



Poster

Abstracts

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Application of Polyacrylamide to Enhance Silt Fence Performance

Jeyarathan Arjunan, Sandeep Yeri, Dr. Ellen W. Stevens, Dr. Bill J. Barfield, and Dr. Khaled A.M. Gasem

Department of Chemical Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Conventional barrier methods of erosion control, in particular silt fence, have demonstrated poor performance at trapping clays and fine silts due to inadequate detention time for settling. Trapping efficiency can be improved by flocculation of clays into larger particles with higher settling velocities. Studies have shown that clay flocculation can be induced by anionic polyacrylamides (PAM) in conjunction with divalent cations. Although anionic PAM is available commercially with different charge densities and molecular weights, the flocculation characteristics of a given anionic PAM are not the same for all soils.

The purpose of this study is to investigate the flocculation characteristics of three anionic PAMs on four different soil types. Jar test experiments were conducted to treat the sediment with PAM and divalent cations. Flocculation efficiency, suspended solid concentration (SSC), particle size distribution, and floc size of the treated samples were determined with the experimental protocol developed. Specifically, a factorial design was implemented to determine the best (a) PAM type and concentration, and (b) calcium ion concentration that will produce larger flocs with high settling velocity, for each type of soil considered in this study. Sediment concentration ranging from 25,000 to 200,000 ppm was considered.

Field testing will be conducted to identify the most effective means of incorporating the PAM with the silt fence installation.

Characterization of Genotypes and Phenotypes of Antibiotic Resistance in Enterobacteriaceae Isolates from Retail Meat Products

David Belanger, Heather Belanger, Shin Hee Kim, and Chang-i Wei

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

The extensive use of antibiotics in medical and agricultural practices has resulted in widespread horizontal transfer of mobile genetic elements carrying resistance genes between bacterial species. Emergence of multidrug-resistant bacteria is of particular concern because of their potential for widespread dissemination and acquisition of additional resistance genetic elements. In this study, the genotypes and phenotypes of antibiotic-resistant Enterobacteriaceae isolated from retail meat products were characterized. Tested species included *Salmonella* spp., *Escherichia coli*, *Klebsiella pneumoniae*, and *Proteus mirabilis*. Antibiotic-resistant bacteria were examined by Kirby-Bauer disc diffusion test. The types of antibiotic resistance genes were determined by polymerase chain reaction assay and DNA sequencing. In general, these bacteria showed resistance to ampicillin, tetracycline, and gentamycin, and kanamycin. These multidrug-resistant bacteria possess class 1 integrons. The gene cassettes located in the class 1 integrons were *aadA1* (1.0 kb) as well as *aadB* and *aadA2* (1.6 kb), which confer resistance to streptomycin. Since all the tested bacteria showed resistance to ampicillin, we inferred the presence of β -lactamase genes in the isolates. *Salmonella*, *E. coli*, and *P. mirabilis* contained *bla*_{TEM}, whereas *K. pneumoniae* isolate contained *bla*_{SHV}. Plasmids containing class 1 integrons were able to be transferred from *Salmonella* isolate into *E. coli* by conjugation,

indicating that conjugal transfer could contribute to the dissemination of antibiotic-resistance genes between the Enterobacteriaceae species.

Sensor based monitoring of surface quality in grinding process

Yatin Bhamare, and Kannan Sripathy

Department of Industrial Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Grinding process is extensively used for realizing submicron surface finish on parts and work pieces. Significant research has been undertaken to study the salient mechanisms in grinding operations as well as to measure and predict surface roughness and integrity, and other quality attributes like dimensional accuracy, tool condition, and chatter detection using sensors. Forces, power, vibration, and acoustic emission sensors are being used to monitor the grinding process.

A void still exists in the models developed for practical monitoring. Analytical models that are developed to date cannot be applied for online prediction, due to their reliance on parameters which are not readily obtainable. We believe that this gap can be overcome by deriving models that relate the relevant process mechanisms with the measured sensor data. Towards this end we have created a two degree of freedom model along the lines developed by R.A. Thompson (1986). We used a nonlinear forcing function that captures the effect of vibrations on undeformed chip characteristics and workpiece deformation in surface grinding process. This model was implemented using Matlab's Simulink. The simulation outputs were compared with vibration signals from experiments.

The experiments were conducted on a Proth PSGS 3060BH surface grinding machine. The machine was instrumented with three accelerometers located respectively at the wheel spindle, and along the horizontal(X) and Vertical (Z) directions on the work table. The vibrations were captured using a LABVIEW interface and were analyzed off-line. Surface roughness was measured using by Phase II SRG-1000 profilometer at three settings of in-feed. Features extracted from vibrations data were used to predict surface roughness under various levels of degradation of the wheel and different in-feed values.

The results show that the simulation model correctly captures the frequency characteristics. It seems capable of predicting all dominant frequencies in the vibration data. More pertinently our analysis show that the features extracted from sensor data based on the model can improve the predictability of surface roughness values by 22%. Such predictability can help in reducing operating costs in a grinding operation by minimizing wastage and rework.

Acknowledgement: Guidance provided by Dr. Satish Bukkapatnam and Dr. R Komanduri for this work is deeply appreciated.

Predictors of Persistence in an Honors College

Kay Celeste Campbell
Department of Educational Psychology
Oklahoma State University
Presentation Subject Area: Education

Records of 304 students at Oklahoma State University were studied to evaluate potential predictors of their persistence in the Honors College. Using multiple regression, a linear model was constructed that predicted a significant amount of variance in the number of honors hours completed during the first two years of college. The cumulative college grade point average emerged as the strongest predictor for the entire group, with ACT score (a negative relationship with the criterion) and academic college within the university as other significant predictors. When analyzed separately by gender, however, differences were seen. The ACT score remained a significant predictor only for females (still maintaining a negative relationship with Honors College persistence).

The Role of Culture to Employee Service Quality

Gina Fe Causin
Department of Hotel and Restaurant Administration
Oklahoma State University
Presentation Subject Area: Social Sciences

International tourism and international tourists call for a well defined combination of global, national and local cultures, of globally and locally valid service qualities (Weiermair, 2000). In order to create and market internationally appealing tourism products, to achieve competitive advantages and to sustain competitiveness against global or transnational tourism firms, a number of tourism and hospitality management know-how gaps have to be specified and corrective management measures must be undertaken.

The study will review and discuss the topic of customer satisfaction and its application to the hospitality and tourism industries. It will define the concept and analyze its importance to services in general and the hospitality/tourism services in particular. In addition, the study determines whether job satisfaction, service quality and culture could influence customer satisfaction in the hospitality or tourism industry (Weiermair, 2000).

Calculation of Coupling Strength Between Whispering-Gallery Modes in a Dual Microsphere System

Elijah Dale, Michael J. Humphrey, A. T. Rosenberger, and D. K. Bandy
Department of Physics
Oklahoma State University
Presentation Subject Area: Physical Sciences & Technology

Coupled-mode theory is used to numerically calculate the coupling coefficients between transverse electric modes of various polar and radial order within a dual fused-silica microsphere system. The results of these calculations suggest that the overall coupling coefficients are largely independent of the relative radii of the coupled microspheres. Furthermore, within these calculations it is found that coupling is strongly dependent on spatial field overlap between modes of different polar order while strongly dependent on phase matching

between modes of different radial order. The results of these calculations are in good agreement with experimental results.

A Model for Radiative Transfer in the Atmosphere of Mars in the 200-900nm Range

Shubhada Deo, R. Kalchgruber, and B.Mayer

Department of Physics

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

One question of Mars-exploration is the climatic history of this intriguing planet. In this context, efforts are made to create a miniature dating device for in situ luminescence dating of Martian sediments. In luminescence dating the time elapsed since deposition of a sediment layer is determined from the radiation-dose accumulated in minerals since the last bleaching event, and the dose rate due to naturally occurring radiation. During sunlight exposure sediments are mainly bleached by the part of the solar spectrum ranging from 200-900nm. Solar resetting under terrestrial conditions has been extensively investigated. For the spectral irradiance at the surface of Mars, however, no measured data exist. Therefore a software package called libRadtran was used for radiative transfer calculations from 200-900 nm. Factors like the vertical atmospheric profile, absorption due to CO₂, O₂, O₃, H₂O and dust particles (Rayleigh scattering) in the Martian atmosphere were considered.

Role of the Phytotoxin Coronatine in Pathogenesis of *Pseudomonas Syringae* pv. Tomato DC3000 in Edible Brassicas

Sarita Elizabeth, and Carol L. Bender

Department of Entomology and Plant Pathology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Coronatine (COR) is a non-host specific, chlorosis-inducing toxin produced by several pathovars of *P. syringae* and is considered a virulence factor on certain hosts. *P. syringae* pv. tomato strain DC3000 has been recently sequenced and hence is a model organism for investigating plant-microbe interactions. The pathogen causes significant loss on edible Brassica spp. Hence, it is important to investigate the role of coronatine in the pathogenesis of Pst DC3000 on commercially important Brassica spp. such as collard and turnip. These hosts were inoculated with defined mutants of DC3000 that were defective in CFA, CMA and/or COR production and were monitored for symptoms, colonization, chlorophyll and anthocyanin content. Our results suggest that COR is required for symptom development in both hosts and for multiplication of DC3000 in turnip. RNA blot analysis conducted with PR1 indicated that coronatine may function to suppress salicylic acid-mediated defenses in turnip. Furthermore, analysis of LOX (lipoxygenase) expression in RNA blots suggested that Pst DC3000 could promote the expression of JA response genes in both collard and turnip. COR11, which encodes the chlorophyllase gene, was expressed in collard as well as turnip leaves inoculated with the wild type DC3000 strain. Our results suggest that COR has different effects in these two host plants.

First-Principles Optical Cross-Sections for Single-Walled Carbon Nanotubes

Shelly Elizondo, Shagoto Nandi, and J.W. Mintmire

Department of Physics

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Using a first-principles local-density functional (LDF) method, theoretical calculations for the optical absorption properties of single-walled carbon nanotubes (SWNTs) are carried out, taking into account the effect of polarization. The optical cross-sections for a large array of nanotubes, ranging from $(n,m) = (5,4)$ to $(15,7)$ are calculated using an Ehrenreich-Cohen formalism. We use 512 evenly spaced points in the one-dimensional Brillouin zone $(-\pi < \kappa \leq \pi)$ and a $C(7s, 3p)$ Gaussian basis set. Polarizations both parallel and transverse to the helical axis are investigated. Previous theoretical work revealed that the optical response for polarizations parallel to the nanotube axis differ from the optical response for polarizations transverse to the nanotube axis. [1] Our current motivation is influenced by experimental work in which polarized spectroscopy of aligned SWNTs is investigated [2] as well as interests in the mapping of specific nanotube structures to spectral data [3,4]. Future work involves implementing time-dependent density functional theory (TDDFT) to account for dynamic polarizabilities.

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1. J.W. Mintmire, C.T. White, *Synthetic Metals* 77, 231 (1996).
2. J. Hwang, H.H. Gommans, A. Ugawa, H. Tashiro, R. Haggemueller, K.I. Winey, J.E. Fischer, D.B. Tanner, and A.G. Rinzler, *Phys. Rev. B* 62, 13310 (2000).
3. S.M. Bachilo, M.S. Strano, C.Kittrell, R.H. Hauge, R.E. Smalley, R.B. Weisman, *Science* 298, 2361 (2002).
4. S.M. Bachilo, L. Balzano, J.E. Herrera, F. Pompeo, D.E. Resasco, and R.B. Weisman, *J. Am. Chem. Soc.* 125, 11186 (2003).

Identification and Functional Characterization of a Novel Bovine Host Defense Peptide

Grace Hale, Yanjing Xiao, and Guolong Zhang

Department of Animal Science

Oklahoma State University

Presentation Subject Area: Biomedical Sciences

One common characteristic of the innate immunity of many organisms is the production of antimicrobial peptides, a group of small amino-acid based molecules that are among the first line of defense against pathogenic microbes. Among many such host defense peptides are the cathelicidins, so named because of their conserved N-terminal cathelin-like prosequences, which are in turn followed by highly variable mature sequences at the C-terminus. These diversified cathelicidins have been shown to exhibit potent antimicrobial activity against a broad spectrum of pathogens with potential for becoming a new class of novel antimicrobials. Based on the highly conserved cathelin prosequence, a novel cathelicidin, which was termed Bovine Cathelicidin-8 (BCATH8), was identified by computational homology search through the genomic sequence database in the GenBank. The gene for BCATH8 consists of four exons separated by three introns, and the encoded unique mature peptide sequence at the C-terminus is 36 amino acids long. This peptide was chemically synthesized and shown to kill a wide range of bacteria, including the gram-positive *Listeria monocytogenes* and *Staphylococcus aureus*, as well as the gram-negative *Escherichia coli* O157:H7 and *Salmonella typhimurium* at micromolar concentrations, while at the same time maintaining low levels of

cytolytic activity. Further testing and modification of this peptide may lead to the development of novel anti-infectives with little chance of bacterial resistance.

Contribution of Glycolysis and Glyceroneogenesis to the Synthesis of Triglycerides in Adipocytes

Masakazu Hamada, Umezu S., Arrese E.L., and Soulages J.L.

Department of Biochemistry and Molecular Biology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Adipose tissue stores most of the fat (triglyceride) of the human body. The metabolism of triglyceride (TG) is very active and a continuous breakdown and re-synthesis of TG takes place in adipose tissue. The balance between synthesis and degradation of TG determines whether at a given point the tissue loses TG (as fatty acids released into circulation) or accumulates TG. A minor imbalance between the rates of degradation and synthesis of TG appears to be a major factor in the development of diabetes type II. Because an excessive release of fatty acids to circulation is characteristic of diabetes type II the study of the regulation of the re-synthesis of TG is essential to the understanding of the development of diabetes. Glycerol 3-phosphate (G3P) is a required metabolite for the synthesis of TG in adipose tissue. G3P can only be produced through the metabolism of glucose and or through gluconeogenesis. In order to understand the regulation of the synthesis of TG we have carried out studies to assess the contribution of gluconeogenesis and glycolysis to the synthesis of the glycerol backbone of TG in 3T3-L1 adipocytes. These studies were carried out under the effect of insulin (low rate of TG degradation) or isoproterenol (high rate of TG degradation) using the two possible (radiolabeled) precursors of glycerol, glucose and lactate. Our studies indicated that, contrarily to the current belief, glycolysis is the major route for the synthesis of the glycerol backbone of TG. This result suggests that alterations in the glycolytic pathway of adipose tissue could be responsible for the development of diabetes type-II.

Effects of Marital and Maternal Status on Perceived Work Productivity of Women

Pamela Harjo and Kathleen M. Donovan, Ph.D.,

Department of Psychology

University of Central Oklahoma, McNair Scholars Program

Presentation Subject Area: Social Sciences

Research suggests that there are stereotypes and negative attitudes toward pregnant women in the workforce. This study examined how college students (65 females and 16 males) from a Midwestern university perceive women in the workforce based on their marital (single versus pregnant) status. Both their current and future job performance scores actually increase during pregnancy, which is similar to other research findings (Gueutal et. a., 1995). However, in contrast, performance scores for future job performance suggests that single women (pregnant or not) have the highest job performance ratings, which is opposite current job performance. This implies that being pregnant increase job performance, but after pregnancy job performance decreases. Future job ratings are highest for those who are single and not pregnant. These results have implications for all employees of women who become pregnant while working.

Screening for Virulence Mutants of Pseudomonas Syringae pv. Tomato DC3000 Using a High-Throughput Technique

Sarah Harley, Tamding Wangdi, and Carol L. Bender
Department of Entomology and Plant Pathology
Oklahoma State University
Presentation Subject Area: Biological Sciences

P. syringae pv. tomato DC3000 (Pst DC3000) is a gram negative plant pathogen that causes bacterial speck of tomato. Pst DC3000 has become a model strain for investigating plant-microbe interactions, largely because of its genetic tractability, pathogenicity on Arabidopsis, and the availability of its genomic sequence. The current study addresses the application of a seedling assay for the screening of Pst DC3000 virulence mutants from a library of a random Tn5 insertion mutants. The effectiveness of the seedling assay was tested by comparing its results with those obtained by foliar inoculation of tomato plants. Furthermore, tomato seedlings infected with Pst DC3000 carrying transcriptional fusion of selected genes to the GUS reporter gene yielded expression results that are consistent with those obtained from foliar inoculation of 3-4 week old tomato plants. The use of a seedling assay for virulence and gene expression has several advantages over whole plant assays including a shorter growth and incubation period, ease of inoculation and handling, more replications and larger samples per assay.

The Consistency of the ZF System

Ali Hassan
Department of Computer Science
Oklahoma State University
Presentation Subject Area: Physical Sciences & Technology

This work is intended to focus on the consistency of the set theory, which is the foundation of the Modern Mathematics. The foundation of the set theory is the ZF system, or sometimes referred to as ZFC system. The ZF system will be challenged against consistency. An evidence will be presented to show the system inconsistent. More over, the work will suggest the ZF system to be self contradictory. A solution for one of the most important unsolved problems in that system, named the Continuum Problem, will be proposed. A suggestion for future work will be stated clearly.

Effect of Spatial Architecture on Cellular Colonization

Yan Huang, Mbonda Siewe, and Sundararajan V. Madihally
Department of Chemical Engineering
Oklahoma State University
Presentation Subject Area: Biomedical Sciences

Effect of spatial architecture on cellular colonization Yan Huang, Mbonda Siewe, Sundararajan V. Madihally, PhD* School of Chemical Engineering, Oklahoma State University, Stillwater, OK 74078 Key words: scaffold architecture, colonization, HUVEC, MEF, chitosan, PLGA, cytoskeletal organization. ABSTRACT Matrix elements orchestrate the morphogenesis of cells and during the process, cells also remodel the matrix components. A number of studies have shown that matrix chemical or mechanical properties such as stiffness, hydrophilicity, adhesion sites, edges, grooves, and roughness/ nanotopographies, pore sizes, and void fractions influence cellular processes. Despite these advances, it is not clear how the

architecture influences cell colonization when presented in two different forms i.e., in 2D and 3D and in the presence of other elements. In this study, 2D and 3D chitosan scaffolds were formed without affecting inherent chemical characteristics and were used to understand the influence of architecture on cell behavior. In addition, chitosan was emulsified with 19kD, 76kD and 160kD 50:50 poly lactide-co-glycolide (PLGA) using phosphatidylcholine as stabilizer. Alterations in the cellular colonization and cytoskeletal organization of human umbilical vein endothelial cells (HUVECs) and mouse embryonic fibroblasts (MEFs) were studied. These results showed that the formed 3D chitosan scaffolds had interconnected open pores. HUVECs and MEFs had reduced spreading areas and circular morphology on 2D chitosan membranes compared with 3D chitosan scaffolds. 2D and 3D emulsified chitosan and chitosan/ PLGA scaffolds reduced the spreading of HUVECs and MEFs even further. Proliferation analysis via MTT assay, correlated with the spreading characteristics. Despite these reduction in cell spreading area, cells were viable and functional. However, they were not proliferative. The observed alterations in cellular colonization could be due to the substrate stiffness and also surface topology. In summary, these results suggest a significant influence of spatial architecture on cellular colonization.

A Revised Version of the Critical Thinking Disposition Inventory

Lenka Humenikova
Department of Nutritional Science
Oklahoma State University
Presentation Subject Area: Education

The California Thinking Disposition Inventory (CCTDI) is designed to measure students' dispositions for critical thinking. The administration of the current instrument requires extensive time during lectures and causes a burden on students. The main objective of the study was to develop a revised version of the CCTDI. Data for this study came from 728 undergraduate students in a mid-western university. Student scores from two surveys, the CCTDI and the California Critical Thinking Skills Test (CCTST), were analyzed with simultaneous multiple regressions using SPSS 12.0 for Windows and $p < 0.05$. The initial criterion-scaled regression analysis revealed that only three scales (open-mindedness, analyticity and maturity) of the CCTDI were significant predictors of CCTST scores. The final revised regression model indicated that 12.2% of the variability in the CCTST scores was predicted by open-mindedness, analyticity and maturity alone. Based on these findings, a reduced version of

The Role of Learning in the Headfirst Ingestion of Prey in Neonate Rattlesnakes

Larry Hyde, Aaron Place, and Charles Abramson
Department of Zoology
Oklahoma State University
Presentation Subject Area: Biological Sciences

Snakes generally exhibit headfirst ingestion of prey. It is unknown what cues these animals use to determine which end of the prey to ingest. Regardless of which cue(s) are used, it is unknown if the use of these cues are innate or learned during the first feeding experiences. We devised an experiment to determine the role of learning in feeding behavior in snakes. Surgically prepared pinky mice with two tail ends, two head ends,

and a sham-operated control were presented to neonate Western Diamondback Rattlesnakes (n=5). Each snake consumed ten mice in their respective treatment groups over several months. Following these training trials, test trials were conducted with intact pinky mice to determine at which end consumption was initiated. Several performance measures were evaluated between groups. The importance of learning in the ontogeny of neonate snakes is discussed.

Boron, Fish Oil and Estrogen Effects on Rat Mandibles

Catherine Jones

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

Boron, Fish Oil and Estrogen Effects on Rat Mandibles Boron, dietary fatty acids and estrogen have all been linked to bone health in various ways. Although functions of boron have not been definitively identified, there has been significant evidence that varying boron intake changes skeletal composition. Bone has been shown to be sensitive to changes in dietary omega-3 fatty acids and estrogen deficiency has been linked to osteoporosis. This experiment was conducted to determine the effects of boron deficient diets or boron adequate diets, omega-3 fatty acids or omega-6 fatty acids, and ovariectomy procedures on the amount of bone in mandibles of adult female rats. The 2 x 2 x 2 factorial experimental design used had boron-deficient (0 ppm) or boron-supplemented (3 ppm) diets with safflower or fish oil as a fatty acid source. After being fed for six weeks, the female rats were bred and continued on their respective diets. After weaning, pups continued on the diet of their dam for 14 weeks and then were ovariectomized. Five weeks later animals were necropsied and mandibles from three rats from each of the 8 treatment groups were isolated. The mandibles were placed in 16 mm clear scanning tubes with the molars aligned with the central line on the tube and the long front incisor pointing down. Microcomputed tomography (Scanco 40, Switzerland) was utilized to analyze the bones. By analysis of variance, bone volume was significantly increased in ovariectomized rats ($p=0.0230$). Boron deficient diets produced a greater bone surface than boron adequate diets ($p=0.0393$). Likewise, rats fed omega-6 FA had a greater bone surface than rats fed omega-3 FA ($p=0.0280$). The increased bone surface may represent increased porosity. Supported by the Seretean Nutritional Sciences Undergraduate Research Scholarship.

Sequence Comparisons of Plasmids pBJS of Spiroplasma Citri and pSKU146 of S. Kunkelii: Implications for Plasmid and Pathogen Evolution

Bharat Joshi, Janet Rogers, Jacqueline Fletcher and Ulrich Melcher

Department of Biochemistry and Molecular Biology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Background: Spiroplasma citri BR3-3X and S. kunkelii CR2-3X, two related mollicutes, cause serious diseases on citrus and corn species worldwide, respectively. S. citri BR3-3X harbors a plasmid, pBJS-X, that encodes the spiroplasma adhesion related protein 1 (SARP1), a protein implicated in binding of the pathogen to cells of its leafhopper vector, Circulifer tenellus. The IncP-like S. kunkelii CR2-3X plasmid, pSKU146,

encodes the homolog of SARP1, SkARP1. Due to the close phylogenetic relationship of the two pathogens, we hypothesized that the two plasmids are closely related as well. Methods: The nucleotide sequence of pBJS was determined and compared to the sequences of a plasmid from BR3-T, which is a multiply passaged leafhopper-transmissible derivative of BR3-3X, and to other known plasmids, including pSKU146. Results: In addition to arp1, the 13 kb pBJS sequence putatively contains seven genes, recognized as open reading frames (ORFs). Of the eight ORFs, arp1, traE and mob have homologs in pSKU146. However, although both pSKU146 and pBJS contain soj-like genes, the sequences of those genes are more distant from one another than are the sequences of the other genes. Further, unlike pSKU146, pBJS lacks the conserved oriT region characteristic of the IncP group of bacterial plasmids. We were unable to identify a region in pBJS resembling a known plasmid origin of transfer. In regions where sequence was available for pBJS from both BR3-3X and BR3-T, the pBJS-T sequence had a frequency of nucleotide substitution of 1% and had a 0.4 kbp deletion relative to its progenitor, pBJS-X. For the same regions, the frequency of nucleotide substitutions between S.citri BR3-3X and S. kunkelii CR2-3X was 12%. Conclusion: Our data suggest that pBJS is a novel S. citri plasmid that does not belong to any known plasmid incompatibility group. The differences between pBJS and pSKU146 suggest that one or more events of horizontal gene transfer have contributed to the divergence of the plasmids of these two sister Spiroplasma species.

Material Testing by Nano-Tension Experiments on Aluminum & Copper Samples

Nikhil Joshi

Department of Mechanical and Aerospace Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Multiscale modeling and simulation for materials processing Abstract: Material testing by nano-tension experiments on aluminum & copper samples Nikhil C. Joshi Mechanical and Aerospace Engineering Oklahoma State University, Stillwater, OK-74078 (405) 744-3158 Nikhil.joshi@okstate.edu Plastic deformation in metal alloys becomes highly non-uniform at relatively small plastic strains. One of the examples is the appearance of coarse slip bands under uniaxial stressing of an aluminum crystal. This phenomenon is further investigated by micro-tension experiments carried out on Aluminum samples. Following are the Important steps in investigating shear localization bands, which appear during tensile tests of Aluminum samples: ‘ Experimental setup for nano-tensile testing of aluminum & copper samples. Phase 1 involved setup, operation, characterization and testing of apparatus for tests. ‘ Phase 2 included setup of data acquisition system and it’s software configuration for abstracting the required data during the tests. The output data was filtered using a Matlab program for removing unwanted noise signals. ‘ Phase 3 involved Analysis of output data using Digital Image Correlation software. Images of the samples were taken during the tests using high speed Nikon camera, and analyzed using Digital Image Correlation software for accurate strain measurements in case of large-deformations, to explore material properties at nano-scale. The results of the experiments are discussed in this presentation in detail.

Dried Plum Polyphenols Dose-dependently Increase Nodule Formation in MC3T3-E1 Osteoblast-like Cells

Lily L. Kamkar, Cha-chin, E. Lucas, B.H. Arjmandi

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Environmental Sciences

In the United States alone, a conservative estimate is that nearly half of all women over the age of 50 will suffer a fracture related to osteoporosis, resulting in more than 1.5 million fractures a year including painful and often crippling hip fractures. Of those with hip fractures, 20% die within a year, and half of the survivors never walk independently. Therefore, osteoporosis is an enormous public health problem with immense socioeconomic significance. Although there are drug therapies available for osteoporosis treatment, not all the patients are willing to initiate drug therapies due to a number of undesirable side effects and risks associated with prolonged use of drugs. We have previously demonstrated that dried plum can prevent and more importantly reverse bone loss in female rat model of postmenopausal osteoporosis. The bone protective effects of dried plum in part may be due to its polyphenol contents. The intent of the present cell culture study was to investigate the bone protective mechanisms of action of polyphenols extracted from dried plum. MC3T3-E1 cells were treated with various doses of polyphenols (0.5, 1, 10, 100, 1000 μ g/ml). After 14 days of carrying cell culture, mineralization was characterized by Alizarin red staining and by counting the nodules. Our findings indicate that dried plum polyphenols dose-dependently increase mineralization without having any toxic effects as shown by MTT assay. Further analyses are being performed to assess the effects of polyphenols on osteoblastic activity.

Micromachining of Borosilicate Glass Using an Excimer Laser KrF 248 NM

Ganesh Kanbargi, and Choo, K.L

Department of Mechanical and Aerospace Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Micromachining of Borosilicate glass is conducted using a short pulse (FWHM=25ns) KrF Excimer Laser (248nm wavelength) that generates laser energy in the range of 100-550mJ. Laser ablation tests were conducted both in air and under water. The machined surfaces were examined using conventional optical and scanning electron microscopes, as well as a laser interference microscope. Simple microstructures as well as complex geometries such as micro fluidic channels, inductors, medical part geometry, and RF circuits were machined. The impact of changing the major operating parameters, such as pulse fluence, pulse number and different media on the resulting micro structural shapes is also studied. Once the laser fluence exceeds a certain threshold value ($2.19\text{J}/\text{cm}^2$ in air and $2.44\text{J}/\text{cm}^2$ under water), the photochemical ablation begins. The ablation depth was also found to depend on the number of pulses, increasing with increasing number of pulses.

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The Older Population: Designing environments to prolong independent living

Chia-Ling Khoo, Theodore Drab, Huantian Cao, and Esther Winterfeldt
Department of Design, Housing and Merchandising
Oklahoma State University
Presentation Subject Area: Social Sciences

In 2000, there were an estimated 35 million people age 65 or older in the United States, nearly 13 % of the total population (Federal Interagency Forum on Aging-Related Statistics Website, 2000). However, by 2011, those born in the United States between 1946 and 1964 (also known as “baby boomers”) will begin to turn 65. It is projected that by 2030, the population of those 65 or older will grow to 20 % of the United States population or 70 million people. This growing segment of the population is now calling for their own set of needs and demands on the housing market. Clark and Lawton et al (1988, 1970) stated the preference of the older population to delay the need for institution living if given the choice to live in the comfort and privacy of one’s home and to avoid the higher cost of the assisted living facility or nursing care environment. Therefore, the objective of this research project is to identify ways to delay the need of the older population, age 65 and older to move into an assisted living facility or nursing care environment through a home design that will prolongs independent living. Quoted from the AARP Executive Summary Report (2003), “independent living philosophy sees disability not as an individual characteristic or ‘problem’ but as a relationship between the individual and the entire environment in which one lives.” Hence, successful independent living can be achieved through the designed environment that addressed the issues and changes faced by the older population. The two main issues that will be addressed in this research project are the safety and cost issues faced by the older population.

The increased difficulty with the activity of daily living (ADL) such as bathing, dressing, eating, and toileting generally were more evident among those ages 65 and above (Newcomer, Kang, Kaye, and LaPlante, 2002). Accidents such as falls are one of the most common types of injuries for this population (Valente, 1998). Some of the causes that contribute to accidents such as falls include physical weakness, frailty, lack of balance, arthritis and osteoporosis, decreased vision and loss of sensation in the feet (Implications Newsletter, 2004). The aging process leads to a gradual decline in physical functioning and an increase in dependence on others assistance. Researchers recognize that the designed environment plays a major role in the ability of an older person to continue to perform daily tasks and thereby to continue to live independently (Andreasen, 1985; Lawton, 1989). Hence, accessible design will be implemented with the emphasis on the design of the bathroom and the kitchen. These areas are also known as the most hazardous areas in the house and where most accidents occur.

Although the trend in median household income of the older population has been positive according to the Older Americans 2004: Key Indicators of Well-Being report by the Federal Interagency Forum on Aging-Related Statistics, the cumulative cost of living in an institution or an assisted-living building are very costly. The average monthly costs for nursing care, depending on the care level is about \$5,400 or \$64,800 annually (PartnerShips for Aging Conference, 2004). And according to the MetLife Market Survey of Assisted Living Costs in 2003, the average monthly cost of an assisted living facility in the United States was \$2,379 or \$28,500 annually. Energy efficient design features will be emphasized in this project to address the cost issue faced by the older population many whom are bound to fixed monthly income. According to a report by the Building Industry Roundtable (2001), energy costs represent a large percentage of the older population’s total expenses. One of the reasons for higher heating cost is due to their heightened risk of hypothermia. According to the same report, the older population households overall spend 8.1 % of their income on residential energy compared to 5.3 % for average households. Therefore, the use of natural lighting, housing placement, solar energy, and energy efficient appliances will be examined in this research project.

This project is partially funded by the College of Human Environmental Sciences Salmon Professor Graduate Research Scholar Program 2004.

Biofilm Formation of Multidrug-Resistant Bacteria on the Surface of Stainless Steels and Slide Glasses

Swee Hwa Kong, Shin-Hee Kim and Cheng-i Wei
Department of Nutritional Science
Oklahoma State University
Presentation Subject Area: Biological Sciences

The extensive use of antibiotics has resulted in the emergence of antibiotic-resistant bacterial pathogens. Multidrug-resistant bacteria have been isolated from human, food animals, and retail meat and poultry products. To protect public health, it is important to control cross-contamination and proliferation of these multidrug-resistant bacteria during processing of food products. In this study, multidrug-resistant bacteria isolated from retail meat products were tested for their biofilm formation on the surface of stainless steels and slide glasses. Tested isolates were *Pseudomonas aeruginosa* (PAO1 and PA112), *Escherichia coli* (EC81) and *Proteus mirabilis* (PM95). Antibiotic-resistant profiles of the bacterial isolates were examined by Kirby-Bauer disc diffusion test. Biofilm formation on the surface of stainless steels and slide glasses by the isolates was monitored during the growth of isolates in turkey infusion broth. Numbers of attached and unattached cells were enumerated by the standard pour plate method. The isolates were all resistant to ampicillin, chloramphenicol, and tetracycline. The biofilm formation by *E. coli* on the surface of both stainless steel and slide glass were obvious followed by *P. mirabilis* PM95 and *P. aeruginosa* PAO1 and PA112. This study showed that efficient cleaning after processing would be critical to prevent biofilm formation and cross contamination of these multidrug-resistant bacteria in processing facilities.

Factors Affecting Student Learning Outcomes in Engineering Statistics Courses

Chin-Huey Lee
Department of School of Educational Studies
Oklahoma State University
Presentation Subject Area: Education

This study was conducted to investigate the significant factors influencing student-learning outcomes in engineering statistics courses. A regression model, containing factors thought to affect student learning, was developed to predict students' achievement. Transfer status, gender, work experience, ACT scores, high school GPA, and grade of Calculus I were the factors identified during literature review. These factors were hypothesized to affect student learning in statistics methods courses. Data on student learning was collected through two sets of standardized questions that were administered to two different engineering statistics courses at a large midwestern university. These standardized questions were a portion of the questions and problems during the midterm and final exams in the Spring 2004 semester. Independent t-tests and multiple regression analyses were applied to this study. A final regression model with the combination of transfer status and ACT scores is supported as a strong model to predict student academic achievement in engineering statistics courses.

The Formation of Bud-like Structures in Tri-Octyl Phosphine Oxide and 1,2-Dipalmitoyl-sn-Glycero-3-Phosphocholine Mixtures

Liangkun Li, Bret N. Flanders, and Eric A. Tong

Department of Physics

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

The alveoli expand and compress during a breathing cycle to deliver oxygen to the rest of the body. Due to the elastic properties of the alveoli membrane, collisions occur on the alveoli membrane during compression. However, human bodies produce some natural surfactants to lower the surface tension and prevent the collisions of the alveoli. Therefore, new born babies, who lack sufficient natural lung surfactant, suffer respiratory distress syndrome. To produce synthetic surfactants, it is necessary to understand its mechanism on the lung surface.

The purpose of this research is to understand this mechanism. The surface pressure-area isotherms of various tri-octyl phosphine oxide (TOPO) and 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) mixtures were measured on air-water interface using a Langmuir film balance (Nima). A plateau exists in most isotherms. High degree polynomial functions were computed to model the isotherms and analyzed to compute the plateau lengths. The lengths of the plateau depend on the mole percentage of TOPO. The bud-like structures can be observed through AFM during compression. The results suggest that during compression folding process exists in TOPO and forms bud structures to prevent the increase of surface pressure during folding region.

Feasibility of Operating Elderly-Theme Restaurant in Taiwan: An Exploratory Study

Shuchuan Liu and Jerrold Leong

Department of Hotel and Restaurant Administration

Oklahoma State University

Presentation Subject Area: Humanities

With advances in prolonged life and decreasing birth rate, the proportion of older people in Taiwan has more dramatically increased than the other world population, 8.5% and 9.3% respectively between 2000 and 2004; moreover, the proportion of older people, except Japan, is the highest in the Asian countries (Department of Social Affairs, 2004). Although older people taken care by their children based on family tie and obligations in the Taiwanese traditional culture (Seeman, Gleib, Goldman, Weinstein, Singer, and Lin, 2004), the report of the Department of Social Affairs (2004) indicated that around 80% of the age of 65-plus presents a steady financial support. Therefore, older people in Taiwan still have potential consumption powers to dine out. The purpose of this study is to investigate the feasibility of the elderly-theme restaurant for older generation in Taiwan and to understand what kinds of dining conditions and facilities to attract seniors to dine out. The closed-ended questionnaire was ready to be conducted survey in Taiwan. Questionnaires were given out after asking if respondents are 65 years and over. Only people who are 65 and over were selected to be the study's subjects. A total of 200 questionnaires were conducted during one-week period. 57 questionnaires were invalid and 143 valid questionnaires were gathered. The response rate was 71 percent. The statistical package for the Social Science, Windows Version 11.5 (SPSS 11.5) is used to process the responses of the returned questionnaires. Due to the Multiple Response items, the researcher uses the crosstabulation to run the variables. The result from this study indicated that most elderly are willing to spend 2-3 hours dining out with their family for dinner at the elderly-theme restaurant. Male ask for more nutrition than female. Aimed at functions of the elderly-theme restaurant, most elderly prefer to go to the clean restaurant and to eat

Taiwanese traditional food that is presented by a setting of meal. The price range is around US\$ 3-9 and pay by cash. When the elderly come to the elderly-theme restaurant, they expect to have a free drink (tea or water). Older people like to have a special low-price meal during promotional campaign. About the facilities of the elder-theme restaurant, the highest need of elderly is to build handhold and chock in the restroom. According to the results of this study, most elderly prefer to have an elderly-theme restaurant to dine out. If the restaurateurs really want to operate an elderly-theme restaurant, they may know the results of the study so as to reach senior's expectation and satisfaction.

Modeling Environmental Benefits in Post-CRP Landscapes Using GIS

Cosmas Lungu

Department of Environmental Science

Oklahoma State University

Presentation Subject Area: Environmental Sciences

Conservation Reserve Program (CRP) has been designed to improve the nation's resources by reducing soil erosion, improving water quality, reduction of sedimentation in fields and improving fish and wildlife habitats. CRP is a priority program such that the 2002 Farm Bill authorized \$2 billion to be allocated for the CRP. A large investment has been made in CRP so that the question of how to maintain the gained environmental benefits when CRP lands are returned to production is an urgent and important one.

The paper discusses two indicators of environmental benefits, water quality and wildlife habitats, to determine how CRP lands can be returned to farming operations and still maintain environmental benefits gained from CRP.

The paper outlines how to model post-CRP land use using GIS in Texas County, Oklahoma. Water quality can be safe guarded by buffering operations thus excluding sensitive areas from cropping in sensitive areas to protect surface and groundwater. GIS is also used to select suitable land use (cropping, haying, pasture, and wildlife habitats) to avoid sedimentation and water quality problems by overlaying of soil, stream buffers, and wetland buffers to model for different land uses. Success of modeled land use for water quality benefit is tested with AVSWAT, a watershed modeling tool. Using Excel Solver as an optimization spreadsheet, land use is optimized for environmental benefits while maximizing for profit for different land use options. The result is a post-CRP land optimized for environmental benefits while maintaining or optimizing farm production.

Flaxseed and its Oil Lowers Cholesterol in the Ovariectomized Golden Syrian Hamsters.

Sachin Mahajan, Lucas EA, Soung DY, Kamkar L, Kozlagunta K, Devareddy L, and Arjmandi BH.

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

Our earlier findings indicate that flaxseed reduced plasma cholesterol and plaque formation induced by ovarian hormone deficiency in Golden Syrian hamsters. This study was designed to investigate whether flaxseed oil (FO) exerts the same hypocholesteromic effect as whole flaxseed (WF) in the ovariectomized

(ovx) Golden Syrian hamster. Forty eight, 6-month-old female, Golden Syrian hamsters were either ovx or sham-operated (sham) and randomly assigned to four groups: sham, ovx, ovx plus either WF [15% diet] or FO [equivalent oil content of WF diet] and fed for 90 days. Ovx elevated plasma total cholesterol concentrations and WF was more effective than FO in reducing the increase in circulating cholesterol. To elucidate this hypocholesteromic action, we quantified some key regulators of cholesterol metabolism in the liver microsomes using western blot analysis. Preliminary analyses indicate that scavenger receptor BI (SRBI), a HDL receptor, was decreased by ovx and brought to sham level by both WF and FO, albeit not significant. Similar pattern was observed with HMG CoA reductase, the rate limiting enzyme in cholesterol synthesis. The effect of flaxseed and its oil on other regulators such as 7 α hydroxylase and LDL receptor are currently being investigated. [Supported by grants from USDA (2003-0817).]

Predictors of Youth Abortion Found in the Family of Origin

Kalyn McAlister

Department of Human Development and Family Science

Oklahoma State University

Presentation Subject Area: Social Sciences

The Center for Disease Control states that abortion ratios have been higher for adolescents aged younger than fifteen years than any other age group since 1973. Teenagers have sex and some of those teenagers get pregnant. Pregnant youths are the predominant population getting abortions in America. The purpose of this study was to detect characteristics in the family of origin that correlate with a youth's choice to abort. The variables studied were family interaction, parent discipline style, and the family structure.

Characterization of Probiotic Strains of *Lactobacillus reuteri* as Potential Probiotics for Dogs

Sandra McCoy, and Stanley E. Gilliland, Ph.D.

Department of Animal Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

Because of the need to control pathogenic microorganisms in the intestinal tract of dogs, there is interest in using probiotics such as species of *Lactobacillus* as dietary supplements. For successful use, the *Lactobacillus* species should be of canine intestinal origin since this species exhibits host specificity. Serial dilutions of freshly voided dog feces were plated on *Lactobacillus* Selection (LBS) agar to isolate the cultures. Isolates were identified based on Gram stain, Catalase test, fermentation patterns using API 50 CH Kits. All potential isolates were compared for bile resistance based on relative ability to grow in broth containing 0.3% Oxgall, and for the ability to inhibit *Salmonella typhimurium* in associative broth cultures. Of the lactobacilli isolated, *Lactobacillus reuteri* was the dominant species. We found variations among the isolates of *L. reuteri* with respect to bile tolerance. There also were variations in the ability to inhibit growth of *S. typhimurium*. The inhibition caused by *L. reuteri* may have been caused by the production of the antimicrobial substance, reuterin. Comparisons of the amount of reuterin produced were made and the isolate of *L. reuteri* that produced the most reuterin also caused the greatest inhibition of *S. typhimurium*. Further research is being done to determine stability of the chosen culture during processing and storage of pet food. Such stability is necessary for successful commercial adaptation of a culture for use as a probiotic.

Studies on the *Pseudomonas aeruginosa* type III secretion proteins PscD and PscJ

Ashley McDaniel, and Anand Sukhan
Department of Microbiology and Molecular Genetics
Oklahoma State University
Presentation Subject Area: Biomedical Sciences

Pseudomonas aeruginosa possesses a type III secretion system (TTSS) that is critical to its ability to cause disease. Studies of other bacteria have shown that one component of TTSSs is a protein complex named the needle complex. This complex is composed of two substructures, an externally located needle (polymerized of a single protein) and a membrane-localized base (composed of three different proteins). Although complexes have not been detected in *P. aeruginosa*, homologs of two of the three base protein genes have been identified (pscC and pscJ). The goals of this study were to provide experimental evidence that PscJ is a component of the *P. aeruginosa* TTSS needle complex and to test the hypothesis that PscD is the third component of the base substructure. *P. aeruginosa* pscD and pscJ deletion mutants were created by allelic exchange using a suicide vector. Wild type and mutant strains were grown under TTSS-inducing conditions and culture supernatant proteins were precipitated with trichloroacetic acid and analyzed by SDS-PAGE. The mutant supernatants lacked the secreted TTSS proteins. Western blot analysis of wild type and pscJ mutant strain whole cell lysates using an anti-PscJ peptide antibody detected a 32 KDa band that was absent in the mutant strain. Wild type bacteria grown under TTSS-inducing conditions showed increased levels of the 32 KDa band in comparison to cells grown under non-inducing conditions. Whole cell lysates of the pscD mutant were shown to lack the 32 KDa band but the band was restored when pscD was expressed in trans. Wild type and pscD mutant strains were subjected to the needle complex isolation procedure. The resulting protein preparations from the wild type and complemented mutant strains contained a 32 KDa band that the preparation from the non-complemented mutant lacked. Conclusions: 1) PscD and PscJ are required for type III secretion in *P. aeruginosa*, 2) PscJ migrates as a 32 KDa band, 3) PscJ exhibits properties characteristic of a component of the TTSS needle complex, 4) PscD is required for the stability of PscJ and is likely the third component of the *P. aeruginosa* needle complex base.

Identification of Differentially Expressed Genes Associated with Cold Tolerance in Bermudagrass

Kalpalatha Melmaiee, Michael P. Anderson, Sathya Elavarthi, Charles M. Taliaferro, Andrew H. Paterson, Jeffery A. Anderson, and Arron C. Guenzi
Department of Plant and Soil Sciences
Oklahoma State University
Presentation Subject Area: Biological Sciences

Bermudagrass (*Cynodon dactylon L.pers.*) is one of the most widely adapted warm-season grasses with its usage and geographic distribution limited by cold temperature. The goal of this research was to identify genes that are differentially expressed during cold acclimation in two bermudagrass genotypes that differ in tolerance to low temperature stress, including: the cold tolerant cultivar 'MSU' and cold sensitive experimental line 'Zebra'. Plants were cold acclimated at 8°C/2°C day/night temperatures. Crown tissues were sampled at 2 and 28 days after cold acclimation from both acclimated and non-acclimated plants. Total RNA was extracted from crown tissues and suppression subtraction hybridization (SSH) was performed to create eight normalized cDNA libraries enriched for expressed sequence tags (ESTs) representing up or down regulated genes. A total of 3,870 clones were isolated from the eight cDNA libraries and are currently being sequenced. ESTs will be assigned putative identities using the BLASTX algorithm. Differential gene expression will be evaluated by cDNA microarray analysis. Genes discovered in this study will have value

in developing molecular markers to assist in breeding for cold tolerance and/or provide candidate genes for transgenic manipulation to improve cold tolerance in this economically important grass species.

Piaget's Theories of the Development of the Perception of Time and of Space in Children

Lynnette Michaluk, Zephier, R. H. & Thomas, D. G.

Department of Psychology

Oklahoma State University

Presentation Subject Area: Social Sciences

The child's development of a 'universal perspective' of space occurs in three stages, each of which must be mastered before going on to the next; this is also true of her developing sense of Newtonian time, or something that exists in and of itself, regardless of events that fill it. Duration is not perceived directly, but is derived from motion and distance, so the child's development of the sense of duration must be preceded by an ability to understand sequence, first directly, then intuitively, and finally, abstractly, much as the ability to adopt a universal point of view begins with simple exploration of topological shapes. Her understanding of sequence begins as a result of direct observation of motion and of cause and effect relationships. Her ability to understand complex notions of time and space are the result of direct observations of events occurring in time and direct experiences with objects that exist in space. The conception of space and time begin in Stage I with the most basic components of each. The conception of space begins with the child's egocentric interactions with topological objects, or those that are recognizable to her not by their shapes but by the 'spaces' contained within each object that the child explores. It is not until the child masters topological shapes that she begins to recognize Euclidian shapes. Based on Piaget's observations of the child's ability to understand sequence, he concluded that the child's understanding of sequence begins with her egocentric experiences with motion. The conception of space and sequence during stage II rely on the child's perceptions, much as during stage I the child relied on her own actions. The stage II child still thinks in egocentric ways, relying on her own actions to reach conclusions. However, her thought processes are evolving, and she can use her perceptions as well as her experiences to perform these tasks. By stage III, children have achieved the ability to think in reversible and dynamic terms. They do not need to directly experience or perceive an event or object to apply concepts to them, because they generalize previously learned concepts to new situations. During stage III children come to appreciate a universal viewpoint; they realize there are infinite possible perspectives, as opposed to stage I children, who don't recognize a 'viewpoint', or stage II children, who recognize only their own viewpoints. They can think of space as a container that exists regardless of objects or events in it. During stage III children also come to understand 'duration'. The child can think of events as separate durations as part of a larger duration, and they understand time as something that exists regardless of the events that fill it.

Omega-3 Fatty Acids and Depression in Young Women

Rori Morrow, Barbara J. Stoecker, and Laura Hubbs-Tait

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Biomedical Sciences

According to the National Institute for Mental Health, approximately 18.8 million American adults, an estimated 9.5 percent of the U.S. population age 18 and older in a given year, have a depressive disorder. Omega-3 fatty acid deficiencies have been implicated as a possible contributor to depression. This study was designed to gain a greater understanding of the potential relations between omega-3 fatty acid intake (specifically docosahexaenoic acid, or DHA) and depression as measured by comparing initial (day one) and final (day 14) responses to the State Trait Anxiety Inventory-State Form (STAI) and the Center for Epidemiologic Studies Depression Scale (CES-D). We hypothesized that after controlling for usual iron intake, supplementation with fish oils containing DHA and eicosapentanoic acid (EPA) should lower depression and anxiety scores. At Oklahoma State University, 65 women between the ages of 18 and 25 volunteered to participate in this study. Half were randomly assigned to a placebo group and half to the treatment group. The treatment group was given three capsules daily, each containing one gram of enteric coated fish oil. Total daily supplement contained 900 mg of omega-3 fatty acids (DHA and EPA) and was given for 12 days. Participant scores from the time one and time two CES-D and STAI instruments were compiled and analyzed using the Statistical Package for Social Sciences (SPSS 11.0). Prior to conducting the one-way analyses of variance, depression (and anxiety) scores at time one were subtracted from depression (and anxiety) scores at time two yielding change scores for each participant. These depression and anxiety change scores were evaluated for significant differences between placebo and treatment groups with one-way analysis of variance (ANOVA). Although literature suggests a strong relationship between depression, anxiety, and omega-3 fatty acids there were no effects on either depression or anxiety change scores based solely on administering the supplemental fish oil at the dosage and time intervals used in our study. Supported by the Wentz Research Foundation at Oklahoma State University

Nanoindentation of Single Crystal Aluminum Using Molecular Dynamics

Rutuparna Narulkar

Department of Mechanical and Aerospace Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Hardness in a material is its resistance against deformation. Several experimental studies have been conducted on various materials. As it becomes very important to measure mechanical properties of materials at nano level, it also becomes very difficult and expensive to study the properties experimentally at this level and so simulation techniques are used to address these issues. Molecular Dynamics (MD) simulation is used to study hardness at low indentation depths which involve integration of Newtonian equations of motion. In this present study, MD simulation is used to conduct studies on nanoindentation of single crystal aluminum in experimental conditions. MD simulation results are compared with experimental results. Nanoindentation tool is moved for 1000 time steps and the system is relaxed for 4000 time steps. This is done in order to accommodate real time experimental conditions into the system. The empirical potential used in the system is two-body Morse potential. The parameters are adjusted to give experimental values of sublimation energy, Debye temperature, and lattice constant. The indentations were conducted on (100) surface. For MD simulations of nanoindentation, conical indenter with a 30° included angle was chosen. Various physical parameters were varied to study their effects.

The Effects of Flaxseed on Cholesterol and Glucose in Native American Postmenopausal Women.

Anagha Patade, L. Devareddy, K. Korlagunta, S.Chai , E.A. Lucas, and B.H. Arjmandi.
Department of Nutritional Science
Oklahoma State University
Presentation Subject Area: Biological Sciences

A large number of Native American postmenopausal women have one or more risk factors of cardiovascular disease (CVD) such as high blood cholesterol, diabetes, hypertension and obesity. This study was designed to investigate whether incorporation of 25-30 g of flaxseed per day, a rich source of lignans, α -linolenic acid and soluble fiber mucilage, for a period of 3 months into the diet of Native American postmenopausal women will positively affect their lipid and glucose profiles. Forty mild to moderately hypercholesterolemic and/or hyperglycemic Native American postmenopausal women were randomly assigned to the control (A), flaxseed (B) or flax+fiber (C) group. Both the flaxseed groups reduced total cholesterol and low density lipoprotein cholesterol (LDL-C) by approximately 7% and 9% respectively. However flaxseed had no effect on the glucose levels. The findings of this study indicate that daily intake of flaxseed is beneficial in improving the lipid profile of Native American postmenopausal women.

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Process Simulation & Analysis of Biomass to Ethanol

Aniket Patankar, Sirigudi Rahul Rao
Department of Chemical Engineering
Oklahoma State University
Presentation Subject Area: Alternative Fuels & Chemical Engineering

The process for the production of fuel-grade ethanol from agricultural biomass is being investigated in order to seek a renewable and non-polluting fuel as an additional source to fossil fuels. A pilot plant level study has been conducted to analyze the feasibility of ethanol production from biomass. This is essentially a gasifier, bioreactor and distillation column setup. Chemical process design software, ASPEN Plus, has been used to study the individual segments of the pilot plant.

Process models have been developed using ASPEN Plus. Simulation models based on experimental data can give accurate results for each individual process variable over the entire range of operation. The key process variables have been manipulated in the developed models to conduct sensitivity analysis. Specifically, the influence of temperature, air flow rates, moisture content, and syngas flow rate on the product compositions has been studied. Sensitivity results from the simulation models developed have been presented in this poster. Optimization of process variables and the subsequent use of optimized process parameters will result in an efficient plant design.

Activation of the Lipid Droplet Controls the Rate of Lipolysis of Triglycerides in the Insect Fat Body

Rajesh Patel, Alisha Smith, Palaniappan Chetty, Jose L Soulages, and Estela L Arrese.

Department of biochemistry

Oklahoma State University

Presentation Subject Area: Biological Sciences

The hydrolysis of triglyceride (TG) stored in the lipid droplets of the insect fat body is under hormonal regulation by the adipokinetic hormone (AKH), which triggers a rapid activation cAMP-dependent kinase cascade (PKA). The role of phosphorylation on two components of the lipolytic process, the TG-lipase and the lipid droplet was investigated in fat body adipocytes. The activity of purified TG-lipase determined using in vivo TG-radiolabeled lipid droplets was unaffected by the phosphorylation of the lipase. However, the activity of purified lipase was 2.4-fold higher against lipid droplets isolated from hormone-stimulated fat bodies than against lipid droplets isolated from unstimulated tissue. Investigation of the phosphorylation state of lipid droplet-associated proteins showed that in vivo stimulation of lipolysis promotes a rapid phosphorylation of a protein with an apparent mass of 42-44kDa. This protein was identified by mass spectrometry as Lipid Storage Droplet Protein-1 (Lsdp1). In vivo phosphorylation of this protein reached a peak ~10min after the injection of AKH. Supporting a role of Lsdp1 in lipolysis, maximum TG-lipase activity was also observed with lipid droplets isolated 10min after hormonal stimulation. The activation of lipolysis was reconstituted in vitro using purified insect PKA and TG-lipase, and lipid droplets, without additional cellular components. In vitro phosphorylation of lipid droplets catalyzed by PKA enhanced the phosphorylation of Lsdp1 and the lipolytic rate of the lipase proving a prominent role for substrate activation in the regulation of the lipolytic response. AKH-induced changes in the properties of the substrate do not promote a tight association of the lipase with the lipid droplets. It is concluded that the lipolysis in fat body adipocytes is controlled by the activation of the substrate. This activation is achieved by PKA mediated phosphorylation of the lipid droplet. Lsdp1 is the main target of PKA suggesting that this protein is a major player in the activation of lipolysis in insects.

Dibenzo[b.f]1,4-oxazepines and Their 10,11-Dihydro Derivatives by a Consecutive Reduction-Reductive Amination Reaction

Ryan Patman, and Richard A. Bunce

Department of Chemistry

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Several six-membered heterocyclic systems have been prepared using a tandem reduction-reductive amination procedure under catalytic hydrogenation conditions. This process involves selective reduction of a nitro group in the presence of an aldehyde or ketone followed by condensation to close the ring, all in a single flask. Seven-membered rings have proven more difficult to prepare by this strategy, however, due to stereoelectronic and entropy effects which slow the cyclization and permit side reactions to compete. In an attempted one-step synthesis of 10,11-dihydrodibenzo[b.f]1,4-oxazepine from 2-(2-nitrophenoxy)benzaldehyde, hydrogenation over 5% palladium-on-carbon gave a mixture of the desired heterocycle along with the amino alcohol resulting from reduction of both the nitro and phenyl-conjugated aldehyde groups. To circumvent this problem, a two-step consecutive procedure was employed whereby the heterocycle precursor was first closed to dibenzo[b.f]1,4-oxazepine using iron powder in acetic acid, and then hydrogenated to give the 10,11-dihydro derivative. The dissolving metal reduction conditions were sufficiently mild to permit chemoselective reduction of the nitro group without affecting the aldehyde. The resulting amino group then condensed with the aldehyde to give the dibenzo[b.f]1,4-oxazepine which could

be isolated, or further reduced under catalytic conditions to saturate the 10,11-double bond. We are currently working to extend the scope of this reaction as well as exploring methods to introduce additional functionality to these systems.

Effect of Pomegranate Juice on Lipopolysaccharide induced Nitric Oxide Production in Murine RAW 264.7 Macrophages.

Jennifer Powell, Brenda J Smith, Bahram H Arjmandi and Edralin A Lucas

Department of Nutritional Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

Oxidative stress has been cited as an important risk factor in a number of inflammatory conditions such as atherosclerosis. The production of reactive oxygen species increases the oxidation of low density lipoprotein, a key step involved in atherosclerosis development. The objective of this study was to evaluate the anti-inflammatory activity of antioxidants naturally found in pomegranate juice. Murine Raw 264.7 macrophages were incubated in DMEM containing 10% FBS and 1% penicillin supplemented with pure pomegranate juice; concentrations of 0.03125, 0.0625, 0.125, 0.25 and 0.5% (v/v) for 24hrs. Half of the cells were stimulated with Lipopolyscharride (LPS) for 24hrs to induce inflammatory conditions. The production of nitric oxide (NO) and cell viability was analyzed using the Griess and Resazurin assay's respectively. As expected, stimulations with LPS increased NO production. Cells stimulated with LPS and supplemented with 0.25% pomegranate juice had the lowest NO concentration. Pomegranate appears to have no significant effect on NO production in un-stimulated cells. Cell viability was not affected by any of the concentrations of pomegranate used in the study. These findings suggest that pomegranate juice supplementation may modulate the effect of NO production. Further areas of investigation are directed to the inflammatory mediators, interleukin and cyclooxygenase 2.

A Comparison Among Diets in Five Sympatric Frog Species

Nick Rasmussen, and Jerry Husak

Department of Zoology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Anurans, as a whole, are considered to be dietary generalists, consuming virtually any prey item they can overpower and fit into their mouths. If this is the case, one might assume that frog species which are similar in size and occur in similar habitats are competing with each other for the same food resources. The focus of this study was to examine the diets of five frog species and determine how much overlap there is in the composition of their diets. The species studied were Acris crepitans, Gastrophryne olivacea, Hyla chrysoscelis, Pseudacris clarki, and P. streckeri. All of these species appear to be relatively similar in size and are found occurring together in northcentral Oklahoma. Museum specimens representing these species were obtained from the Oklahoma State University Collection of Vertebrates and dissected. Prey items removed from the stomachs of these specimens were identified to order or more specifically when possible. Prey length was also measured if whole prey items were present. For the frogs, snout-to-vent length and gape width were measured as these are two of the main morphological features which determine what a frog can consume. When the prey were identified to order, all five species had diets significantly different from

each other except the following pairs: *P. clarki* & *P. streckeri*, *H. chrysoscelis* & *P. clarki*, and *H. chrysoscelis* & *P. streckeri*. When prey were identified to more specific taxonomic levels, only the pairs *H. chrysoscelis* & *P. clarki* and *H. chrysoscelis* & *P. streckeri* were not significantly different from each other in diet. All frog species were significantly different from each other in snout-to-vent length except *G. olivacea* & *P. clarki*, and all five species were significantly different from each other in gape width. There were no significant differences among four of the frog species in the length of prey consumed except between *G. olivacea* & *P. clarki* and *G. olivacea* & *P. streckeri*. *Hyla chrysoscelis* was not included in this part of the study due to the scarcity of measureable prey items found in stomachs of available specimens. These conclusions suggest that perhaps frogs are a little more specific in the prey they select than previously believed in order to reduce competition with other anuran species. The species used in this study differ from each other in morphology, perhaps providing a functional explanation for how they avoid dietary overlap.

Gene Silencing in *Aspergillus nidulans*

Lisa Rigdon, and Dr. Rolf Prade

Department of Microbiology and Molecular Genetics

Oklahoma State University

Presentation Subject Area: Biological Sciences

Silencing the expression of genes often allows researchers to identify the function of the genes silenced. RNA Silencing is performed by eukaryotic cells and is a natural defense mechanism against viruses, but researchers have learned to utilize this mechanism. In our case, we will use *Aspergillus nidulans*, a multicellular fungus, to silence the expression of a sporulation gene in order to test the procedure, and then create a library to help us determine the function of many genes in our model organism. We plan to construct a plasmid which contains two inverted alcohol dehydrogenase promoter elements surrounding a BamHI restriction site in which we plan to insert partial Sau3A digested small DNA fragments derived from a tester gene, bristle A or an entire genomic library. DNA-mediated transformation and random integration of these libraries into an appropriate *Aspergillus nidulans* host, results in an alcohol dependent inducible system in which random pieces of the genome (inserted in between the *alcA* promoters) transcribe single stranded RNAs, which should result in silencing of the complement gene of interest.

Isolation of Scrapies Infected Protein

Justin Roach, Stanley Thomas, and Dr. Christina Dewitt

Department of Animal Science

Oklahoma State University

Presentation Subject Area: Biological Sciences

Contamination of meat by infectious prion proteins is an important concern of the meat industry. The goal of this project is to begin investigations that evaluate and compare the solubility of infectious prion proteins from sheep with that of myofibrillar proteins. Differences in solubility may allow infectious proteins to be removed from a meat matrix, enhancing the safety of the resulting product. To date, I've been involved in learning how to handle infectious materials in a Biosafety Level 2 laboratory and helping to prepare the laboratory for this necessary upgrade. In addition I have accompanied my graduate mentor, Stanley Thomas, to the slaughter floor of the Food and Agriculture Product Center to learn how to remove the obex region of the brain from several non-scrapies infected sheep. The obex region of the brainstem is a location where abnormal prion proteins accumulate. In addition, I have worked with another undergraduate on a project

dealing with protein solubilization to learn the techniques involved in solubilizing, extracting, and recovering myofibrillar proteins.

Future goals are to evaluate how protein solubilization affects normal, non-infectious prions. This work will allow me to become comfortable with my protocols and prepare me for work with infectious materials. Once our research has begun we hope to be able to isolate the prions from the contaminated mixtures they are contained within and also test the purity of the remaining protein after the removal of the prions. Hopefully with this research we will be able to recover 60-70% of the protein after removal of the prions. This protein that we recover, if 100% free of the abnormal prion protein, could then be taken on and used in the production of animal feed and fertilizers.

Influence of Glycocholic Acid on Conjugated Linoleic Acid Production by cells of *Lactobacillus reuteri* 55739

Mireya Roman-Nunez, P.E. Cuesta-Alonso, AND S.E. Gilliland
Department of Animal Science
Oklahoma State University
Presentation Subject Area: Biological Sciences

Cells of *L. reuteri* 55739 were grown in MRS broth with and without linoleic acid (LA, 0.2%). The cells were harvested after 24 h of incubation time at 37 °C and washed, then added to buffer containing LA (0.2%) and incubated 18 h at 37 °C. The cells, which had been grown without LA, transformed LA into conjugated linoleic acid (CLA) better than did those cells grown with it. When glycocholic acid (GA, 0.3%) was included in the washed cell suspension about the same level of CLA was formed regardless of whether or not the cells had been grown in the presence of GA. Further testing will be necessary to determine the reason why GA had no influence on the washed cells.

Success Factors of Spa Business

Wanlanai Saiprasert, and Arisara Seyanont
Department of Hotel and Restaurant Administration
Oklahoma State University
Presentation Subject Area: Environmental Sciences

Thailand is widely acknowledged as the capital of the Asian spa industry. According to the Thai Spa Association (2002), 3.3 million people visited spas in Thailand, generating approximately \$ 83 million. Key characteristics of a successful small spa business are the role of the owner, the influence of ownership on employee performance, and the amenities offered. In contrast, with large spa firms the focus is on professional management, long term strategic planning, and formalization of management process and procedures. With the rapid expansion of the spa industry, it now covers a wider range, from hotel spas to individual entrepreneurs. Established companies are driving the growth and the newcomer needs to consider all factors contributing to the greatest competitive advantage. The purpose of this study is to identify the success factors of spa business. Data will be collected from questionnaires submitted to 58 spa managers in Phuket, Thailand, who are members of Phuket Spa Association. Frequency count and percentage, weighted means, and analysis of variance will be used in statistical treatment of the data.

Novel polymeric blends for Tissue Engineering Applications

Aparna Sarasam, and Sundar Madihally
Department of Chemical Engineering
Oklahoma State University
Presentation Subject Area: Biomedical Sciences

Tissue engineering aims at generating functional tissues or organs to overcome the problems associated with organ shortage and organ donation. The basic concept of tissue engineering involves guided growth of cells on porous biocompatible matrices (called scaffolds) and tissue formation accompanied by scaffold degradation. Important features of a scaffold are its biocompatibility (non-toxic/ inflammatory), mechanical strength to support tissue formation and withstand stresses, bioactivity (encourage cellular activity) and degradation (at an alterable rate to match tissue formation). Natural and synthetic polymers have been extensively studied for engineering several types of tissues, prominent among which are Chitosan and Polycaprolactone (PCL). Chitosan, a naturally derived polysaccharide has known to support a variety of cell types but its drawbacks are weak mechanical properties and slow degradation. PCL is an aliphatic polyester with excellent mechanical and degradation properties. These properties of PCL are also tailorable to suit specific tissue needs. However, PCL is limited in its support to biological activity. The hypothesis is that the individual deficiencies of Chitosan and PCL can be overcome by blending them.

In this work, hydrophilic chitosan and hydrophobic PCL were blended in three mass ratios in a simple single phase solution without any chemical modifications. The resultant solutions were processed into membranes by drying at different conditions and their tensile properties tested. Values were comparable to that of pure chitosan indicating a need for further modification. Thermal analysis by Differential Scanning Calorimetry indicated partial miscibility of the two polymers in the blends. In vitro cell culture assay conducted on the blends using mouse embryonic fibroblasts indicated a significant improvement in cell viability on blends when compared to control or chitosan alone. Finally, blends were fabricated into porous cylindrical scaffolds by freeze-drying method. SEM analysis of these scaffolds showed favorable pore morphology in the blends. In conclusion, chitosan and PCL were blended homogeneously and processed into 2D membranes and 3D scaffolds and blending increased their individual biological properties. Degradation studies are underway.

Diastereoselective Synthesis of Hexahydropyrrolo[1,2-a]quinolines by a Tandem Reduction-Double Reductive Amination Reaction

James Schammerhorn, and Richard A. Bunce
Department of Chemistry
Oklahoma State University
Presentation Subject Area: Physical Sciences & Technology

A diastereoselective synthesis of hexahydropyrrolo[1,2-a]quinolines has been developed using a tandem reduction-double reductive amination reaction. The cyclization substrates were synthesized by alkylation of methyl (2-nitrophenyl)acetate with 2-bromomethyl-1,5-hexadiene derivatives, followed by ozonolysis of the side chain double bonds. Hydrogenation of these nitro dicarbonyl compounds over 5% palladium-on-carbon initiated a sequence involving reduction of the aromatic nitro to an amino group followed by double reductive amination with the two side chain carbonyls. The cyclization reaction was remarkably diastereoselective, yielding each ring-closed product as a single stereoisomer with the all-cis geometry. The reaction also produced a significant amount of a decarbonylation product, especially from the substrate incorporating an aldehyde in the side chain. This competing process has not been previously observed in cyclizations of related compounds. The poster will present the synthetic aspects of the project along with a rationale for the observed selectivity and some mechanistic insights into the decarbonylation reaction.

Habituation of Defensive Responses in Nerodia Erythrogaster

Adam Scherm, Aaron Place and Dr. Charles Abramson

Department of Zoology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Habituation is characterized as a decrease in response to a repeating stimulus. Habituation of defensive responses have been characterized in several snake species. This experiment was conducted to examine the pattern of habituation in young *Nerodia erythrogaster* (common water snake). Eleven snakes were presented with a stationary finger or a moving finger for a duration of 30 seconds per trial, for ten trials. Ten more trials were carried out with the other stimulus (stationary or moving finger) directly after the first ten trials. The total number of strikes and whether or not a subject tried to flee were recorded for each trial over ten consecutive days. The results confirmed that young *Nerodia erythrogaster* habituate more quickly to the stationary stimulus both within and between days. No effect of stimulus order was found. The adaptive value of habituation of defensive behavior in watersnakes is discussed in light of these results and compared to habituation in other snake species.

Improved Synthesis and Characterization of 3,6-Dibromophenanthrene

Dane Scott, Richard A. Bunce, and Nicholas F. Materer

Department of Chemistry

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

Improved Synthesis and Characterization of 3,6-Dibromophenanthrene Department of Chemistry, Oklahoma State University Stillwater, OK 74078-3071 A current project required access to 3,6-dibromophenanthrene. An earlier 7-step synthesis of this dibromide did not proceed as reported. We have modified the reaction conditions for several steps of the earlier procedure to afford a reproducible synthesis of this material. Additionally, we have characterized each intermediate in the synthesis by IR, ¹H NMR, ¹³C NMR and MS. This compound is of interest because the distance between the bromine groups is similar to that of the double dimer rows of the Si(100) surface. The similar spacing may permit adsorption of the compound on this surface in an orderly manner. Our goal is to study the reactions of this dibromophenanthrene derivative on the Si(100) surface. Information obtained by investigating these reactions may be useful in the design of microcircuits and sensors.

Electronic Structure of Free-Base tetraphenylporphyrin- and the free-base porphyrin-water complexes.

Ryan Scott, T.C. Collins, H.J. Harmon, D.F. Scofield¹ and T.M. Wilson

Department of Physics

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

The structure of tetraphenylporphyrin(TPP), and the free-base porphyrin-water and TPP-water complexes (H_2P-H_2O and $TPP-H_2O$) were studied using density functional theory *ab initio* methods with the B3LYP exchange-correlation potential. The energies and oscillator strengths for the transitions from the ground to excited states for both systems were calculated using time-dependent density functional theory (TDDFT).

The calculations were done for both the *cis* and *trans* configurations. The results are used to interpret the observed absorption spectra of an aqueous solution of tetraphenylporphyrin-sulfonate (TPPS).

¹ ApplSci, Inc., Newark, DE 19711

Role of Conformational Flexibility of Helices and Loops on the Lipid Binding Activity of Apolipoprotein-III.

Palaniappan Sevugan Chetty, Estela L. Arrese, Veronica Rodriguez, and Jose L. Soulages
Department of Biochemistry and Molecular Biology
Oklahoma State University
Presentation Subject Area: Biological Sciences

Apolipoprotein-III is an insect exchangeable apolipoprotein. In solution apolipoprotein-III from locusts consists of five amphipathic α -helices connected by four loops. The essential role of conformational flexibility of helices and loops on the lipid-binding activity of apolipoprotein-III was investigated by disulfide mediated tethering experiments. Two disulfide mutants restricting the flexibility of helices 1 and 5 (H1-H5 mutant) and helices 3 and 4 (H3-H4 mutant) and one disulfide mutant tethering loops 2 and 4 (L2-L4 mutant), were studied. The ability of the disulfide mutants to interact with phospholipid multi-lamellar vesicles, detergent and phospholipid bilayers and to native spherical insect lipoproteins was studied. The H1-H5 mutant was unable to interact with any of the three types of lipid-surface provided. The H3-H4 mutant interacted only with detergent-phospholipid bilayers. The L2-L4 mutant was active in binding to native spherical lipoproteins, phospholipid multi-lamellar vesicles and detergent-phospholipid bilayers. Based on these studies the conclusions are: (1) Separation of helices 1 and 5 is essential in the binding of apolipoprotein-III to any type of lipid-surface, (2) Helices 3 and 4 are involved in the insertion of apolipoprotein-III in spherical phospholipid surfaces, and (3) separation of loops 2 and 4 is not essential in the lipid-binding activity of apolipoprotein-III as recently proposed.

Gender Differences in the Willingness to Seek and Recommend Treatment for Mental Illness

Christine W. Skow, Shelia M. Kennison, and Amber Burress
Department of Psychology
Oklahoma State University
Presentation Subject Area: Social Sciences

National statistics have shown that more women than men receive treatment for mental illnesses, such as depression and anxiety. On one hand, women may be biologically more prone than men to these illnesses. On the other hand, women may be more likely than men to acknowledge symptoms and to seek out treatment. The present research investigated men's and women's willingness to seek treatment for a number of physical and mental illnesses, including depression, phobia, addiction, trauma, relationship problems, trauma, grief, romantic problems, phobia, and addiction. The research also investigated participants' willingness to recommend treatment for these illnesses to a close friend or family member. All participants completed three versions of the Multidimensional Health Locus of Control Scale (Wallston, Wallston, & DeVellis, 1978): One version of the scale assessed the individual's LOC for his or her own mental health. The second version assessed the individual's ideas about LOC

Mobilization of Triglyceride Stores in the Insect Fat Body - Effect of Calcium and cAMP on the Activation of Lipolysis

Alisha Smith, Rajesh T Patel, Palaniappan Chetty, Jose L Soulages, and Estela L Arrese
Department of Biochemistry and Molecular Biology
Oklahoma State University
Presentation Subject Area: Biological Sciences

Fatty acids are the primary substrate used by insects to fuel long-term flight. Fatty acids are stored as triglycerides (TG). The vast majority of stored lipids are found in the fat body in the form of lipid droplets. Utilization of the fatty acids stored in the fat body requires hydrolysis of TG (lipolysis) in a reaction catalyzed by a TG-lipase. Lipolysis is regulated by adipokinetic hormone (AKH). cAMP-dependent-protein kinase (PKA) is a central player of the adipokinetic signal that controls the mobilization of stored lipids in the fat body. Studies showed that AKH rapidly activates PKA from the fat body of the moth *Manduca sexta*. As a part of our investigation on lipolysis in insects, here we present information on the adipokinetic affect. We also purified and characterized the catalytic subunit of PKA. PKA was purified to apparent homogeneity and the identity of the protein was confirmed by MALDI-TOF and Western blot analysis. *Manduca sexta* PKA only recognized serine residues as phosphate acceptors; threonine or tyrosine containing peptides were not phosphorylated. Purified fat body TG-lipase proved to be a good substrate of the purified kinase. However, phosphorylation of the lipase did not enhance the lipolytic activity of the enzyme in vitro. These results suggest that the mechanism of AKH-induced activation of the lipolysis may require the involvement of other proteins, signals and/or involvement of the lipid droplet.

Effects of Soy Isoflavones on Intestinal Integrity in a Mouse Model of LPS-induced Chronic Inflammation

Mackenzie Smith, Virginia Suydam, Kelly Hager, and Elizabeth Droke, Ph.D.,
Department of Nutritional Science
Oklahoma State University
Presentation Subject Area: Biomedical Sciences

The purpose of this study was to evaluate the effects of soy isoflavones on intestinal integrity in mice challenged with lipopolysaccharide (LPS). Eight week old female C57BL/6 mice were implanted with LPS sustained-release pellets to simulate chronic inflammation. Phase I was a 30-d dose-response study to determine the dose of LPS to administer during the subsequent soy study. Treatment groups consisted of 0, 6.6, 66.6, or 666.6 $\mu\text{g/kg/d}$ of LPS from *E. coli* 0127:B8. Phase II was to determine the effects of soy isoflavones on the chronic inflammation induced by the LPS. Mice were fed soy isoflavone-containing diets (0, 200, or 800 mg/kg) for 2 weeks. Mice were then implanted with a 30-d placebo or LPS containing pellet. The dose (66.6 $\mu\text{g/kg/d}$) used was based upon the differential leukocyte counts obtained in phase I. The small intestine and colon were collected at the end of the 30-d LPS period. Intestinal integrity will be determined by: H&E staining for structural changes; diamine oxidase for permeability; and, Caspase 3 for apoptosis. These results will demonstrate if there are changes in intestinal integrity caused by LPS and if soy isoflavones are beneficial in attenuating these effects.

Effects of Three Kinds of Auxin on Young Inflorescence Culture of Bermudagrass

Rima Thapa, C. M. Taliaferro, and Arnold Parco
Department of Plant and Soil Sciences
Oklahoma State University
Presentation Subject Area: Biological Sciences

To optimize tissue culture technique for regenerating bermudagrass (*Cynodon dactylon*), culture response of young inflorescence of varieties Brazos and PRC58 was investigated. Pieces of young inflorescence tissues were cultured on solid MS nutrient medium supplemented with 2, 4-D, Dicamba, or Picloram. Five levels of these three auxin types were tested: 0, 1, 3, 5, and 7 mg L⁻¹. Calli were initiated from explant tissues except at 0 mg L⁻¹ auxin, and higher initiation frequencies occurred at levels higher than 1 mg L⁻¹. After a few subcultures, some calli developed compact sectors characteristic of regenerable calli. Several plantlets of PRC58 were successfully obtained from calli grown with 3 mg L⁻¹ 2, 4-D, while most calli of Brazos suffered severe contamination prior to transfer to regeneration medium.

Selenium and Iodine Depletion Affects Bone Growth and Biomechanical Properties in Growing Rats

Fanta Toure, Barbara J. Stoecker, Brenda J. Smith, and Dannie Bellmar
Department of Nutritional Science
Oklahoma State University
Presentation Subject Area: Biological Sciences

Effects of selenium (Se) and/or iodine (I) deficiency on bone growth and strength were investigated using diets in a 2 x 2 factorial design (+Se+I; +Se-I; -Se+I; -Se-I) to dams beginning week 2 of lactation. Pups were weaned at 3 weeks and 72 males and females were fed the experimental diet of their mothers for an additional 7 weeks. Tibia and femur length and femoral midshaft thickness were measured with a digital caliper. Biomechanical properties of the femur and the L₃ vertebra were determined using 3-point bending and finite element (FE) analysis respectively. Both I and Se depletion decreased tibia and femur lengths. Femur cortical thickness was higher with -Se. Femur ash weight was higher in females than males. The 3-point bending of the femur showed that the modulus of elasticity was higher in females than males. Iodine depletion decreased femur stiffness. Femur yield stress and ultimate stress were both higher in females than males. The ultimate force for the femur was decreased by both -I and -Se in all the animals, and when selenium was deficient, iodine adequacy increased femur ultimate force. FE analysis of L₃ trabecular cores showed forces to compress, average strain, and stiffness were higher in females than males. Iodine depletion increased the stiffness of the L₃ trabecular core and -Se tended to increase this stiffness. Selenium and Iodine depletion impaired bone strength in growing rats. (Supported by Oklahoma Agricultural Experiment Station).

Real-Time Optically Stimulated Luminescence Dosimetry for use in Medical Radiotherapy

Natalie Trent and David Klein

Department of Physics

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

In radiation therapy for cancer patients, there are currently no methods for measuring the dose of radiation that is actually absorbed by the tumor. Acquiring information regarding the characteristics of clinically administered doses inside human tissue may greatly improve the accuracy of radiotherapy and minimize the side effects. The purpose of this project is to develop and improve a dosimetry system that can take real-time measurements using the optically stimulated luminescence (OSL) of Al₂O₃:C. Our current system uses a small (approximately 1 mm³) single-crystal Al₂O₃:C dosimeter at the end of a 1 mm diameter optical fiber with the intention of minimally invasive internal placement. Also, the diminutive size provides high spatial resolution and little interference to the medical treatment. When given a dose of radiation, the crystal stores energy. This energy may be released as luminescence after the crystal is stimulated with a laser (532 nm wavelength). From this, we obtain raw OSL data, which corresponds to the absorbed dose. This data can then be used to obtain a real-time dose rate. I am currently working to optimize this system by refining the algorithm used to calculate the dose rate.

Effect of the Anti-diabetic Drug, Rosiglitazone(Avandia) on the Metabolism of Glucose and Triglyceride in Adipocytes

Soreiyu Umezu, Hamada M., Arrese E.L. and Soulages J.L.

Department of Biochemistry and Molecular Biology

Oklahoma State University

Presentation Subject Area: Biological Sciences

Rosiglitazone (Avandia) is an effective therapeutic agent for type 2 diabetes. However, the mechanism by which rosiglitazone improves glucose and lipid metabolism remains unclear. Diabetes affects 6.2% of the population in the United States. Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes and is characterized by a poor response of tissues to insulin. Rosiglitazone treatment enhances insulin sensitivity of cells normalizing glucose and lipid levels in plasma. Since adipose tissue is a key organ affecting the homeostasis of lipid and glucose metabolism, we studied the effect of rosiglitazone on the rate of triglyceride (TG) hydrolysis and synthesis in 3T3-L1 adipocytes. Our study showed that rosiglitazone increases the rate of fatty acid re-esterification (TG re-synthesis) in the absence of insulin or when the tissue is exposed to isoproterenol (lipolytic hormone). Supporting this observation, our study also showed that rosiglitazone decreases the release of fatty acids into the cell medium and also increases the incorporation of glucose carbons into TG. Overall, the studies indicate that the beneficial effects of rosiglitazone could be due to the improvement in the efficiency of TG synthesis in adipose tissue.

Nanoindentation and Nanoscratching of Aluminum Coated Silicon Wafer

Sony Varghese

Department of Mechanical and Aerospace Engineering

Oklahoma State University

Presentation Subject Area: Physical Sciences & Technology

In this investigation the nanohardness of aluminum coated silicon wafer, was determined using a Digital Instruments AFM and an MTS Nanoindenter apparatus. Nanoscratching experiments were performed on the coating using both these instruments. Also, the morphology and microstructure of the indents and scratches made on the material by both instruments were analyzed using the AFM. It is well known that magnitudes of the mechanical properties of materials at macroscale are different to those at the micro- or nano-level. This is because the materials of interest have fewer and fewer defects as the scale is reduced from continuum (macro) to micro to nano, with the result the properties rapidly reach their theoretical values. Nano hardness was determined by indenting the sample with a 60° tetrahedral indenter up to a depth of about 60nm using the atomic force microscope. A procedure was developed to obtain load verses displacement curves from the raw data obtained from the AFM. A 120° berkovich indenter was used in the MTS nanoindenter to determine the hardness at depths of up to 200nm. Nano scratching experiments were performed on the aluminum coating using the AFM indenter, in two different directions to see the effect of the indenter orientation. A 90° tetrahedral indenter and 10.3µm spherical indenter were used in the MTS Nanoindenter to scratch the aluminum coating at different loads. The scratches were then imaged using an Atomic Force Microscope.

This work has been supported by Micron Technology, Inc. (Dr. N. Chandrasekaran) and Air Force Office of Scientific Research (AFOSR). Thanks are also due to Dr. Hongbing Lu and Jin Ma of OSU for their help with using the MTS Nanoindenter and Dr. Yoshino of the Tokyo Institute of Technology,

Undercurrents: Asian Philosophy in the Films of Akira Kurosawa

Grant Wilson

Department of English

Oklahoma State University

Presentation Subject Area: Humanities

This study seeks to examine evidence of the influence of Asian philosophies within the films of Japanese auteur Akira Kurosawa. Most of his films ask distinctly philosophical questions (Can modern life mean something? What is the nature of truth? How should we balance mercy and logic?), and the responses to these questions display a unique solution of Eastern and Western philosophies. While the study includes cases of 1:1 comparison (taking specific passages from a work and relating it to a concrete moment in the film), broader hypotheses concerning the Japanese religious and moral psyche (also taking into account post-World War II mentality) as related to Kurosawa's films are also present. One of the most promising aspects of this research concerns framing, perspective, and composition on the screen, with which Kurosawa was always distinctly aware. He strove to make his compositions appear seamless on the screen, just as Japanese Zen Buddhist Monks strove to make their rock gardens flow seamlessly into the surrounding landscape. Visual comparisons of Kurosawa to these 'rock waterfalls' will be aided by screen captures. Another intriguing aspect of this research concerns the Western influences of Kurosawa, which include Shakespeare, Maxim Gorky, and Dostoevsky. The shadings of Asian philosophy present in Kurosawa's adaptations of great Western works (Macbeth, King Lear, The Lower Depths) created a unique vision, predicting the almost certain clashes between Asian and Western cultures in the near future. More than that, however, these films point toward a peaceful synthesis that can guide these interactions for the better. With a director as

vastly influential as Kurosawa, it is essential that the primary sources behind his personal philosophy be pinpointed and examined, and that is the goal of this study.

The Design of Sustainable Relief Housing in Africa

Brooke Woods

Department of Design, Housing, and Merchandising

Oklahoma State University

Presentation Subject Area: Humanities

In order to achieve sustainability, cities in developing nations must “function for the people, protect their health, provide appropriate shelter, and offer opportunities for employment and cultural expression.” Africa is one such continent. However, the urbanization in Africa results in urban poverty and homelessness. In this project, a sustainable relief housing model will be designed that aids in sheltering homeless citizens until they are able to return to their traditional ways of life. To avoid repeating developed nations’ errors in urban development, and consider current environmental, economic, and social issues in Africa, the design must go beyond traditional construction materials and methods to benefit people, prosperity and the planet in a sustainable way. This project will apply McDonough and Braungart’s “Cradle to Cradle” design model to the earthbag construction technique in order to develop a model for sustainable relief housing in Africa. Based on environmental and human health, all materials selected for construction will be naturally available and safely return to nature after use (waste equals food). Structural design will maximize natural energy use (use of current solar energy), and furniture selection will consider local culture in Africa (celebrate diversity). With locally available materials, inexpensive construction, maintenance, and use, this project will provide affordable shelter for the African people. All construction and interior design materials are naturally occurring, and will return to nature after use, ensuring the most effective use of material resources, no synthetic materials and toxin deposition, and the best indoor air quality for human health. Finally, using earthbags rather than wood for the structure, this housing design will prevent deforestation and the resulting desertification in Africa.

Identification and Functional Characterization of Two Novel Chicken Cathelicidins with Potent Antimicrobial Activity

Yanjing Xiao, Om Prakash, Jose L. Soulages, Stanley Gilliland, and Guolong Zhang

Department of Animal Science

Oklahoma State University

Presentation Subject Area: Biomedical Sciences

Cathelicidins constitute a family of antimicrobial peptides sharing a conserved N-terminal prosequence (cathelin), followed by highly diversified mature sequences at the C-terminus. These peptides are effective against a broad spectrum of pathogens, providing excellent templates for development of novel anti-infectives. A genome-wide computational screen of the entire chicken genome led to identification of two novel cathelicidins, which were termed Fowlicidin-1 and Fowlicidin-2. Both genes are clustered on chromosome 2 in a head-to-head orientation each with a typical four-exon structure. The deduced amino acid sequences of Fowlicidin-1 and -2 share a significant homology with all known cathelicidins in the prosequence region, but diverge greatly in the C-terminal mature sequences, which are 26- and 32-amino acid in length with a net positive charge of +8 and +10, respectively. Fowlicidin-1 and Fowlicidin-2 were

synthesized and showed potent activity against *E. coli* (ATCC#25922) with a MIC₅₀ of less than 50 nM and 165 nM. Importantly, such antibacterial activity is maintained at physiological concentrations of salt. More desirably, both peptides kill a range of bacteria, including gram-negative (*E. coli* O157:H7; *Salmonella typhimurium*, *Pseudomonas aeruginosa*) and gram-positive bacteria (*Staphylococcus aureus*, *Listeria monocytogenes*) in the low micromolar concentrations. Although both peptides cause 50% lysis of chicken erythrocytes at approximately 30 μ M, such a concentration is more than 150-fold higher than MIC₅₀ against *E. coli*. CD and NMR spectroscopy revealed that both peptides adopt predominantly alpha-helical structures. Taken together, potent and broad antibacterial activity of Fowlicidins with low cytotoxicity demonstrated their promising potential as novel antimicrobials. Rational mutagenesis of certain amino acids based on their 3-D structures may further reduce their cytotoxicity without compromising their antimicrobial activity.