a rapid rate. Over the same temperature range detected by Dielectric analysis (DEA) with an intense rise in electrical conductivity, the mechanical properties yield to a soft structure and a dimensionally slow disintegrate to a sharp mechanical change at the melt temperature. In order to establish a structure property relationship the United States Pharmacopeias (USP) melting standard drugs were evaluated by TMA, DSC and Macro-photography. The USP standard melt temperature for Vanillin (80oC), Acetanilide (114oC), Acetophenetidin (135oC), Sulfapyridine (191oC) and Caffeine (235oC) are easily determined calorimetrically. Commercial APIs evaluated by DEA/TMA are Carbamazepine (189oC) and polymorphic Nifedipine (170oC). The DEA method uses alternating current (a.c.), frequencies from 0.10 to 10 Hz which allowed evaluation of surface variations at the sensor. The TMA variables include heating rate, applied stress and sample thickness. The combined TMA, DSC, DEA and the Macro-photography techniques allow for a wide variety of newly discovered physical properties of Drugs and Excipients.

147 USE OF VIDEO GAMING TO IMPROVE UPPER EXTREMITY FUNCTION IN CHRONIC STROKE

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Current research supports that multiple repetitions of practice are essential to improvement in function post stroke. However, recent work has shown that individuals post stroke are not getting the necessary repetitive practice. This pilot study assessed the effectiveness of using video gaming in a group of six individuals with chronic stroke who regularly attend a community-based stroke exercise class at Lakewood Hospital. Practice time was measured, and scores on the Wolf Motor Function Test, Fugl-Meyer Stroke Assessment, and Intrinsic Motivation Index were measured. Participants practiced from 9.9 to 18.7 hours playing Wii and PlayStation II with the EyeToy video games modified for their level of arm function post stroke. There was a statistically significant improvement on the Wolf Motor Function Test ($p=0.043$ using the Wilcoxon Signed Ranks Test) from 52 seconds to 42 seconds and the Intrinsic Motivation Index (Friedman test $p=0.028$) from 6.6 to 5.2 after the intervention. Fugl-Meyer test results improved from 35 to 39 points, although this was not statistically significant ($p=0.102$ using the Wilcoxon Signed Ranks Test). In conclusion, while there were statistically significant changes in the Wolf Motor Function Test, overall there were minimal changes in the lowest and highest functioning individuals in the group, as compared to those with moderate function of their hemiplegic arm post stroke. Large quantities of practice time and changes in the Intrinsic Motivation Index suggest that video gaming may be an effective means of massing practice post stroke.

148 SYNTHETIC PEPTIDES FROM NOVEL RHOPTRY PROTEINS INDUCE IMMUNITY AGAINST PLASMODIUM YOELII INFECTION

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Malaria affects 500 million people worldwide and results in 1-2 million deaths in children annually. Mouse malaria models are used to identify parasite proteins with vaccine potential. Synthetic peptides of 10 amino acids in length, derived from novel rhoptry proteins were prepared as multiple antigenic peptides (MAPs), evaluated for immunogenicity and used in immunization-challenge experiments to determine the protective effects of the peptides on *Plasmodium yoelii* blood stage infection. The MAPs from proteins encoded by genes PY07482 and PY00763, designated 05-173 and 05-175, respectively, were mixed with Titermax gold adjuvant and used to immunize Swiss mice in two rounds of immunization, and challenged with a lethal strain of *P. yoelii*. Challenged mice were monitored for parasite development and percent parasitemia calculated. Antisera was collected from immunized mice and *P. yoelii* challenged mice and analyzed for immunoglobulin isotype and subsotype using western blotting and direct enzyme-linked immunosorbent assay (ELISA). TH1/TH2 cytokine levels were also analyzed using cytokine capture ELISA. Mice in all groups produced IgG and IgM but no IgE. Antisera from both immunized and parasite challenged mice had elevated levels of IgG subisotypes; IgG1, IgG2a, IgG2b and IgG2c. IgG3 levels were similar among all groups including control mice. TH1 (IL-2 and IFN γ) and TH2 (IL-4 and IL-10) cytokines were detected in antiserum from immunized mice challenged with *P. yoelii*. IL-10 levels were elevated in mice immunized with 05-173 peptide and challenged with *P. yoelii* compared to mice immunized with 05-175 peptide and challenged with *P. yoelii*. Interestingly, mice that received sham injections followed by *P. yoelii* challenge also had elevated levels of IL-10. These results suggest that TH2 mediated humoral immune responses might contribute to the reduction of parasite levels in *P. yoelii* infected mice.

149 IMMUNOSENSOR DESIGN FOR DIAGNOSIS OF MALARIA USING THE RHOP-3 RHOPTRY PROTEIN OF PLASMODIUM SP.

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Plasmodium falciparum causes the most lethal form of malaria resulting in approximately 500 million clinical cases annually and 1-2 million deaths in children under the age of 5 years. Currently, diagnosis of malaria depends on microscopy and is augmented by serological tests and rapid diagnostic tests. Etiological confirmation of the correct *Plasmodium* species remains challenging and molecular diagnostic tests such as the polymerase chain reaction (PCR), is not available in many malaria endemic areas. Reliable, specific and sensitive point-of care (POC) diagnostic methods that are of low cost are needed to facilitate rapid single step diagnosis of malaria. Diagnostic tests with prognostic value will increase treatment efficiency and reduce the development of drug resistant parasites in malaria endemic areas. The structure of the Rhop-3 rhoptry protein of *Plasmodium* sp. was investigated using the thermal analytical techniques of dielectric analysis (DEA), differential scanning calorimetry (DSC) and X-Ray diffraction (XRD) analysis for potential immunosensor development for malaria diagnosis. Antisera from patients in malaria endemic areas were shown to be highly reactive with recombinant Rhop-3 in an enzyme-linked immunosorbent assay. The Rhop-3 protein is also secreted by the parasite and present in plasma during infection. The electrical conductivity (ps/cm) of Rhop-3 in aqueous solutions revealed bulk conductivity properties and was more reliable than surface sensor conductivity values by DEA. Calorimetry revealed unbound water crystallizing and melting at appropriate temperatures. An additional endotherm and corresponding exotherm at 14 J/g is probably related to the interaction of the protein and a “type” water. The latter may reflect specific amino acid water interactions which can be used to monitor the Rhop-3 protein in the process of immunosensor design.

150 DETERMINATION OF TETRACYCLINES IN MEAT

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The tetracyclines are a class of antibiotics employed widely by U.S. stockyards as a preventative means of controlling illness in cattle. The practice of preventative medicating is believed to be one of the chief ways in which the evolution of antibiotic resistance is encouraged in bacteria. The aim of this project was to determine if tetracycline antibiotics are present in deceased cattle intended for human consumption, which could cause exposure of human beings to the drug. The liver of a cow was treated with a variety of chemicals designed to separate tetracyclines from animal tissue. The extract was purified and concentrated, then examined using high performance liquid chromatography (HPLC). When compared to the readings of prepared spiked samples of tetracycline, the HPLC readings of the beef liver extract strongly suggest the presence of tetracycline compounds in animals intended for use as food by human beings.

151 THE LEACHING OF BISPHENOL A INTO CANNED FOODS

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Bisphenol A is an organic compound associated with health problems and diseases, including breast and prostate cancer and infertility as well as being an endocrine disruptor. BPA is an intermediate in the production of polycarbonate (PC) plastics and epoxy resins. These epoxy resins are used to coat the inside of metal food containers. BPA can leach from this epoxy resin and into food, especially at increased temperatures of heat processed canned foods. This study will measure the amount of BPA that leaches into water from a selection of canned foods at elevated temperatures and to compare these amounts to currently acceptable levels.