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**RECENT RESULTS ON THE SOLUTION OF A NONLINEAR INTEGRAL EQUATION APPEARING IN RADIATIVE TRANSFER.** **Ionannis K. Argyros**, Department of Mathematical Sciences, Cameron University, Lawton, OK 73505.

In this study we develop perturbation techniques, based on the contraction mapping principle which can be used to prove existence and uniqueness for the quadratic equation

$$x = y + B(x,x) \quad (1)$$

in a Banach space  $X$ ; here  $B : X \times X \rightarrow X$  is a bounded, symmetric bilinear operator,  $\alpha$  is a positive parameter and  $y \in X$  is fixed. The following is our main result.

**Theorem.** Suppose  $F : X \times X \rightarrow X$  is a bounded, symmetric bilinear operator and that the equation

$$z = y + F(z,z)$$

has a solution  $z^*$  of sufficiently small norm. Then equation (1) has a unique solution in a certain closed ball centered at  $z^*$ . **Applications:** The theorem is applied to the famous Chandrasekhar equation and to the Anselone-Moore system which are of the form (1) above and yields existence and uniqueness for a solution of (1) for larger values of  $\alpha$  than previously known, as well as more accurate information on the location of solutions.

**A FLORISTIC SURVEY OF PLANT COMMUNITIES AT THE UCO SELMAN LIVING LABORATORY IN THE GYPSUM HILLS OF NORTHWESTERN OKLAHOMA.** **Robin Buckallew and Gloria M. Caddell.** Department of Biology, University of Central Oklahoma, Edmond, OK 73034.

The Selman Living Laboratory is located on 320 acres in the gypsum hills of Woodward County in northwestern Oklahoma. It contains gypsum outcrops, grasslands, springs, a creek with riparian areas, and numerous cave entrances. During the growing seasons of 1999 and 2000, we conducted a survey to determine the plant species and communities present, and the flowering and fruiting periods of all species. We visited the site biweekly, recorded all species in flower and/or fruit, and noted the communities in which each was found. We identified 233 species in 60 families. Plant families with the largest number of species are the Poaceae, the Asteraceae, and the Fabaceae. Several species can be classified as gypsophiles. Gypsum-tolerant plants have been poorly studied, and there is no published research on the gypsum-tolerant vegetation of northwestern Oklahoma. This study therefore furthers our understanding of these unique plant communities.

**NUTRITIONAL VALUE OF PIGEONPEA (*CAJANUS CAJAN*) FOR YOUNG RUMINANTS.** **H. Cantrell<sup>1</sup>, W. Phillips<sup>1</sup>, S. Rao<sup>1</sup>, H. Mayeux<sup>1</sup>, and R. Gossen<sup>2</sup>.** <sup>1</sup>USDA-ARS, Grazinglands Research Laboratory, El Reno, OK 73036 and <sup>2</sup>Redlands Community College, El Reno, OK 73036.

In Oklahoma, winter wheat production accounts for 11% of the \$4 billion in annual farm cash receipts and utilizes over 2.4 million ha of farm land. A decrease in the value of wheat grain and an increase in the cost of inorganic N fertilizer has renewed wheat producers' interest in crop rotation strategies that employ a warm season legume to increase soil organic N and to provide economic diversity. The objective of these experiments was to deter-

mine the nutritional value of pigeonpeas, a warm season legume, as a potential protein source for young ruminants. Crossbred, fall born lambs less than 1 year of age were used in digestion and N-balance (Experiment 1) and growth-intake (Experiment 2) trials. Diets containing pigeonpea, cottonseed meal, or alfalfa as the primary source of protein had similar digestion coefficients (Experiment 1). Lambs readily consumed a diet contain pigeonpeas as the primary protein source and gained weight more rapidly than lambs fed cottonseed meal (Experiment 2). From these data we concluded that raw, cracked pigeonpeas can be used as a dietary protein source for young ruminants.

**ION ANALYSIS OF TENKILLER AND BROKEN BOW LAKES.** Myron L. Cherry and Bonnie Kennedy. Department of Chemistry, Northeastern State University, Tahlequah, OK 74464.

The unique industrial and recreational characteristics of northeastern Oklahoma provide problematic environmental issues within the water system of the geographical area. Especially the potential run-off from poultry farms has enhanced the probability of producing atypical acidity and concentrations of some ionic species in local water systems. This can result in unsafe levels of some ionic species, which consequently can be detrimental to the ecological system. This study specifically involves concentration determinations of nitrate, total nitrogen, total phosphorus, ortho-phosphate, and silica in Tenkiller and Broken Bow Lakes at various sites and water depths. The analysis of these concentration determinations indicates that these ion levels are elevated and thus the health of the lake is not improving. Concentration determinations of these ions have also been carried out for various sites on the Illinois River, the main water source for Tenkiller Lake. Ion concentration analysis was carried out with a Hach ultra-violet spectrophotometer. (Research supported by the U.S. Army Corp of Engineers).

**INCORPORATION OF AN INDEPENDENT PROJECT INTO A BASIC ECOLOGY CLASS.** Erica A. Corbett. Department of Biological Sciences, Southeastern Oklahoma State University, Durant, OK 74701.

Although gaining research experience is an important component of a student's science education, relatively few courses incorporate projects that are "realistic" in the sense that the student is fully responsible for planning and conducting research. I have instituted an independent project in my basic ecology classes. Students are required to plan, conduct, analyze, interpret, and present research on some ecological topic. Three components of the project contribute to the student's final grade: a proposal, a write-up of the research and results (in a standard format such as would be published in a scientific journal), and a 7 to 10 minute class presentation on the research. Proposals are an integral part of the research project and are evaluated on the quality of writing, feasibility of project, and relation of the project to basic ecological principles. Students are given the chance to receive "peer-review" input on their proposals from other students, as well as the instructor's input. This project has been a part of Ecology classes for Fall 2000, Spring 2001, and now Fall 2001. Students have generally enjoyed the project; several have commented on its value to their education. Students did not only gain experience in doing research, but also demonstrate their understanding of ecological concepts in ways not restricted only to exams.

**IMPACT OF ANIMAL GENOTYPE AND DIETARY PROTEIN CONCENTRATION ON HAY INTAKE.** R. Ellison<sup>1</sup>, W. Phillips<sup>2</sup>, R. Gossen<sup>1</sup>, S. Coleman<sup>3</sup>, and H. Mayeux<sup>2</sup>,  
<sup>1</sup>Redlands Community College, El Reno, OK 73036; <sup>2</sup>USDA-ARS, El Reno, OK 73036; and  
<sup>3</sup>USDA-ARS, Brooksville, FL 34601.

Each fall, millions of calves are assembled from farms across the southern U.S. and transported to Oklahoma for growth and development before entering regional feedlots for finishing. Some of these calves come from the Gulf Coast region where genetic adaptation to tropical conditions is advantageous. Although tropically adapted beef breeds may not be able to withstand the winter conditions in Oklahoma as well as the temperate beef breeds, they may be genetically predisposed to consume larger quantities of low quality hay. Beef calves (average weight = 303 kg) of four different genotypes, born and reared at the Subtropical Research Station, Brooksville, FL were transported to El Reno, OK in the fall of 2000. Calves were individually fed and had ad libitum access to mature tall grass native prairie hay with and without 225 g of supplemental protein/day in a single switch-back design. Providing supplemental protein increased (P=0.02) hay intake (5.44 to 6.06 kg/d) equally across all four genotypes. However, increasing the percentage of tropical breeding in stocker calves from 25% to 100% did not increase hay intake.

**CLONING OF B71 AND EXPRESSION AND PURIFICATION OF THE B71 PROTEIN FOR USE IN A DIAGNOSTIC ELISA.** Kirk B. Hickey, Tami G. Ross and Earl L. Blewett.  
Department of Biochemistry and Microbiology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences, Tulsa, OK 74107.

Xenotransplantation has been examined as an alternative for the shortage of human organ donors. Baboons have been identified as potential donors due to their phylogenetic relationship to humans. Baboon cytomegalovirus (BaCMV) can reside within donor tissues and a sensitive diagnostic ELISA is needed to identify infected individuals. The BaCMV genome encodes greater than 200 proteins. The B71 protein was selected because of its previous reactivity to positive baboon sera in the  $\lambda$ Triplex expression vector. B71 was amplified using mutagenic primers introducing BamHI and XhoI restriction sites. B71 was cloned into the pProEX-1 expression vector and subsequently purified via a 6-His-tag using a Ni-NTA matrix. A 6-His-tag monoclonal antibody was used to show specific His-tagged expression and purification. The nucleotide sequence was determined and shows 34.5% identity to HCMV UL71. The purified B71 protein can be used in western blots and ELISA assays.

**INTRODUCING ANALYTICAL CHEMISTRY TECHNIQUES IN GENERAL CHEMISTRY: A SOLAR ENERGY PROJECT LABORATORY.** Jonathan Hunt and Ben Hutchinson.  
Oklahoma Christian University, Edmond, OK 73013.

Titanium dioxide in aqueous solution can act as semi-conducting photocatalyst when exposed to UV-visible rays. Organic molecules in such a solution can be catalyzed via sunlight and decomposed to form carbon dioxide and water. This reaction can be followed with the following analytical techniques when malachite green is used as the organic compound. 1) The concentration of malachite green can be measured using UV-visible spectroscopy; 2) the amount of carbon dioxide generated can be measured by precipitating it from a Ba(OH)<sub>2</sub> solution; and 3) the amount of carbon dioxide can be estimated by examining the IR spectra of the carbon dioxide formed during the reaction. This experiment serves as a

visually exciting introduction to several important concepts in chemistry as well as an illustration of the usefulness of three different analytical techniques.

**PROCESS CHEMISTRY: ETHICS AND METHODOLOGY OF RESEARCH THROUGH SOCIETAL NEED REGARDING PESTICIDE USAGE REDUCTION.** Aundre' Johnson and Kurtis J. Koll. Cameron University, Lawton, OK 73505.

The American Association for the Advancement of Science published (1990) the Science for All Americans document which delineates Project 2061. Science for All Americans recommends scientific ways of thinking for individual and social purposes. There are certain thinking skills associated with science that students (and citizens) need to develop during their school years. One inherent recommendation from the AAAS is the social value of science and technology. Through the American Chemical Society's Project SEED program high school students have the opportunity to experience a chemically-related research laboratory. Process Chemistry: Ethics and Methodology at Cameron University through its Project SEED mentoring program engages students in fundamental laboratory skills, chemical processes, and research design. Research design includes experimental protocol, data collection, and data analysis, especially related to research ethics. This research, not only teaches ethics in research, but through experimental development, allows the student researcher to experience methodology accumulating data for a social purpose. The pesticide diazinon was measured quantitatively in soil, sludge, and sewage liquor samples as to its presence and persistence in the environment. Un-managed pesticide usage can potentially lead to an environmental concern. Experimental results are used in community decision-making to reduce pesticide usage. The Cameron University Project SEED program contributes to the ability of high school students to reflect on enduring questions of societal concerns.

**THE RESOLUTION OF A DIGITAL PICTURE SPACE.** Michael Scott McClendon. Department of Mathematics and Statistics, University of Central Oklahoma, Edmond, OK 73034

In the Euclidean topology, straight lines are connected. On a computer screen an analog to a line must be composed of discrete pixels adjacent to each other in such a way as to appear connected if it is to mimic our visual interpretation of the Euclidean world. This simple example demonstrates the problem inherent in modeling the infinite nature of Euclidean space with the finite nature of a computer screen. A digital picture space (DPS) is an Alexandroff space (that is, a space in which each point has a smallest neighborhood) that consists of both a set of points and a set of adjacency relations between them, where the set of adjacency relations between the points depends only upon the topology placed upon the set of points. In this presentation we will describe the construction of our DPS and then define the resolution of the space. We think of a resolution of a DPS as the digital space that results from looking at a DPS with a more powerful microscope. Since we can find the resolution of a space, we can find the resolution of the resolution of the space. Continuing this iterative process of finding the resolutions leads to a limit space,  $P_{\times}$ , that has unexpected properties. We identify this space  $P_{\times}$  and examine its properties.

**WILDLIFE FORENSICS: AN INTERDISCIPLINARY APPROACH FOR THE ENHANCEMENT OF SCIENCE AND MATH CURRICULUM.** Kathi A. McDowell<sup>1</sup>, Erik Terdal<sup>1</sup>, and Michael Wilds<sup>2</sup>. Department of Biology, <sup>2</sup>Department of Criminal Justice and Legal Studies, Northeastern State University, Tahlequah, Oklahoma, 74464.

Wildlife conservation, forensic techniques, and criminal justice can be integrated into a multi-disciplinary educational program. Wildlife Forensics is a unique program that incorporates the PASS curriculum framework into an integrated hands-on inquiry-based math and science learning platform. The program includes a scenario that involves the killing of a gray wolf on Native American Land. The participants begin by learning scientific methods and Internet research that includes mammalian species comparisons on the organismic level, DNA analytical techniques, crime scene investigation and the law. The scientific method is emphasized for each component of the program as well as the applications of mathematics in acquiring, understanding and interpreting the data. Another unique aspect of this program is that it brings both high school teachers and students into the same classroom. This facilitates a synergistic learning environment unmatched in the traditional classroom. The Wildlife Forensics program was sponsored by a Summer Academy grant and an Eisenhower grant from the Oklahoma State Regents for Higher Education.

**PROTEOMICS STUDY OF HEAT SHOCK RESPONSE IN *DROSOPHILA* PHOTORECEPTORS.** Ken Miyaguchi<sup>1</sup>, Sadamu Kurono<sup>2</sup>, Naoka Komori<sup>2</sup>, Olivia Hanson<sup>1</sup>, Hiro Matsumoto<sup>2</sup>, <sup>1</sup>Department of Chemistry, University of Central Oklahoma, Edmond, OK 73034; <sup>2</sup>Department of Biochemistry & Molecular Biology and NSF EPSCoR Oklahoma Biotechnology Network Laser Mass Spectrometry Facility, University of Oklahoma Health Sciences Center.

Stress induces expression of a group of proteins that protect cells from being damaged. Heat is one of the many physical factors that can induce such a defense mechanism against stress. We initiated a proteomics approach to investigate heat shock response in the compound eyes of the fruit fly, *Drosophila melanogaster*. The alteration of the heat shock response by preconditioning or by mutation was also investigated. In this study, we asked 1) what kinds of proteins would be induced/upregulated in the compound eyes by heat shock, 2) whether or not the activation of G protein-coupled receptor rhodopsin by light stimulus would alter the heat shock response, and 3) whether or not mutations in the genes involved in photoreceptor signal transduction would alter the heat shock response. Two-dimensional (2-D) gel display of proteins from the compound eyes of *Drosophila* revealed a protein that was upregulated after a heat shock treatment. We trypsin-digested the protein spot and measured the masses of the fragments to obtain peptide mass fingerprints. Database search of the peptide mass fingerprints pinpointed "ferritin light chain" as a best candidate protein. An increase in the expression of ferritin in the eyes has never been previously reported. Because ferritin has been shown to play a role as a protectant against oxygen free-radical-mediated damage, we speculate that the upregulation of ferritin by heat shock is a cellular response against oxidative damage caused by heat. KM was a summer student at OUHSC. Supported by NIH EY06595 and EY12190.

**CONSTRUCTION OF A PLASMID VECTOR FOR THE GENERATION OF BIDIRECTIONAL DELETIONS IN GENOMIC CLONES HOUSED IN pJCPAC-MAM2.** Kyle Moore and Jonathon Coren. Department of Biology, Southwestern Oklahoma State University, Weatherford, OK 73096.

Genomic libraries constructed in the PAC cloning vector pJCPAC-Mam2 are amenable to functional analysis in mammalian tissue culture systems since this vector can be propagated in both bacterial and human cells. The existing retrofitting technology allows investigators to make nested deletions from one end of any library member. Since this cloning vector contains wildtype and mutated versions of the loxP site-specific recombination sequence,

bidirectional deletions should be able to be generated in individual library members. The vector pZT344 has been modified to introduce two mutated versions of the loxP site into the mini-transposon cassette region of this plasmid. The orientation of the mutated loxP sites was determined using diagnostic restriction enzyme digestion. The tetracycline-resistance gene was inserted into each version of the transposon cassette in both possible orientations as determined by restriction digestion analysis. These modifications should allow investigators to generate nested deletions from the mutated loxP site present in any genomic clone of interest. This improved technology should allow scientists to determine both the 5' and 3' boundaries of any gene or *cis*-acting element of interest using both sets of transposon vectors.

**GENOMIC ANALYSIS OF THE BABOON CYTOMEGAOVIRUS UNIQUE SHORT TERMINUS.** Susan R. Neubauer and Earl L. Blewett. Department of Biochemistry and Microbiology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences, Tulsa, OK 74107.

The risk of baboon cytomegalovirus (BaCMV) transmission to human recipients of baboon organs has led to extensive biomedical research to limit this possibility. One aspect of this research has included cloning, mapping and sequencing BaCMV strain OCOM4-37. The BaCMV genome is linear, and cloning near the termini proves difficult. To overcome this obstacle, forced cloning was used to produce terminal clones which are now sequenced. Using this method, we have sufficient sequence from the right terminus, designated unique short (US), to allow genomic analysis. DNA software was used to compare BaCMV US sequences to human cytomegalovirus (HCMV) US sequences to locate regions of homology, to identify open reading frames and protein motifs, and to determine the GC ratio and hydrophobicity. BLAST searches of BaCMV sequences have been used to find sequence homology with HCMV and other primate CMVs. Comparison of the BaCMV genome with the well-characterized HCMV genome may reveal which genes have similar function, and provide additional information important in developing diagnostic assays for BaCMV.

**SINGLE MOLECULE SPECTROSCOPY OF DYES ENCAPSULATED INSIDE SOL-GEL FLIMS.** Amanda Jayne Nichols<sup>1</sup>, Diego Fernando Ortiz<sup>2</sup>, Jennifer Lynn Gushall<sup>3</sup>, Wai Tak Yip<sup>2</sup>, <sup>1</sup>Oklahoma Christian University, Edmond, OK 73013; <sup>2</sup>University of Oklahoma, Norman, OK 73019; <sup>3</sup>Ohio Northern University, Ada, OH 45810.

The photostabilities of 1,1'-didodecyl-3,3',3'-tetramethylindocarbocyanine perchlorate (DiI), rhodamine 590 (R6G), and pyrromethene 567 (P567) encapsulated inside sol-gel films were examined. The samples were first prepared by adding a dilute dye solution to a sol-gel precursor solution that contains tetraethyl orthosilicate, ethanol, and water in a 1:4:11 or 1:8:7 mole ratio. The dye-doped precursor solution was then spin cast onto a glass coverslip to form a sol-gel film. The thickness of the film was determined by atomic force microscopy to be about 270 nm. Freshly prepared samples were excited at either 488.0 nm or 514.5 nm and their emission spectra were continuously monitored. We found that DiI, being the most flexible molecule, degrades rapidly upon laser excitation and exhibits substantial changes in the emission spectrum. R6G and P567, being more rigid molecules, are more photo-stable and are able to withstand longer laser excitation without noticeable change in their emission spectra. Detection of single P567 molecules has been achieved recently. We will discuss the photostabilities of DiI, R6G, and P567 in sol-gel films at the single molecule level and compare the results obtained from the more concentrated dye doped sol-gel films. Future investigations will focus on the correlation between mobility and photostability of single dye molecules in differently prepared sol-gel films.

**DEVELOPMENT OF A DIAGNOSTIC PCR ASSAY FOR THE DETECTION OF BABOON CYTOMEGALOVIRUS.** Tami G. Ross and Earl L. Blewett. Department of Biochemistry and Microbiology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences, Tulsa, OK 74107.

Cytomegalovirus is a major cause of disease in immunosuppressed individuals and is the most commonly transmitted virus in human transplantation procedures. The use of non-human primates as organ donors raises the possibility for the spread of zoonotic diseases. Our goal is to develop sensitive and reliable diagnostic assays for the detection of baboon CMV (BaCMV) in donor baboons and in humans receiving baboon xenograft transplants. Glycoprotein B (gB) is a highly conserved component of the viral envelope that plays a central role in the infectivity of herpesviruses. We have cloned and sequenced the gB gene from five strains of BaCMV and compared them to human CMV (HCMV). Phylogenetic analyses of gB from these and other primate CMV strains have been performed. We have used sequence data to design primers that will allow specific amplification of gB from each BaCMV strain and differentiation from HCMV using a multiplex polymerase chain reaction. A BaCMV specific diagnostic PCR assay such as this will be very useful in detecting CMV infections in human xenotransplant recipients while at the same time distinguishing between HCMV and BaCMV.

**ANALYSIS OF MICROBIAL DIVERSITY OF BROMELIACEAE IN THE CLOUD FOREST OF THE RIO SAVEGRE VALLEY OF COSTA RICA.** Skipper V. Rowland, Southern Nazarene University, Bethany, OK 73008 and Quetzal Education Research Center, San Gerardo de Dota, Costa Rica.

Bromeliads play an important role in the neo-tropical cloud forest habitat. By trapping and storing water in the base of the plant, bromeliads provide a significant microcosm in this habitat. Little research has been conducted on the ecological role of the bromeliad plant. One goal of this study was to provide baseline microbiological data that will promote further study both microbiologically and ecologically on bromeliads in this particular system. Samples were taken from the throat of bromeliads along three horizontally and vertically distributed transects. The samples were plated on nutrient, EMB, and APT agars for colonial isolation and analysis. Different physical and microscopic properties of the cultures allowed for the separation of different species. Colonies that displayed anti-microbial producing properties were isolated. Further results implied that these colonies indeed produced effective anti-microbial agents.

**TRANSPLANTATION OF MHC MISMATCHED THYMIC EPITHELIAL CELLS INDUCES RECIPIENT TOLERANCE TO SUBSEQUENT PANCREATIC GRAFTS.** Sandra S. Sands<sup>1</sup>, Lee F. Rickords<sup>1</sup>, Jun Hayashi<sup>2</sup>, and Robert J. Ketchum<sup>1</sup>, <sup>1</sup>Department of Anatomy and Cell Biology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences, Tulsa, OK 74107 and <sup>2</sup>Department of Pharmaceutical Sciences, School of Pharmacy, University of Maryland, Baltimore, MD 21201.

Rejection remains a major obstacle in transplantation. Intrathymic (IT) transplantation of allogeneic tissues or peptides with a concomitant dose of antilymphocyte serum (ALS) has been shown to prolong subsequent graft survival. The aim of this research was to introduce genetically mismatched thymic epithelial cells to alter lymphocyte clonal selection. Four groups (n=4) of 6 week old Lewis rats (RTI<sup>1</sup>) were treated with combinations of either intra-

peritoneal (IP) saline or 0.5 mL of ALS followed by IT inoculation with either saline or  $10^6$  Lewis-Dark Agouti (RT1<sup>L,a</sup>) thymic epithelial cells from the TEA3A1 cell line. Twenty one days later, pancreatic tissue harvested from neonatal Dark Agouti (RT1<sup>a</sup>) rats were transplanted to the renal subcapsule of the Lewis rats. After 10 days, the graft response in each recipient was determined by histologic sectioning of the kidney. As expected, the saline only treated animals experienced severe graft rejection. Similar results occurred in the animals receiving IP saline and IT cells and IP ALS and IT saline. Two of the four animals receiving IP ALS and IT cells experienced reduced graft rejection. These results indicate that it may be possible to influence clonal selection with genetically altered thymic epithelial cells. TEA3A1 cells were shown to express red fluorescent protein (RFP) after liposome mediated transfection.

**DOWN-REGULATION OF OPIOID RECEPTORS IN AMPHIBIANS AFTER CHRONIC MORPHINE ADMINISTRATION.** Steven S. Sands, David R. Wallace, and Craig W. Stevens. Department of Pharmacology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences Tulsa, OK 74107.

Opioid agents have been shown to elicit antinociception through three distinct types of receptors ( $\mu$ ,  $\kappa$ , and  $\delta$ ) in mammals. These opioid receptors have been characterized and cloned in several mammalian species. Previous behavioral and binding data from this laboratory have pharmacologically characterized these receptors in the amphibian, *Rana pipiens*. The present study was performed to investigate the regulation of this unique opioid receptor by chronic administration of morphine. Antinociception was assessed using a behavioral assay (Acetic Acid Test) and opioid receptors were characterized by radioligand binding techniques. Daily systemic injections of morphine produced a tolerance time-course curve which was significantly greater than the saline control group. Brain tissue was harvested from these animals for use in binding studies. Saturation analysis of brain homogenates was used to obtain affinity ( $K_D$ ) and receptor density ( $B_{max}$ ) values. The saline control group yielded affinity and receptor density values similar to untreated animals. The morphine-treated group showed no changes in affinity but a significant decrease in opioid receptor density in brain tissue. These studies suggest that the regulation of amphibian opioid receptors is consistent with that observed in mammalian studies.

**CONSTRUCTION OF A NEW TRANSPOSON VECTOR TO GENERATE BIDIRECTIONAL DELETIONS IN LIBRARY MEMBERS HOUSED IN pJCPAC-MAM2.** Max A. Seibold and Jonathon S. Coren. Department of Biology, Southwestern Oklahoma State University, Weatherford, OK 73096.

Since human genomic libraries generated in the vector pJCPAC-Mam2 are amenable for direct functional analysis in human cells, new disease genes can be identified as long as an investigator has an appropriate assay. Retrofitting of individual clones by transposition of the loxP site present in a transposon vector can be used to create nested deletions from one end of a clone to delineate either the 5' or 3' boundary of any gene. In this study we describe the construction of a transposon vector pZT344NotILOxP\* to enable investigators to generate nested deletions from the other end of any genomic insert. A unique NotI restriction site was created within the Tn10 repeats of the plasmid pZT344. Next two versions of mutated LoxP sites were ligated into the NotI site, and then the Tet<sup>r</sup> gene was inserted between the Tn10 repeats. Diagnostic restriction digests of miniprep DNA followed by agarose gel electrophoresis were used to identify the desired constructs. We are in the process of testing the system to establish proof of principle. Generation of bidirectional nested deletions in



PAC clones will allow researchers to determine both the 5' and 3' boundaries of a gene and other *cis* acting elements.

**EVALUATION OF THE RELATION OF ESTIMATED PROGENY DIFFERENCES FOR MILK AND ACTUAL MILK YIELD IN BRANGUS CATTLE.** Jason Uecke and Michael A. Brown. Redlands Community College, El Reno, OK 73036 and USDA-ARS, El Reno, OK 73036

Fifty Brangus cows varying in genetic potential for milk yield were milked by single-cow milking machine to evaluate the relationship of genetic potential for milk yield and actual milk yield. Cows and calves were separated overnight before milking and cows were allowed access to hay and water. Cows were given a sedative and oxytocin to induce milk let-down before milking. Cows were milked every 28 days starting at 58 days postpartum (PP) until 204 days PP. Milk yield was relatively stable from 28 days to 148 days PP but significantly declined by 177 and 204 days. The average 24-hour milk yield during lactation was 18.4 lbs. Milk fat ranged from a low of 3.25% at 58 days to 3.93% at 204 days PP. Milk protein averaged 3.17% and was lower on days 86 and 114 PP. Cows were divided into two groups for purposes of statistical analyses: cows with sire milk estimated progeny differences (EPD, an estimate of genetic potential for a trait, in this case milk yield) greater than zero (average of 5.2 lb) and cows with sire milk estimated progeny differences less than zero (average of -6.6 lb). The high milk EPD group exceeded the low milk EPD group in actual milk yield for days 58 to 142, although the differences between the groups decreased with time. Results from this research suggest that sire milk EPDs are more predictive of actual milk yield of their daughters during early lactation as compared to later lactation.

**ATTENUATION OF HIV-MEDIATED OXIDATIVE STRESS BY DELTA OPIOID RECEPTORS.** David R. Wallace and Summer L. Dodson, Department of Pharmacology, College of Osteopathic Medicine, Oklahoma State University Center for Health Sciences, Tulsa, OK 74107 and Department of Chemistry and Biochemistry, University of Tulsa, Tulsa, OK 74104.

Oxidative stress (OS) was quantified using the dichlorofluorescein assay (DCFH-DA) in SK-N-SH cells. Initial experiments determined the ability of the  $\delta$  peptide agonist DPDPE,  $\delta$  non-peptide agonist SNC-80 and  $\delta$  antagonist naltrindole to effect OS in the presence of  $H_2O_2$ , AAPH or SIN-1. Both DPDPE (100nM) and SNC-80 (250nM) attenuated (30-50%) the increased OS in the presence of SIN-1. This effect was partially reversed by addition of naltrindole, suggesting involvement of  $\delta$  receptors. SIN-1 generates peroxynitrite radicals, which are involved in neurotoxicity associated with TAT, a HIV-associated protein. Incubation with TAT (10-250nM) demonstrated a concentration-dependent increase in OS up to 200% over control values. Preincubation with  $\delta$  agonists reduced 50nM TAT-mediated OS 15-40%, which was partially reversed by naltrindole. Increasing log-concentrations of DPDPE or SNC-80 (0.01-100 $\mu$ M) attenuated TAT-mediated OS up to 50% at 100 $\mu$ M. In conclusion, these data demonstrate that both peptide and non-peptide  $\delta$  ligands can attenuate intracellular OS partially via receptor-mediated mechanisms. This suggests that  $\delta$  ligands may have therapeutic usefulness in HIV patients beyond analgesia. (Supported by NIH DA13137, DRW, and ASPET SURF award, SLD)

**VEGETATIVE COMPATIBILITY AMONG NITRATE NON-UTILIZING (*NIT*) MUTANTS OF *FUSARIUM OXYSPORUM* . Loretta Rush<sup>1</sup>, Robert King<sup>1</sup>, Vincent Russo<sup>2</sup>, Charles Biles<sup>1</sup> and Terry Cluck<sup>1</sup>. <sup>1</sup>Biology Department, East Central University, Ada, OK 74820 and <sup>2</sup>USDA-ARS, Lane, OK 74555.**

Eight Oklahoma isolates of *Fusarium oxysporum* were cultured on two types of agar amended with 1.5% potassium chlorate which is growth-restrictive for the wild-phenotype. Mutants were identified as fast growing mycelial sectors. Samples of all fast-growing sectors were transferred to a minimal agar medium. Nitrate non-utilizing mutants (*Nit*) were classified into 3 distinct groups based on the growth, or lack of growth, on minimal media amended with five different nitrogen sources. The phenotypic classes observed presumably reflected mutations at different loci in the nitrate reductase pathway. The three types of mutations were classified phenotypically as *Nit-1*, *Nit-3*, and *Nit-M*. Of the 86 *Nit* mutants, the majority were obtained from potato dextrose agar amended with chlorate (76%). Only 24% of the *Nit* mutants were obtained on a minimal media with chlorate. Fifty-three percent of the *Nit* mutants were *Nit-1*, 32.5% were *Nit-3*, and 14% were *Nit-M*. The mutation involving the molybdenum cofactor loci (*Nit-M*) occurred less frequently than either *Nit-1* or *Nit-3*. Heterokaryon formation (complementation) was observed among mutants of different phenotypes from the same parental isolate and was highest (70% complementation) when *Nit-M* and *Nit-1* were paired. Complementation among mutants of different phenotypes from different parental isolates occurred 56% of the time when pairing *Nit-M* and *Nit-3* mutants, and 30% of the time when pairing *Nit-M* and *Nit-1* mutants. Further analysis is ongoing to determine relatedness of *F. oxysporum* isolates based on vegetative compatibility.