

LRIG Mid Atlantic Posters for May 22nd 2008 Technology Exposition

HIGH SCHOOL DIVISION

Vanessa Bedoya Morristown High School

Faculty Advisor: Erin Colfax

Evaluating the Bedside Manner of American Physicians

In the future what patients have to say about their doctors is very important. The Bedside Manner of a physician is how the physician interacts with the patient. The investigator is going to run a study and evaluate physicians and their bedside manner then the investigator will follow up with the patients and see how certain doctors have more effect than others. This will be done by observing six different physicians on ten to twelve different appointments and rounds in his/her own practice and hospital. The goal of this investigation is to evaluate the bedside manner of physicians and determine the impact that it has on a patient's attitude to recover.

Morgan Cole, Morristown High School

Faculty Advisor: Erin Colfax

Long and short term memory effects on the content of teenage dreams by exposure to visual pre-sleep stimuli

Abstract:

Dreams are experiences that occur in the brain while a person is sleeping. Dreams originate when the prefrontal cortex of the brain is less active than the limbic system. In order to test for the memory source of dreams, a pre-sleep stimulus will be used. The stimulus chosen will be a non-descript piece of artwork. The purpose of this experiment is to determine if long term or short term memory has an effect on dreaming and if the visual stimuli will appear in the content of the dreams. This will be done by exposing 20 teenage male and female subjects to the selected art work just prior to sleeping. Subjects that meet selection criteria will be invited to participate in the study. Subjects will be given a questionnaire on their sleep habits and patterns. The Investigator will determine if the long term or short term memories of pre-sleep visual stimuli have any impact on the content of dreams.

Paige Diamond, **Morristown High School**
Faculty Advisor: Erin Colfax

Color perception in memory and learning using color overlays as it relates to 5th graders.

Color perception is how one comprehends or perceives color in the brain. Color helps the visual system to interpret and commit to memory complex images both faster and more efficiently. The purpose of this investigation is to discover whether important information can be proficiently recalled from memory by specific colors. Also, whether there is general universal background color that the majority of students respond to in order to create a basic enhancement of every student's capacity to recall information. This will be done by testing 60 5th grade male and female subjects. Subjects will be asked to read the children's story, The Frog Prince, while using different *Irlen color overlays*. The goal of this study is to test a subject's ability to retain written information from various selected color overlays and to try to determine the principle color that provides subjects with the highest retention status.

Sara Fisch, **Morristown High School**
Faculty Advisor: Erin Colfax

Color-grapheme synesthesia in adolescents

Synesthesia is a condition where a person's senses are combined. For example, a person with color-grapheme synesthesia will combine colors and graphemes (small units of words or letters) by associating one to the other. This investigation will explore how color-grapheme synesthesia affects number cognition in adolescents. This experiment will be conducted by using flashcards with math problems displayed in different colors on them. Thirty male and female adolescent subjects will be asked to solve the math problems that are flashed in front of them as rapidly and accurately as possible. The goal of this investigation is to determine if subjects who have color grapheme synesthesia can solve mathematical problems faster when presented with digits that correlate to their identified color number scheme.

Stephen Gilmore, **Morristown High School**
Faculty Advisor: Erin Colfax

Urban Heat Island Phenomena,

Urban heat island phenomena is an abnormal warming of a city due to radiation fluxuations brought on by common construction materials such as steel and concrete when compared to rural and suburban areas. The goal of my proposed study is to see if the urban heat island phenomena can be replicated in an urbanized large town. To discover this possible replication, I will compare temperatures in a suburban and an urban area over three weekends and compare their rates of urbanization to see if there is a correlation between the two parameters. If a correlation is found, one can safely conclude that the urban heat island phenomena is not a global warming pattern exclusive to cities, but to all urbanized human population centers. In short, this proposed study can help illustrate the fact that global warming patterns do not effect only certain environments, but ALL environments.

Hannah Goldberg, **Morristown High School**
Faculty Advisor: Erin Colfax

The effects of alginate-apple puree food films on Escherichia coli K-12

Food technology is the study of the composition of food and the application of this knowledge toward the enhancement of food handling processes. The purpose of this investigation is to create a food film that prevents Escherichia coli K-12 growth on Ocimum basilicum. This will be done using an alginate-apple puree food film mixed with oregano oil, which has been previously proven to reduce Escherichia coli counts. The long term goal of this study is to create a useful technology that can be applied to any form of vegetation susceptible to Escherichia coli infection, such as Spinacia olaracea.

Jennifer Hession, **Morristown High School**
Faculty Advisor: Erin Colfax

The effects of auditory distracters on a teen’s ability to recall information

Memory is the mental capability and capacity to recognize and recall information such as facts, sights, or how to perform an action. This study aims to explore how an outside stimulus such as music interferes or interacts with human memory. This will be accomplished using a series of memory tasks involving word lists which will be performed in a silent environment and an environment with music. The prediction is that students will lose efficiency in memory when music is played in the background while they study the word lists. The hope is that this investigation will help high school students study more efficiently by informing them of the effects of music on their ability to recall information.

Anna McCabe, **Morristown High School**
Faculty Advisor: Erin Colfax

Determining canine breed success in evaluations for entrance into animal assisted therapies and activities.

Animal-Assisted Therapy is means of interacting with humans for a therapeutic use; while Animal-Assisted Activities are referred to as “meet and greet encounters” where humans interact with an animal for a few minutes. Both types of therapy have proven to lower blood pressure, anxiety, and loneliness in humans. The purpose of this investigation is to determine which breed of canine is most likely to pass an animal assisted therapy and activities evaluation. This will be done by analyzing and interpreting canine evaluations at St. Hubert’s Animal Welfare Center in Madison NJ. Data recorded will attempt to uncover patterns and thus translate into success rates of specific breeds. Only subjects that are classified as a canine, have completed evaluations, and have been evaluated at least once in the animal assisted therapy and activities program at St. Hubert’s in Madison, NJ will be considered for this study. The investigator will determine which breed of canines has a higher success rate by examining their evaluations for participation in animal assisted therapies and activities programs.

Tim Stoeckle and Jordan Zaid,, **Morristown Friends School**,
Faculty Advisor: Drew Newmann

The Effects of Boiled and Aggravated Pond Water on Basil

Abstract

In this experiment, basil (*Ocimum basilicum*) was used to test the effects of growing a plant with boiled pond water or aggravated pond water from the same source. Bacteria that naturally grow in pond water is either killed off, by boiling, or stimulated, by aggravating. Overall, is killing the good and bad bacteria worse than stimulating them? After twenty days, the plant receiving boiled pond water rapidly began to turn a yellowish-brown, shriveled, and died. There were no out-of-the-ordinary changes in the basil plant receiving aggravated water.

Jacob Montgomery and Justin Stark, , **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Sure you want to use that fertilizer?

Abstract

This experiment tested the effects of fertilizers on plant growth and on the environment surrounding the area in which the fertilizers are used. Three different types of commercial fertilizer and organic compost were each used on plants of the same variety for a 25 day period. The results indicated that the fertilizers greatly help the growth of the plants and increase the plants' speed of growth and overall health. It was also found that the fertilizers do pollute the surrounding environment but are no worse for the environment than organic options. The most environmentally safe way of growing plants would involve adding no extra compounds. However, the most practical method regarding speed of plant growth would be to use commercial fertilizers. This experiment only tested for the compound nitrite. For conclusive information on the effects of fertilizers on the environment, more experimentation is needed.

Emma Baiada and Ally Shaffer, , **Morristown Friends School,**
Faculty Advisor: Drew Newmann

To SEE or Not To SEE

Abstract

Levels of photosynthesis were tested by placing leaves under various color light. A process was followed, which eventually led to the development of a picture on the leaf. It was hypothesized that the picture would come out the

clearest on the leaf that was under the red and blue light, and come out the worst on the leaf under the yellow and green light. Once the process was completed, the results were opposite of what was hypothesized. After completing the experiment, the green and yellow leaves developed the clearest. This inverse reaction is believed to have occurred because the cellophane that was used in order to create colored lighting screened out the wavelengths from the plants that our eyes are able to see.

Chelsea Loring and Rachel Mulligan, **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Soil Substances for Indoor Plants: Effects on the Growth and Leaf
Production of Vinca Vines

Abstract

Indoor plants are most commonly grown in potting soil to stimulate successful plant growth. Over a time period of twenty-five days, four common household plants, vinca vines, were grown in four different soils (soil, sand, clay and gravel) to test their sustainability of plant life. After studying the plants' growth, it was concluded that, although plant grown in potting soil resulted in a greater number of leaves, plants grown in clay were tallest.

Sarah Connell and Jessica Walker **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Just Spit Now, Ask Questions Later.

Abstract

Cinnamon, peppermint and other strong flavors are commonly added to toothpastes, mints and mouthwash. In order to test the hypothesis that these flavorings act as natural bactericides, saliva samples were diluted and plated on nutrient broth agar at 37°C. Ultimately, the flavorings were found to be less a factor in reducing oral bacteria than the simple, mechanical agitation involved in brushing teeth.

Keyanah Freeland, **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Studying the effects of age on memory and protein synthesis.

Abstract

The act of memory is a profound process of protein synthesis, meaning that when one is remembering something, one is actually reconstructing proteins, and changing their memories. This study tested whether the brains of adults were more likely to have a better ability to reconstruct proteins and in essence, remembering things more accurately. Four separate age groups were interrogated with questions for a minute and a half to two minutes to test their memory. It was found that the adults over 25 years old showed the best ability to remember.

Samantha Cruz **Morristown Friends School,**
Faculty Advisor: Drew Newmann

The Effects of Saliva Production and its pH Levels Due to Chewing Gum

Abstract

This experiment was done to determine the affects of saliva production and pH levels due to chewing gum. In order to determine if the gum increased the volume of saliva produced, as well as the pH levels, fifty subjects of all age groups were tested. Each subject, one at a time, chewed four different kinds of gum, tested their pH levels with test strips, and spat in a measuring cup to determine any change in volume. The experiment showed that chewing gum can drastically increase your saliva production, and slight cause pH levels to become more basic. Because of the sample size there wasn't a drastic correlation that could've determine if age, or gender had anything to due with these changes.

Katie Cushing **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Study of Sanitary Habits and Hand Bacteria in a High School Population

Abstract

Hand washing has been proven to prevent cross contamination and the spread of *E. coli* and *S. aureus* in the community. This study set about to determine whether females or males were dirtier after using the restroom and any if there were any correlations in the hygiene practices among demographics, with the hypothesis that females were generally cleaner. The hands of forty four students and faculty in a high school were swabbed upon exit of the restroom and cultured, and each subject was given a survey to complete about their personal hygiene choices while in the restroom. In general females had the least amount of colonies of *E. coli* compared to the males. Seventeen year old males and females had the most *E. coli* present on their hands. Among the males the most bacteria was found in the age group seventeen years and younger. Among the males the most bacteria was found in the age group seventeen years and younger. This outcome is probably due to the fact that more females washed with hot water and for longer than ten seconds than males, even though almost all subjects used soap.

Dana Ocher

Comparisons of the Shoulder's Range of Motion Between Swimmers, Girl's Lacrosse Players, and Runners

Abstract

Range of motion is the degree at which a joint is able to rotate in any direction. The shoulder's range of motion was taken of twenty subjects that were swimmers, girl's lacrosse players, and runners ages fourteen to eighteen in order to see if there was a difference in ROM depending on how much each type of sport uses the shoulder. Based on the results, there is no major difference in the shoulder ROM of different athletes.

Mike Stobbe **Morristown Friends School,**
Faculty Advisor: Drew Newmann

How much is too much caffeine?

Abstract

Many of today's consumer's drink caffeinated beverages in the morning and throughout the day to give them an extra edge to get their day moving. The experiment was designed to observe the severity of the effects done to the consumers' heart rate. Four colonies were cultured and observed through a microscope. The *Daphnia* were given two different levels of caffeine through a Guarana supplement. Results showed a considerable increase in

heart rate as more caffeine was administered. In conclusion, caffeine can have a significant effect on normal cardiovascular function and consumers should be cautious of their caffeine intake.

Sarah Connell and Jess Walker, **Morristown Friends School,**
Faculty Advisor: Drew Newmann

Cinnamon vs. Peppermint: Effects on the Number of Mouth Microbes in Saliva Samples

Shree Agrawal, **John P. Stevens High School, Edison NJ**

“The effect of UV Light exposure on amylase-producing bacteria on the nucleotide sequence.”

The focus of this study is to monitor the effects of UV light on amylase-producing bacteria. When amylase-producing bacteria are exposed to UV light, the bacteria undergoes a mutation. In some cases it may be beneficial or detrimental to the bacteria. In this experiment, it creates more amylase. In a 5% starch environment with 30 seconds of UV light, there is a maximum amount of amylase production. Amylase is an enzyme that breaks down starches into a simpler monosaccharide like Glucose. It is usually found in digestive organs and saliva for digesting food. Based on previous studies, UV light is closely related to cancers and other mutations, and so in this organism there is evidence that supports cancer or some form of mutation. As opposed to normal parameters (without UV light or starch), there is an increased number of bacterial colonies and production of amylase.

COLLEGE AND UNIVERSITY DIVISION

Luis Posadas, **William Paterson University,**

"Binary Vector Development for GmGRP Silencing in Soybean"

Abstract: The molecular interaction between soybean cells and the syringolide elicitor showed a defense signaling pathway in which GmEFH and GmGRP proteins appeared to be phosphorylated specifically during the syringolide-induced defense response (Slaymaker and Keen, 2004). Our long-term goal is to investigate the functional role of these two proteins in the soybean system. In addition, we will attempt to establish a functional role for P34, a known syringolide-binding protein, which is considered to be the elicitor receptor in the soybean system and which is not a product of the plant's R-gene and thus, a key role player in the "guard" hypothesis (Ji et al., 1998). In this project, two binary vectors containing GmGRP target sequences will be generated and will be used to post-transcriptionally silence GmGRP and its closest homologues in transgenic soybean plants. These transgenic lines will enable functional analyses in order to test the role of this gene during the syringolide-induced defense response.

Karthik Gopal, Anna Yap, **William Paterson University.**
Faculty Advisor Jaishri Menon

"Localization and gene expression for nitric oxide synthase isoforms during intestinal remodeling in anuran tadpoles, *Xenopus laevis*"

Anuran metamorphosis involves reorganization of the body plan, remodeling of the intestine and regression of the tail which involve apoptosis, cell proliferation and cell differentiation. Entire process of metamorphosis is controlled by thyroid hormones. Menon and Rozman (2007) have shown that oxidative stress (free radicals) plays an important role in the intestinal remodeling and tail regression in tadpoles of the African Clawed Toad, *Xenopus laevis*. Common examples of the free radicals include the hydroxyl radicals (OH), super oxide ($\times O_2^-$) hydrogen peroxide (H_2O_2), and nitric oxide (NO). NO, a pleuripotent physiological messenger is produced by oxidation of L-arginine catalysed by enzyme nitric oxide synthase (NOS). Kashiwagi et al., (1999) have reported that NO increased in cultured tadpole tail in T_4

containing medium. The objectives of the present study were to investigate a) cell specific localization for NOS using immunohistochemistry (IHS) b) if thyroid hormones control gene expression for NOS isoforms (I-neuronal, II-inducible and III-endothelial) in intestine during different stages of metamorphosis, b). Tadpoles were staged according to Nieukoop and Faber (1967). Immunohistochemically, both NOS I and III are co-expressed in cytoplasm of epithelium and brush border of the mucosa. NOS II was not expressed at all. Increased apoptosis in larval epithelium at stage 61/62 is associated with low expression of NOS 1 and 3. RT-PCR results also suggest that at stage 61/62 and T₃ treatment down regulates NOSI. At the completion of intestinal remodeling (stage 63), both the enzymes were co expressed in mucosal epithelium and connective tissue layer. In conclusion, NO might be playing a crucial role as an endogenous regulator in intestinal remodeling of anuran tadpoles promoting apoptosis or cell proliferation/differentiation depending on concentration of NO and the cell type. Additionally, thyroid hormones might be responsible for down regulating gene expression for NOS 1 during critical period of remodeling.

Stephanie Allen and Federico Floridi, **Marymount Manhattan College**
Faculty Advisor Kelsey Jordahl

"Shapes and size distribution of Pacific seamounts"

Marc Lindner, Andrew Glowacki, **Becton College - Fairleigh Dickinson University**
Faculty Advisor Gloria Anderle

“ A Molecular Dynamic Study of the Effect of a Glycine to Serine Point Mutation on the Structure of Collagen-like Model Peptides Containing a Reputed Stable Region of Collagen II “

Andrew Glowacki, Marc Lindner, **Becton College - Fairleigh Dickinson University**
Faculty Advisor Gloria Anderle

A Comparison of End Restraints for the Molecular Dynamic Study of Model Collagen II-like Peptides in Explicit Water at 310K”

Joseph Jablonski **Becton College - Fairleigh Dickinson University**
Faculty Advisor Gloria Anderle

FTIR Characterization of Chitosan Nanoparticles

Medha Persaud, **Robert Wood Johnson Medical School, Department of Pharmacology**
Faculty Advisor Sally A. Meiners, Ph.D.

Modification of nanofibers with growth factors to create an artificial basement membrane for the culture of astrocytes

Spinal cord injuries are responsible for diminished function or complete loss of sensory and motor function in individuals with dislodged bone fragments, torn disc fabric, or bruised or torn ligaments of the spinal cord. Statistics from the National Spinal Cord Injury Association reveal that close to 250,000 - 400,000 individuals in the United States suffer from spinal cord injuries with approximately 11,000 additional injuries per year. However, despite many advances in spinal cord injury research, there is currently no restorative therapy. The focus of this lab is to create implants formulated from biodegradable electrospun nanofibers to bridge spinal cord injury sites. The success of the implants is dependent on axonal and cell growth, which will facilitate a reformed neuronal circuitry following implants.

Regeneration and growth of axons are highly influenced by astrocyte-derived extracellular matrix (ECM) molecules; hence, astrocytes are utilized *in vitro* to recreate extracellular matrix ideal for axonal growth. To construct an applicable model, astrocytes are cultivated on nanofibers designed to mimic the three-dimensional scaffolding of the ECM *in vivo*. Nanofibers are derived from polyamide polymer, which provides nanotopography, cytoskeletal organization and adhesion properties. To enhance conditions for proliferation of astrocytes and axonal growth, the nanofibers are covalently modified with fibroblast growth factor-2 (FGF-2), vascular endothelial growth factor (VEGF), and transforming growth factor- β (TGF- β). Initial results show increased adhesion and proliferation with all three growth factors although, FGF-2 and VEGF were more active than TGF- β .

Furthermore, covalently bonded growth factors were more active than soluble growth factors despite the fact that the concentration of soluble

growth factor far exceeded that of bonded growth factor. These results suggest that polyamide nanofibers derivatized with growth factors might provide a good scaffolding material for the introduction of astrocytes into the damaged spinal cord.

VENDOR POSTERS

Genetically Encoded Luciferase Biosensors for Screening Potentially Difficult Targets

Frank Fan, Brock Binkowski, Susan Wigdal, Braeden Butler, Ken Lewis, Pete Stecha, and Keith Wood
Promega Corporation, 2800 Woods Hollow Rd Madison, WI 53711

Many potentially druggable targets have proven to be difficult to adapt to many screening programs, especially as cell-based assays. In recent years we have developed new bioluminescence-based assays to address such challenges. Bioluminescent assays are uniquely suited for high-throughput screening due to their inherent high sensitivity, wide dynamic range and low susceptibility to compound interference. In this report, we present a new biosensor technology to address two popular targets in pharmaceutical screening: proteases and GPCRs. The biosensor technology is based on a genetically encoded, circularly permuted form of firefly luciferase into which is inserted a cAMP-binding domain or a protease recognition site. We demonstrate the broad applicability of the assay using proteases and their cognate sites, and through the direct detection of cAMP within living cells. Studies on the endogenous β 2-adrenergic receptor in HEK293 cells with the biosensor for cAMP demonstrate the ability to monitor intracellular cAMP dynamics in real time. The biosensor assay is also highly amenable to HTS. These bioluminescent assays provide better tools for current needs in drug discovery.

A Novel Sensitive nanoCuvette

Yufeng Ma, Microdysis, Inc.,

The nanoCuvette, developed at MicroDysis, Inc., has demonstrated high sensitivity (ppt concentrations) and fast detection (less than one minute) for a variety of substances in aqueous form. It is an optical sensing hybrid system obtained by creating a nano-engineered microfluidic channel to a conventional low-cost plastic cuvette. The nano-engineered microfluidic channel is structured in such a way that highly carboxylized carbon nanotubes are embedded in the sidewalls of the microchannel. Nearly any sensing molecules with primary amino or carboxyl groups can be

implemented on the system for multiplex detection. Because it is combined with conventional cuvette, the detection system is very friendly and can be used in most of current UV instruments.

Kinase Inhibitor Profiling and Compound Characterization on a Microfluidic Mobility-Shift Platform

Laurel M. Provencher, Abbie L. Esterman, Seth P. Cohen, Caliper Life Sciences, Hopkinton, MA

The decision to move a candidate compound into the drug development process often hinges on the selectivity of the compound for its target and the mechanism by which the compound affects enzyme activity. Using the protein kinase ERBB4 as a target enzyme and a known ERB inhibitor, we have demonstrated how in-depth compound evaluation can be achieved with the Caliper microfluidic mobility-shift platform. ProfilerPro™ Kinase Selectivity Assay Kits were used to profile the ERB inhibitor and additional control inhibitors against a panel of 96 kinases. This system enables the rapid determination of kinase selectivity against a panel of pharmacologically relevant and active protein kinases in one day at the laboratory bench. The extent of inhibition by candidate compounds is measured directly by quantifying the level of both un-phosphorylated peptide substrate and phosphorylated product after electrophoretic separation using Caliper's LabChip™ assay technology. After generating inhibition profiles, the interaction between the ERB inhibitor and ERBB4 was further investigated. LabChip™ assays were used to determine IC50 values, confirm irreversible inhibition, measure the concentration of active enzyme, and characterize slow-binding kinetics. The entire study was carried out using the Caliper EZ Reader II instrument which produces consistent high quality data in either end-point or kinetic assays.