Abstracts

2nd Annual Science and Mathematics Student Research Symposium and Open House

Sponsored by:
College of Science and Mathematics

Friday, October 27, 2006
Noon – 2:00 p.m.
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Total Evaporative Water Loss Rates in F344 X BN Rats During Acute Heat Exposure

Ms. Janell D. Maier*, Ms. Elizabeth D. Bugajski*, Mr. Jose Gonzales*,
Ms. Sandra Esquivel*, Mr. Rex T. Lees* and Dr. Annette M. Gabaldon

Department of Biology

Research Project #20 – ABSTRACT

In many mammals, including humans and rodents (mice and rats), thermoregulatory function declines with aging. Near the end of life, even more pronounced and rapid physiological declines are observed during senescence, a term that describes the end-stage of life. The goal of this study is to understand the effect of rapid senescence on thermoregulatory responses to acute heat stress. The hypothesis is that senescent rats develop hyperthermia more readily in response to acute heat exposure due, in part, to impaired evaporative cooling mechanisms. To determine total evaporative water loss (TEWL) rates, a single rat is placed into a sealed metabolic chamber that is ventilated with room air. The influent air is dried by passing it through a column filled with the dessicant Drierite. The effluent air, which contains any moisture evaporated from the respiratory tract or skin of the rat, passes through a series of Drierite-filled glass tubes placed on a digital scale. Any moisture contained in the effluent air gets trapped in the Drierite columns, increasing the weight on the scale by 1 gram for every 1 ml of water collected. In pilot studies on 20- to 25°C averaged about 25 mg H₂O/min. When the animals were acutely heat exposed (1 hr at Tair = 39-40°C), TEWL rates increased significantly, by approximately 3- to 5- fold above the non heat-exposed values. Once TEWL rates began to increase, the increases were pronounced and rapid. However, in the rats tested so far, there appears to be a 30-40 minute delay from the time of onset of heat exposure to the onset of a marked increase in TEWL rate. These results suggest that evaporative cooling responses remain robust in these 20- to 30-month-old rats. The rats will be retested in longitudinal studies to determine if evaporative cooling mechanisms decline with the transition to senescence.
Behavioral thermoregulation is utilized as a strategy for maintaining homeostasis in homeothermic as well as poikilothermic animals. In a cold-exposed mammal, a first defense against hypothermia is to seek a warm environment to reduce the rate of heat loss, thus minimizing metabolic energy expenditure by thermogenic tissues (skeletal muscles and nonshivering tissues such as brown fat). The goal of this research is to characterize behavioral thermoregulation in aging F344 rats. The hypothesis is that behavioral thermoregulation pathways remain intact with aging, and that behavioral thermoregulation becomes a predominant mechanism for maintaining homeothermy when thermogenic tissues begin to decline in function. A thermal gradient with floor temperatures ranging from 12°C (cold end) to 39°C (warm end) was constructed. A single rat was placed into the gradient at a thermoneutral air temperature of 25°C (the temperature of the rat’s home cage) and monitored for three consecutive hours using a digital camcorder. Markings on the shoulder, hip, and base of tail were tracked on the videotape and mapped out to create profiles of body position in the gradient over time. Preliminary studies indicate individual variability in the responses of older 20 mo-old rats. In some cases, the rats immediately migrated to warmer ends of the gradient and remained there, resulting in a 1.5-2.5°C increase in colonic temperature by the end of the 3 hour test. Other rats showed a preference for colder temperatures. In this case, even when colder temperatures were selected, the rats did not develop hypothermia, indicating that any heat loss incurred was appropriately offset by thermogenesis. The studies will be repeated bi-weekly on individual animals to determine the effects of chronological age and senescence (the end-of-life stage) on temperature selection.
8-Methoxypsoralen Disrupts Early Embryonic Development in Hamsters

Ms. Kayleigh A. Zerr*, Mr. Dave D. Unis and Dr. Moussa M. Diawara
Department of Biology

Research Project #1

ABSTRACT

The psoralens are naturally occurring plant metabolites found in numerous plant families. These compounds have been used in skin photochemotherapy to treat psoriasis and other skin disorders, and in suntan preparations until 1997. Unfortunately, the increased use of psoralens in medicine has been linked to an increased risk of skin cancer. Past studies have shown that female rats mated with males exposed to 8-methoxypsoralen (8-MOP) had smaller litter sizes, low birth weight offspring and other teratogenic effects. This suggests that there is either a direct effect on sperm DNA, or that there is an indirect effect on the embryos from the seminal fluid. We hypothesize that the psoralens are transported into the uterine environment through the seminal fluid and that normal embryonic development is disrupted following exposure; leading to spontaneous abortion, mutations, and other teratogenic effects. To test this, embryos from the Syrian golden hamster, *Mesocricetus auratus*, were exposed, in vitro, to 8-MOP and examined during the time frame during which the blastocysts escape the zona pellucida in a series of experiments. Three month-old females were superovulated during metestrus with 0.5cc of PMSG via intraperitoneal injection. Three days later, the females were mated during estrus. The embryos were cultured in Hamster Embryo Culture Media 2 hour containing DMSO vehicle control or 167, 433 or 866 μM. Treatment groups also included a positive control (complete media). The females were sacrificed by cervical dislocation in the evening on day 3 of pregnancy and the uterine horns were removed immediately. The embryos were collected and placed into the prepared media, and incubated at 5% CO2, 37°C, and 75% relative humidity. The embryos were observed for 72 hours, the time frame for undergoing zona escape in vitro. Results show that exposure to 8-MOP has adverse effects on embryo development. Initially, all treatment groups contained healthy morula stage embryos. After 72 hours, the embryos in the DMSO control, were normal blastocysts and were undergoing zona escape. The embryos in the 866 μM, 8-MOP treatment groups, were severely mutated, and cell masses were disconnected with very few intact blastomeres. The embryos in this group did not undergo zona escape and will not survive or implant.

Studies Directed Toward the Synthesis of Azacalix[4](2,6)Pyridine

Ms. Sara C. Bozzi* and Dr. David L. Dillon
Department of Chemistry

Research Project #18

ABSTRACT

Calixarenes and the related azacalixarenes and azacalixpyridines are macrocyclic molecules that exhibit a range of host-guest chemistry with metal ions and organic molecules. Efficient selective binding of specific metal cations has been reported. These substances show promise as chelating agents to remove toxic metals from wastewater or for solubilizing metal cations.

Azacalixpyridines (Figure 1) have been prepared by a palladium-catalyzed coupling reaction between 2,6-dibromo-pyridine and 2,6-bis(methylamino)pyridine, or with 2-bromo-6-(methylamino)pyridine. The latter compound forms *N,N,N',N''-tetramethylazacalix[4](2,6)pyridine, 1*, in preference to larger macrocycles. Formation of linear polymers was avoided by running the synthetic reactions diluted in solvent. Similar azacalixarenes with phenyl substituents have been made but the unsubstituted parent compound, azacalix[4](2,6)pyridine, *2*, has not been reported.

This work will focused on attempts to synthesize *2* from 2-amino-6-bromopyridine. Protection of the amino group and use of dilute solutions to avoid dendritic oligimer formation was an important feature of the synthesis.

Preliminary computational work suggests that *2* is a shallow, bowl-shaped molecule, that is both more symmetrical and has a tighter pocket with opposing N-N through-space distances of 4.489 Å compared with N-N distances of 4.769 Å and 4.860 Å in *1*.

Figure 1. Structures of Selected Azacalixpyridines.
**Segregation Distortion in *Drosophila Melanogaster*: quantifying the Presence of Protamine in Spermatids**

Ms. Danielle M. Boyer* and Dr. Janna R. McLean

Department of Biology

Research Project #17 – ABSTRACT

During spermatogenesis in mammals and *Drosophila melanogaster* alike, an observed chromatin condensation or nuclear compaction is necessary. The compaction is believed to stop most transcriptional activity and provide support and protection for the DNA material within the sperm. This step happens in a mechanism known as the histone-protamine transition. This histone-protamine transition may be facilitated by RanGAP. RanGAP is involved in nuclear transport, and is normally localized to the cytoplasmic face of the nuclear membrane. As a nuclear transport protein, RanGAP is required for the import of molecules, such as protamines, into the nucleus. The *Segregation distorer* gene encodes RanGap; a mutation in this gene (*Sd*) causes RanGAP to be present and active inside of the nucleus, thereby disrupting nuclear transport. The mutation inhibits the proper condensation and compaction needed for one-half of the sperm to successfully mature, and thus causes a decreased viable sperm count. Using fluorescently tagged (eGFP) protamine we have observed and compared the incorporation of protamine into the sperm of control flies versus *Sd* flies. Observations were made with regards to development, concentration of mature sperm, level of fluorescence, structural integrity and color. The fluorescence microscopy techniques did in fact show differences with regards to sperm count, structural integrity, and color. These results indicate that the protamine-histone transition is altered in the *Sd* flies as expected.

**Aging and Water Intake in Rats**

Mr. Rex T. Lees* and Dr. Annette M. Gabaldon

Department of Biology

Research Project #2 - ABSTRACT

Near the end of life, many old animals (including humans, mice, and rats) undergo a rapid physiological decline in homeostasis. In humans, this phenomenon is referred to as geriatric failure to thrive syndrome. The goal of this study is to develop an animal model to understand the physiological mechanisms responsible for disrupted fluid homeostasis. As a first step, a system for continuously monitoring fluid intake in F344 X BN rats will be developed. Drinking responses to acute thermal stress and to acute water deprivation will be determined in older rats that have not yet undergone the transition to senescence, (the period of rapid functional decline near the end of life). The rats will continue to be monitored as they age and enter into senescence. For this study, a single animal will be placed into a metabolic chamber equipped with a water bottle suspended from a force transducer. The transducer relays information about bottle weight, with 1 ml of water corresponding to 1 gram of force. Data is collected using a PC data acquisition system (BIOPAC, MP35). Each time the animal makes contact with the sipper tube on the bottle, deflections in force are recorded, marking the time and length of each drinking bout. To measure the volumes of water consumed, the difference is taken from the weights recorded by the force transducer before and after the drinking bout. After developing and validating this method, we will begin longitudinal studies of drinking behaviors on older (20-mo-old) presenescence F344 X BN rats and monitor their fluid intakes into senescence. Because there are similarities in the end of life behaviors of senescent rats and elderly humans who suffer from FTT syndrome, the information gained from this research will help to better understand FTT syndrome in humans.
Analysis of Capillary "Aging" in Non-Aqueous Capillary Electrophoresis

Ms. Adrienne A. Andriello*, Mr. James D. Garcia^ and Dr. David C. Collins
Department of Chemistry
Research Project #3 - ABSTRACT

Capillary electrophoresis is a technique utilized to separate ions. These separations are usually performed in aqueous solvents. However, aqueous solvents cannot be used to separate neutral species. Non-aqueous capillary electrophoresis is a new technique that makes use of non-aqueous solvents in order to separate neutral species as well as to obtain better separation of some ions. This technique promotes more efficient separation as well as shorter migration times. Due to the "aging" of the capillaries used for this technique, the separation efficiency deteriorates and the migration times appear to get longer. The capillary begins aging the first time the buffer solution runs through it. This aging may be able to be halted, or even reversed, thus impacting the separation efficiency and migration times, through the analysis of the effect of different analytes and buffer solutions on the inner wall of the capillary.

Reisolation of Cellulases from Penicillium Spinulosum

Ms. Kristi J. Blasingame*, Mr. James S. Carsella and Dr. Sandra J. Bonetti
Department of Chemistry
Research Project #16 – ABSTRACT

The ascomycete fungus, *Penicillium spinulosum*, produces a multicomponent enzyme system consisting of 1,4-β-glucopyranosidase, β-D-cellobiosidase and microgranular cellulase for the conversion of cellulose into usable carbon sources making it an effective reducer of consumer and biological waste products. The impact of cellulase systems may prove to have an effect on alternative fuels and land fill industries. Cultures of the fungus were grown on Czapek-Dox minimal growth media for 23 days and the resulting *P. spinulosum* was inoculated into two different Shake Culture media. After 10 days, more growth was noted in the Shake Culture containing glucose as the carbon source than in the galactose media. The galactose media was separated by Buchner funnel filtration and had a pH of 1.98. The resulting filtrate underwent lyophilization resulting in the collection of 62.79g of filtrate. Freeze dried samples were reconstituted with a sodium citrate buffer solution, pH 3.51. The sample was purified initially by centrifugation and the supernatant was further separated by CM Sepharose cation exchange chromatography using a series of buffers with ascending pH and salt levels. The resulting 5mL fractions were collected by a fraction collector. Fractions were assayed for 1,4-β-glucopyranosidase, β-D-cellobiosidase, and microgranular cellulase using glucopyranosidase, cellobiohydrolase and cellulose azure assay protocols. Total protein was measured using the BCA Protein assay. Results were obtained using a spectrophotometer and were graphed on Excel. Each of the three cellulase enzymes were present in the fungal sample and eluted at differing times during separation indicating each is unique in its overall net charge and structure. Further testing will be done to determine structural differences of these enzymes.
Reaction of Acethydrazides with Ketones

Ms. Ashley E. Samek* and Dr. David L. Dillon

Department of Chemistry

Research Project #15 – ABSTRACT

We have investigated the reaction of several substituted acethydrazides, 1, and N'-alkylacethydrazides, 2, with several ketones, 3. Reaction of 1 under neutral to strongly basic conditions yielded the expected hydrazones, 4. Results for the reaction of 2 with various ketones, 3, follows a different course and will be presented.1,2

\[
\begin{align*}
\text{R}^1\text{N} = \text{H} & + \text{R}^1\text{C}=\text{O} \rightarrow \text{R}^1\text{N}=\text{N} = \text{R}^2, \\
\text{R}^1\text{N} = \text{H} & + \text{R}^1\text{C}=\text{O} \rightarrow \text{R}^1\text{N}=\text{N} \rightarrow \text{R}^2
\end{align*}
\]

1We gratefully acknowledge Dr. Melvin Druelinger for helpful suggestions.

Arsenite Exposure Compromises Early Embryonic Development in the Golden Hamster

Mr. Dave D. Unis*, Dr. Cassandra L. Osborne and Dr. Moussa M. Diawara

Department of Biology

Research Project #4 - ABSTRACT

Inorganic arsenic or arsenite has proven extremely detrimental in embryonic development; however there is little or no information on its toxicity on embryos within the luminal fluid. We evaluated the toxicity of sodium metaarsenite (NaAsO2) on preimplantation stage hamster embryos in vitro to acquire a better knowledge of its direct effects using both morphological and biochemical characterization. Embryos were grown in species specific complete culture media containing vehicle control (distilled deionized water), 25, 50, 250, 500, or 750 nM arsenite. A negative control (lacking bovine serum albumin BSA) was also used in each experiment. These treatments were incubated for 72hrs for the morphology evaluation and for 36 hrs for TUNNEL assay. Embryo survivability was expressed as a complete failure of zona lysis. The control group had a 78% survivability rate, a normal in vivo figure, and no evidence of deformities. Embryos in the low concentration of 25nM exhibited a survival rate of 63%, comparable to control group, and little or no deformities. At 50nM embryos showed minor of deformity and 55% underwent zona lysis. At 250 nM only 27% of the embryos developed normally; the rest exhibited major deformities. Arsenic showed total lethality at 500 and 750 nM characterized by major deformities and a complete failure of embryos to undergo zona lysis. The TUNNEL assay showed extremely high concentration of apoptosis in the lethal range (500nM) and little apoptosis in the control. The study underscores the sensitivity of preimplantation stage embryos to presence of even relatively small amounts of arsenic and other xenobiotics in the luminal fluid.
Assessment of Recombinant Molt-Inhibiting Hormone of the Land Crab, *Gecarcinus Lateralis*, Expressed in Yeast

Ms. Rosemary Martinez Townsend*, Ms. Andrea Gomez*, Mr. Joseph A. Covi and Dr. Donald L. Mykles, Colorado State University-Ft. Collins

Department of Biology

**Research Project #5 – ABSTRACT**

Molt-Inhibiting Hormone (MIH) of the land crab, *Gecarcinus lateralis*, regulates the secretion of ecdysteroid molting hormones by the Y-organs. In this study recombinant MIH (rMIH) was produced using a modified crustacean ringer solution for dialysis and the expression levels were quantified using Western blotting and Silver stain analysis. rMIH was expressed using the yeast, *Pichia pastoris*. The secreted rMIH was collected with the culture media and sequentially dialysed against 2X PBS and a modified crustacean ringer solution to prevent aggregation of the recombinant. Western blotting of the dialysate separated by native gel electrophoresis will demonstrated the expression of an unaggregated rMIH protein. Silver stain analysis and a BCA protein assay were used to quantify expression of the recombinant protein. rMIH represented 0.44% of total protein in dialysate and the concentration of rMIH was calculated to be 0.72 micro moles. Biological activity of the recombinant was confirmed using an *in vitro* assay. rMIH demonstrated inhibition of ecdysteroid secretion by cultured Y-organs at sub-micromolar concentrations. Recombinant MIH can help clarify the MIH signaling pathway and receptors. Understanding the MIH pathway will increase the knowledge of hormonal regulation in the molting cycles and growth of decapod crustaceans.

Psoralen Exposure Induces Malformations in *Xenopus* Embryos

Ms. Jennifer M. Cozzetta^, Dr. Cassandra L. Osborne, Dr. Janna R. McLean and Dr. Moussa M. Diawara

Department of Biology

**Research Project #14 – ABSTRACT**

We assessed the toxicity of 8-methoxypsoralen (8-MOP), a natural plant metabolite found used as a medicinal drug, on early embryo development of the African clawed frog (*Xenopus laevis*) by examining the developmental epoch spanning gastrulation to the freely swimming tadpole in FETAX solution. *Xenopus laevis* embryos were exposed at early gastrula to 8-MOP at concentrations ranging from 50µM to 200µM for 96 hours. Embryos were then fixed and serially sectioned for histological examination. A dose response relationship was observed for body length with the higher concentrations of 8-MOP stunting embryonic growth in all experiments. Mortality also increased in a dose-dependent manner. Other deformities included kinked tails, underdeveloped eyes, misshapen dorsal fins, swollen guts, a decrease in melanocyte production, and undefined spinal cords. Histological sections revealed abnormalities with varying degrees in a dose dependent manner. Some of these abnormalities included intestinal and epidermal malformations. TUNEL assay showed that 8-MOP induces apoptosis in exposed embryos in a dose-dependent manner, confirming our previous observations using rodent models.
Organic Reaction Cycles 2: Nitric Acid Oxidation of Meso-Hydrobenzoin

Mr. Jason G. Sullivan* and Dr. David L. Dillon

Department of Chemistry

Research Project #13 – ABSTRACT

As part of our long-term goal of sequencing organic laboratory experiments from products of one experiment to starting materials of another\(^1\), we have investigated the uncatalyzed nitric acid oxidation of meso-hydrobenzoin, \(1\). A survey of the literature revealed one report of this uncatalyzed nitric acid oxidation\(^2\) but review of the article did not reveal that meso-hydrobenzoin had been used. A similar oxidation of benzoin using uncatalyzed nitric acid as the oxidant is a well-known undergraduate textbook procedure.\(^3\) We have obtained 83 % average yield of benzil, \(2\), from meso-hydrobenzoin by this procedure. The product can be recycled for use by the next group of students in borohydride reduction of benzil.

Cyclic Intermediates in the Photooxidation of Hemithioacetals

Mr. Corey B. Smith^ and Dr. David L. Dillon

Department of Chemistry

Research Project #6 – ABSTRACT

It was previously reported that photooxidation of 1-ethylthio-1-methylethoxytrimethylsilane, \(1a\), gives a 5-membered cyclic silicate, \(2\). The mechanism proposed for this reaction involved rearrangement of an initially formed 6-membered cyclic silicate via a methyl migration from silicon to peroxy oxygen. We now report the results of photooxidation of 1-ethylthio-1-methylethoxytrimethoxysilane, \(1b\), in which methyl migration is not possible.\(^1-2\)

\[\begin{align*}
1a & \quad 1O_2 \quad -78^\circ C \\
& \quad S \quad O \quad SiMe_3 \\
& \quad \quad 78^\circ C \\
2 & \quad S \quad O \quad SiMe_3 \\
& \quad \quad 78^\circ C \\
1b & \quad 1O_2 \quad -78^\circ C \\
& \quad S \quad O \quad Si(OMe)_3 \\
& \quad \quad 78^\circ C \\
& \quad S \quad O \quad Si(OMe)_3 \\
& \quad \quad 78^\circ C \\
& \quad \quad \text{rearrangement or other reaction}
\end{align*}\]


Determination and Analysis of Microbes in Heavy Metal Soils from Pueblo, Colorado

Ms. Victoria A. Jones* and Dr. Brian D. Vanden Heuvel
Department of Biology

Research Project #7 – ABSTRACT

To determine the potential effects of heavy metals on the soil microbial community, we attempted to identify and measure microbial diversity present at a site of high lead, high arsenic as compared to a control site. To complete this study, we extracted DNA, amplified ribosomal genes using universal primers for bacteria and fungi, and sequenced resulting clones. This method was found to be ineffective for the purposes of this study. The fungal results were completely inconclusive. The bacterial results, while informative, were still too scattered for sufficient conclusions to be drawn. An in depth continuation of the bacterial study, using similar methods could prove to yield interesting and more conclusive results, however, the methods used in this study are not suggested for determination of the fungal diversity in heavy metal contaminated soils.

Monofluorination of Alkenyl Alcohols Using Electrophilic Fluorine as a Synthetic Route to Fluoroethers

Mr. Daniel K. Lesniewski*, Mr. Ryan J. Jiminez*, Ms. Lisa K. Helland* and Dr. Melvin L. Druelinger
Department of Chemistry

Research Project #12 – ABSTRACT

The reaction of unsaturated alcohols with F-TEDA BF₄ (Selectfluor™) in nitromethane affords fluoroethers via an intramolecular fluoroalkoxylation reaction as well as other products (primarily vinyl fluorides or, in acetonitrile, amides). Nitromethane is a better solvent than acetonitrile for the formation of fluoroethers. These products are believed to be derived from the formation of an intermediate β-fluorocarbocation resulting from the initial electrophilic addition of fluorine to the alkenyl alcohol. The β-fluorocarbocation may react either by deprotonation (vinyl fluorides) or by intramolecular cyclization (fluoroethers). Some alcohols yield multiple fluoroethers; this is believed to occur via hydride shifts which lead to the formation of more stable γ-fluorocarbocation intermediates. The alcohols reported in this study include β-citronellol, which yields an 8-membered cyclic fluoroether, 9-decen-1-ol, which yields 9- and 10-membered fluoroalkyl ethers, (E)-5-decen-1-ol, which yields 5-, 6-, and 7-membered fluoroalkyl and cyclic fluoroethers, and dihydromyrcenol which yields 6- and 7-membered fluoroethers.
Just How Obnoxious is *Elaeagnus Augustifolia*? A comparison of Frankia Diversity Between Imported and Native Species in Colorado

Ms. Lettie M. Williams* and Dr. Brian D. Vanden Heuvel

Department of Biology

Research Project #11 – ABSTRACT

*Frankia* is a genus of bacteria that may live independently or associate with some select plant families. During this association, *Frankia* fixes nitrogen (converts nitrogen gas to ammonia) within specialized root nodules of the plant; in return the plant continuously supplies fixed carbon to the nodule the *Frankia* resides in creating a symbiotic relationship. One plant species that possesses this relationship is *Elaeagnus angustifolia*, or the Russian Olive, which is currently listed as a noxious plant by the state of Colorado. By displacing native plants and by being associated with *Frankia*, Russian Olive may be changing the native microbial (*Frankia*) community by selecting different *Frankia* strains than the native plants. To get the most accurate comparison of the *Frankia* communities within native and exotic plants, we examined nodules of *Shepherdia rotundifolia*, a native plant that associates with Group III *Frankia* and compared them to those from *Elaeagnus angustifolia*. We found *Elaeagnus* appears to be able to associate with many different native strains of *Frankia*, and there appears to be very little overlap between the native *Shepherdia* and exotic *Elaeagnus* strains. This result signals that *Elaeagnus* may be indeed changing the *Frankia* community as it invades.

Geographical Representation of the Underground Storage Tanks of Pueblo Colorado

Ms. Jennifer L. Langley*, Ms. Sara P. Wilson*, Ms. Maiko Yasu*, Ms. Annie M. Berlemann and Dr. Lee Anne Martinez

Department of Biology

Research Project #8 – ABSTRACT

Underground storage tanks have the potential to leak into adjacent groundwater thereby posing human health and environmental risks. To address this issue, Geographic Information System software was utilized. In this study we collected information about underground storage tanks in Pueblo, Colorado. An electronic database of all known underground storage tanks was created using the tools of ArcGIS in conjunction with other technologies such as Microsoft Excel and Access. All of the underground storage tanks reported contain or contained petroleum products. We present the results of this research as a series of accurate thematic maps showing the location of all known underground storage tanks and demonstrating the status of the tank (leaking or non-leaking), responsible party status (known or unknown) and whether the tank is under voluntary clean-up. Although only a small percentage of the leaking tanks are not associated with a responsible party, these instances can still present a major problem for our community. The information gathered can be utilized by the city of Pueblo to aid in identifying areas that pose a public health risk or environmental risk now or in the future.
Identification, Classification, and Quantification of Inorganic Solids using Scanning Electron Microscopy

Mr. Aaron P. Erkman*, Mr. John P. Hatfield and Dr. David W. Lehmpuhl

Department of Chemistry

Research Project #9 – ABSTRACT

Scanning Electron Microscope (SEM) technology was utilized to examine, identify, and quantify samples in three categories: Metal Salts, Minerals, and Fossils. Exploration was made into preparation and mounting techniques for SEM. Analysis of seven unique metal salts using x-ray detection resulted in positive identification of all components in six of the seven samples. 17 minerals were examined and of these, 12 were positively identified. Some unidentified minerals were identified and some minerals were found to be incorrectly labeled. Five of 26 available fossils were analyzed but no trends have yet been deduced as a result. Understanding and execution of SEM operating techniques were greatly improved. Insight into what types of samples image well and produce good quantitative results was gained.

Influenza Induced GCF@: Protein Interactions

Mr. Kevin D. Marquez* and Dr. Kathleen E. Sullivan, University of Pennsylvania School of Medicine, Children’s Hospital of Philadelphia, Division of Allergy and Immunology

Department of Biology

Research Project #10 – ABSTRACT

The purpose of this study is to better understand protein-protein interactions thought to be induced by influenza infection. Definitions of these interactions can lead to a better understanding of cellular responses to viruses. GCF2 is a transcriptional repressor that has been found to interact with several proteins. Among these proteins are p38 and IRF-3. Influenza infection may drive the interaction of GCF2 with phosphorylated p38 as well as IRF-3. p38 is a member of the MAP kinase family which mediates responses to stress and growth factors, and is essential for successful viral replication. IRF-3 is a transcriptional inducer of anti-viral genes necessary for host defense. Immunoprecipitation followed by western blotting will be used to better characterize these interactions with GCF2. Additionally, the use of immunofluorescence will allow us to visualize the GCF2:p38 interaction using murine monocytes. This study characterizes the antiviral activity of the GCF2:p38 interaction with respect to influenza by determining how long after viral infection this protein interaction occurs. We will also determine whether the GCF2:IRF-3 interaction occurs in the cytoplasm or in the nucleus. GCF2 and p38 appear to be constitutively associated, however, the association is increased following influenza infection. Furthermore, the GCF2 and IRF-3 interaction is found in the nucleus and cytoplasm and also appears to be constitutively associated, but influenza infection seems to decrease this association. Defining the regulations of GCF2 has important implications for control of influenza.