

GENEVA COLLEGE



31st Annual

Western Pennsylvania Biology Research Symposium

Symposium Schedule and Proceedings

*Hosted by the
Department of Biology*

*Geneva College
Beaver Falls, PA
15010*

Saturday, April 17, 2010



31st Annual Undergraduate Biology Symposium for Western Pennsylvania

Saturday, April 17, 2010

Northwood Hall
Geneva College
Beaver Falls, Pennsylvania

Schedule of Events

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| 08:30 - 09:00 | Registration/Continental Breakfast/Setup Posters |
| 09:00 – 09:15 | Opening Remarks – Dr. Kenneth Carson, Provost |
| 09:15 – 10:00 | Poster Session I (abstracts 1 – 18 authors stay with poster) |
| 10:00 – 10:15 | Break |
| 10:15 – 11:00 | Poster Session II (abstracts 19 – 37 authors stay with poster) |
| 11:00 – 11:50 | Keynote Speaker – Dr. Brad Goodner, Hiram College (in SE 22) |
| 11:50 – 01:00 | Lunch/Meeting of faculty |
| 01:00 – 02:00 | Oral Presentation session 1 (4 authors) |
| 02:00 – 02:15 | Break |
| 02:15 – 03:15 | Oral Presentation session 2 (4 authors) |
| 03:10 – 03:20 | Closing Remarks – Dr. Daryl Sas, Chairman, Biology Department |
| 03:20 – 03:30 | Awards Presentation |

Poster Presentations

#1 - The Influence of Pre-and Post-Natal Fluoride Exposure on the Symptoms of Attention Deficit

Hyperactivity Disorder in Sprague-Dawley Rats. Margaret E. Arnone* Department of Biology, St. Vincent College.

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common childhood behavioral disorders persisting through adolescence into adulthood. The disorder affects behaviors of attention, impulsivity, and hyperactivity. Treatments include behavior management, psychotherapy, and family therapy, but there is no cure. A linkage between thyroid dysfunction and ADHD has been suggested in both rodent and human studies; however the association is tenuous and remains controversial. This experiment tested the relationship between thyroid function and ADHD by inducing thyroid dysfunction through prenatal and/or postnatal exposure to fluoride, an antagonist of iodine, and monitoring resultant behaviors via open field and novel object assays. Consistent with hypotheses fluoride exposure, whether prenatal or postnatal, resulted in symptoms of hypothyroidism including increased thyroid weight, reduced food and water consumption, and reduced wheel running (male-specific); while behavioral analyses revealed symptoms of hyperactivity (i.e. enhanced exploration and time with unfamiliar objects). Serum triiodothyroxine (T3) levels however, were not reduced in fluoride treated animals.

#2 – Prevalence of Mosquitoes carrying Plasmodium Parasites. Carol Bampoe*, Department of Biology, Thiel College.

The research done was to compare the prevalence of mosquitoes carrying Plasmodium parasites in two different areas, rural and urban. The population of the rural area was approximately 1,000 inhabitants; where as the population of the urban was approximately 10,000. The study was conducted in the country of Ghana in West Africa and involved the capturing of mosquitoes by the pyrethroid spray catch (PSC) method. This is also known as the knock down method because it temporarily inebriates the mosquitoes for easy pick up. The ELISA (enzyme linked immunosorbent assay) test was performed where monoclonal antibodies are used to identify the positive sporozoites in the mosquitoes. Out of the 92 mosquitoes collected overall, only one tested positive. This mosquito was from a rural area. No conclusion regarding the relative prevalence of infected mosquitoes in rural and urban areas could be drawn from this data.

#3 - Antilisterial Efficacy and Lack of Genotoxic Potential of *Listeria monocytogenes* Specific Bacteriophages.

Danielle M. Barton*, Dr. William J. Mackay, Dr. Christopher H. Sommers, and Kathleen Rajkoswki (William J. Mackay), Edinboro University of Pennsylvania, Department of Biology and Health Services- Biology

Listeria monocytogenes, a psychrotrophic food-borne pathogen, is an occasional post-process contaminant on foods. In this study, the use of a commercial bacteriophage product was evaluated for the ability to inactivate *L. monocytogenes* inoculated (10^4 - 10^5 CFU/cm²) onto raw catfish. Spray application of bacteriophage (10^7 PFU/cm²) resulted in a 2 log reduction of *L. monocytogenes* on raw catfish stored for 6 days at 10 °C. Published studies on the safety of bacteriophage products using *in vitro* genotoxicity assays are extremely limited. The bacteriophage preparation did not induce mutations in the bacterial mutagenicity tests or 6-thioguanine resistant mutants in human TK6 lymphoblasts, either with or without exogenous metabolic activation. No induction of micronuclei (chromosome fragmentation) was observed in human TK6 lymphoblasts following exposure to bacteriophage, either with or without exogenous metabolic activation.

#4 - The Effects of Chronic Stress on Behavior and Body Condition in Dusky Salamanders Jacqueline Bliley* and Dr. Sarah K. Woodley. Department of Biological Sciences, Duquesne University.

The stress response is a conserved adaptive mechanism in vertebrates. This response offers a myriad of benefits to the coping organism such as mobilization of energy stores and increased anti-predator behaviors. At the same time, stress responses are believed to suppress non-essential activities such as mating. Glucocorticoid hormones like corticosterone (CORT) are a key mediator of the stress response. We examined stress responses of a terrestrial salamander, *Desmognathus ocoee*. We hypothesized that 1) animals respond to repeated stressors with changes in behavior (activity, feeding, and mating), body weight, reduced immune function, and decreased neurogenesis and 2) these changes are due to stress induced elevations of CORT. We tested our hypothesis via daily application of a noninvasive dermal patch containing CORT or oil vehicle. Dermal patches transdermally deliver steroid hormone and elevate plasma CORT levels. Other treatments consisted of a handling stressor and a group that was not treated in any way. Both handling and treatment with CORT resulted in decreased body weight. Handling, but not treatment with CORT, reduced feeding and activity. Contrary to expectation, all animals had high levels of mating. To summarize, 1) chronic stress had no impact on mating, and 2) CORT did not mediate handling-induced behavioral changes. In conclusion, the stress hormone CORT is not involved in behavioral responses to stressors, but may be involved in metabolic responses to stressors.

#5 - Ankle Sprains And Proprioception In Athletes Cory Borland*, Biology Department, Thiel College.

Proprioception is the ability to know how a joint is oriented without looking at it and can be measured using a variety of instruments. In this experiment, a wobble board is used to determine how ankle sprains have an effect on proprioception in athletes at Thiel College. The only stipulation on choosing subjects was that they could not have had previous ankle rehabilitation that involved proprioception in any way. Ten athletes from each of seven different sports were chosen as well as ten average students to be used as a control. The experiment begins with the subject being seated with their eyes closed and one foot placed on the board. They are then measured on how well they can move their ankle to level the board (parallel to the ground). The information collected is separated in order to test two different aspects of the athletes. The first comparison is to determine whether or not there is a significant difference in proprioception between having zero, one or multiple sprains. The results show that as the number of sprains increases, proprioception decreases. The second comparison separates the athletes into their sports and compares the sports with one another. Even though some sports displayed more sprains than others, the measurements were combined to compare the average proprioception between each sport. The results showed that most, but not all, of the sports were quite similar to one another with regards to proprioception.

#6 - A Genomic Approach To Studying Multiple Sclerosis Ashley Bruno^{4*}, Jennifer Bennett^{1,2}, Thomas Scott^{1,2,3}, Garth D. Ehrlich^{1,2} and Fen Ze Hu^{1,2} 1. Center for Genomic Sciences, Allegheny-Singer Research Institute, Allegheny General Hospital, Pittsburgh, PA 15212. 2. Department of Microbiology and Immunology, Drexel University College of Medicine Allegheny Campus, Pittsburgh, PA 15212. 3. Department of Neurology, Allegheny General Hospital, Pittsburgh, PA 15212. 4. Department of Biology, Washington and Jefferson College, Washington, PA 15301

Multiple Sclerosis (MS) is an autoimmune disease characterized by immune-mediated demyelination within the central nervous system, resulting in axonal and neuronal loss, as well as brain and spinal cord atrophy. Among other medications, β -interferon (β IFN) is commonly prescribed to patients suffering from MS. Previous research has suggested that β IFN treatment increases the expression of IL-12 R β 2 and decreases the expression of IL-23R, both of which share a common subunit, IL-12R β 1. Despite the common subunit, IL-23 stimulates the differentiation of T_H17 cells which are known to be present in inflammatory diseases while IL-12 stimulates the differentiation of T_H1 cells. It is proposed that MS patients undergoing β IFN drug therapy undergo a T-cell switch from T_H17 cells to T_H1 cells, switching the IL-12R β 1 from IL-23R to IL-12R β 2. To test this hypothesis, blood samples were taken from a pool of patients with Relapse-remitting MS prior to β IFN treatment, the day after β IFN treatment, and six months into β IFN treatment. Microarray analysis was used in order to identify whether or not there was a change in gene expression of IL-12R β 2 and IL-23R, while flow cytometry was used to quantify the amount of IL-12R β 2 and IL-23R present in patients. Western blot analysis was used to identify the receptors IL-12R β 2 and IL-23R and the signaling molecule STAT4, which is activated in response to IL-12. While western blot data were inconclusive, microarray and flow cytometry results indicated an increase in IL-12R β 2 and a decrease in IL-23R, supporting the hypothesis that β IFN treatment plays a role in switching IL-12R β 1 from IL-23 to IL-12.

#7 - Comparing High School Athlete Academic Performance In Season And Out Of Season Amanda M. Colvin*, Thiel College.

The objective of this research was to test the hypothesis that high school sports should not overall affect student athlete's academics in season versus out of season. Student grades were collected from three schools in the Penncrest School District in Northwestern Pennsylvania. Core classes (science, math, history, and English) were averaged by each grading period; each grading period was assigned an "In" or "Out" of season; then the "In" and "Out" of seasons grades were averaged, in order to perform statistical analysis. A paired t-test was used to analyze the student's data, which supported the hypothesis that there was not a significant difference between in season and out of season academic grades for athletes. However, the data showed more of a potential difference in ninth grade students as opposed to twelfth grade students; additionally, some students may be affected significantly by sports (either beneficial or detrimental), depending on the individual.

#8 - Characterization Of Embryonic *Twist* Expression Using In Situ Hybridization In *Manduca Sexta* Ben Daggett*, Department of Biology, Washington and Jefferson collage

In the moth *Manduca sexta*, there are several patterns of muscle development. During adult development, some muscles require innervations for proper growth, while others do not. To understand the differences in regulation of muscle development, muscle precursors can be identified based on the expression of the *twist* gene, which is a mesodermal determining factor, using in situ hybridizations. The focus of the research was to develop a method for performing in situ hybridizations in *M. sexta*. It was found that by using a hydrolyzed probe, and blocking endogenous alkaline phosphatases, staining patterns demonstrated an evolutionarily conserved pattern of embryonic *twist* expression with other insects was observed. This technique will be used to examine expression of other muscle regulatory genes in *M. sexta*.

#9 - The Effects Of Photobiomodulation Via Light-Emitting Diodes (405-Nm And 670-Nm) On *Staphylococcus Aureus* Growth Greg Delost*¹, Amanda Stolz¹, (Janis Eells² and Troy Skwor^{1,3})

¹Gannon University, Morosky College of Health Professions and Sciences – Biology, Erie, PA; ²University of Wisconsin – Milwaukee, College of Health Sciences, Milwaukee, WI; ³Children's Hospital Oakland Research Institute, Center of Immunobiology and Vaccine Development, Oakland, CA.

Nosocomial (hospital-acquired) infections and antibiotic resistance among *Staphylococcus aureus* strains, like methicillin-resistance and more recently vancomycin-resistance, provide grave difficulties in treating. Recent studies have utilized low level laser therapy (photobiomodulation) as anti-bacterial and therapeutic in tissue repair and pain alleviation. This suggests its beneficial potential in treating staphylococcal diseases like scalded skin syndrome, impetigo, necrotizing fasciitis, and other pyogenic infections. The objective of our study was to reconfirm previous studies demonstrating bacteriocidal effects on *S. aureus* with 405nm and 670nm, but using novel portable LEDs (405nm and 670nm) suggesting a more clinical application. Dilutions of an overnight culture were exposed to varying intensities of either 405-nm or 670-nm emitted from portable LEDs (Quantum WARP 10A, Quantum Devices, Inc.). *S. aureus* viability was assessed by determining bacterial colony-forming units (CFUs) on tryptic soy agar (TSA) and comparing the plates to controls that were not exposed to LEDs. Our data demonstrates a statistically significant decrease in CFUs to both 405nm and 670nm LEDs, dependent on time of exposure. Additionally, significantly smaller colony sizes in 405nm LED exposed cultures suggested an effect on growth rate as well. Together, these data demonstrate the use of both 405nm and 670nm LEDs as a portable anti-bacterial device against *S. aureus*, which might aid in future medical applications.

#10 - Temporal Dynamics Of Plankton Populations In Relation To Silica In A Freshwater Beaver Pond Nicholas Divjak* (Dr. Ann Throckmorton), Biology Department, Westminster College.

Studies have shown that plankton populations change in response to environmental factors. Diatoms are a silica-based phytoplankton species that are responsible for half of the world's oxygen production. In freshwater systems, diatoms play an important role in food webs, serving as food for zooplankton, such as copepods and rotifers, which in turn serve as a food source for cladocerans and other heterotrophs. The purpose of this study was to observe the relationship between plankton populations of four plankton groups (diatoms, rotifers, cladocerans, and copepods) and silica in a shallow freshwater pond. Shallow aquatic systems have not been extensively studied and therefore this research is significant to the field of aquatic ecology. Results of this study revealed that the dynamics of the plankton species were all directly or indirectly determined by the concentration of silica in the water. There was significance between the diatom population and silica ($p = 0.009$) and between the rotifer and cladoceran populations ($p = 0.005$). The silica concentrations found in the beaver pond are lower than the average of most freshwater systems. This indicates that silica is an influence of diatom populations, which in turn influence the zooplankton populations.

#11 - Effect Of Age And Vaccination On Spread Of *Chlamydia Pneumoniae* To The Cardiovascular System In C57bl/6 Mice Taylor Eddens^{1*}, Amanda Steinberger², Sarah Beaudoin², and Dr. Kerin Fresa-Dillon² Washington & Jefferson College¹ and Philadelphia College of Osteopathic Medicine².

Chlamydomphila (Chlamydia) pneumoniae is an obligate intracellular pathogen which produces an atypical pneumonia in humans. Research has also linked infection with *C. pneumoniae* to extra-respiratory diseases of aging such as coronary artery disease and atherosclerosis. In this study, aged and young C57BL/6 mice were inoculated with 5×10^5 IFU *C. pneumoniae* in an attempt to elucidate the link between age and the spread. The hearts and ascending aortas were harvested and titers were calculated using immunofluorescence. The mean titer in the heart/ascending aorta in young C57BL/6 mice 14 days post-infection was 1.0×10^5 IFU. Aged mice had a mean titer 1.2×10^7 IFU at 14 days post-infection; a difference that approached statistical significant ($p=0.088$). By 28 days post-infection, the aged mice had a mean titer 160-fold greater than the mean titer in young mice. This suggests that while both young and old mice are susceptible to infection, the burden of infection in the cardiovascular system may be higher in aged mice. Also, a heptavalent CTL epitope minigene vaccine, shown to protect young and aged mice from respiratory infection, failed to protect C57BL/6 mice from developing cardiovascular infection. The vaccine appeared to protect both young and old individuals from extra-respiratory infection at 14 days post-infection, as seven of eight (87.5%) mice cleared infection. By 28 days post-infection, only one mouse of 18 (5.56%) was protected from infection regardless of age. While the vaccine may delay extra-respiratory spread to the cardiovascular system, virtually all mice by 28 days post-infection had established infection in the heart/ascending aorta.

#12 - A Study of the Preferred Feeding Location in Woodland Birds Alisha Haibach* Biology Department, Thiel College.

This experiment was performed to compare two different locations of bird feeders; to see if birds preferred to feed in an open field or along the edge of the woods. The experiment was conducted at three different points throughout the day; morning, afternoon and early evening. The hypothesis was believed to be that the birds would feed along the edge to be closer for cover from predators and that the birds would be more active during the morning hours of the experiment. To carry about the experiment, birds were counted at the three different indicated times at the two individually placed feeders. To interpret the data, Chi-Square analysis was calculated to see that there was a preference of feeding along the edge of the woods over the open field, but the calculations showed that there was no preference for the time of day for feeding.

#13 - Immunosuppressive Effects of Interleukin-16 Causing Lymphadenopathy

Bo R. Harstine* Washington & Jefferson College and Daniel S. Green, William W. Cruikshank
The Pulmonary Immunology Center, Boston University School of Medicine.

The cytokine IL-16 is released by a variety of immune cells and is known to be an immunomodulatory cytokine capable of trafficking lymphocytes and causing chemotaxis in several types of cells. It has been shown that T cells migrate to the lymph nodes during an immune response, and that the lipid signaling molecule sphingosine-1-phosphate plays a role in the egress of immune cells from the lymph nodes. This is significant because an increase of IL-16 in the lung-draining lymph nodes during asthmatic inflammation results in reduced airway reactivity and inflammation. *In vivo* and *in vitro* models were used to examine whether IL-16 affects T cell homing to the lymph nodes and therefore a suppressive effect on asthmatic inflammation. To test this mouse models were injected with IL-16 via the tail vein to represent systemic desensitization of CD4⁺ T cells resulting in lymphadenopathy in the inguinal nodes. Intratracheal administration of IL-16 was also performed to represent a nonsystemic, tissue-specific approach to IL-16 medicated desensitization. *In vitro* studies utilized a Boyden chamber; chemotaxis assays were performed using isolated T cells, treated and untreated with IL-16, with then migrated through a filter towards S1P. Mice injected intravenously with IL-16 were found to have significantly more T cells in their inguinal nodes over control mice. *In vivo* results were also imaged using an *in vivo* imaging system (IVIS) after intratracheal administration of IL-16, and showed a higher presence of CD4 isolated splenic T cells treated mice. IL-16 demonstrated a strong inhibitory effect on T cell migration to S1P measured with the Boyden chamber. The lymphadenopathy seen in inguinal nodes after injection of IL-16 suggests a mechanism for the immunosuppression seen in the asthma model when IL-16 is given intratracheally, and is therefore applicable to the treatment of asthma.

#14 - The Effects Of Smoking On Airway Resistance Measured By Fvc, Fev₁, And Mvv Lung Function Tests

Robert Heinz* and Dr. Bryan Hamilton, Department of Biology, Waynesburg University.

Smoking is one of the most renowned causes of disease or damage to the lungs. The lungs are the most vital part of the human respiratory system and contain millions of cilia and alveoli. Smoking paralyzes and kills cilia of the pulmonary tract, and causes tar to build up in the alveoli of the lungs. Once these vital parts of the respiratory tract are compromised, tar and particulate matter builds up in the lungs and causes resistance. The objective of this experiment was to determine exactly how the lungs were compromised by the length of exposure of cigarette smoke. In order to determine the effects of smoking on the lungs and resistance in the airway, spirometry testing was performed on a group of smokers and a group of control subjects. All subjects were separated into groups based on their smoking habits determined by a simple questionnaire and FVC, FEV₁, and MVV testing was measured on each subject. This research shows that there is a slight correlation between the length of time that an individual smokes and the resistance acquired by smoking.

#15 - Investigation Of The Inheritance Of Fingerprint Characteristics Sara Henderson*, Marietta Wright, Department of Biology, Waynesburg University.

Dermatoglyphics, or the study of fingerprints, is one of the most prominent fields in Forensic Science. Many people believe fingerprints are only significant for the identification of criminals. Fingerprints have been collected, observed and tested as means of unique identification of persons for more than one hundred years. Very little study has been done on the inheritance of fingerprint patterns and Total Ridge Count, to determine if these characteristics are inherited from generation to generation. Fingerprints were taken from a total of twenty-four individuals, two groups of twelve, which were separated into four groups of three. These groups were three generations of individuals who are related and three generations of individuals who are not related. Individuals who are related had very similar Total Ridge Counts and pattern types versus individuals who were not related, showing very little to no similarities. This study shows that more in depth research could ultimately prove that Total Ridge Count and fingerprint patterns are inheritable traits and in the future could be used as identifying means in the Forensic Science field.

#16 - Comparison Of Recruitment To Food Among Members Of Order Hymenoptera Within Mercer And Crawford County Ryan Joseph Hill*, Biology Department, Thiel College.

Relative recruitment among the ant genera *Formica*, *Lasius*, *Myrmica*, *Camponotus*, *Aphaenogaster*, and *Myrmecina* to allocate food resources, was compared over the course of the 2009 summer in both Mercer and Crawford Counties of Western Pennsylvania in three different locations, respectively. Recruitment habitats included an open field, gravel road, and cement pad. Two particular ant genera recruited most of the food resources in both counties; *Formica* and *Lasius*. Baits consisting of strawberry jelly on filter paper were the food source provided. Chi-square association and goodness-of-fit tests were used to analyze the data. The initial hypothesis that the Carpenter Ant, *Camponotus pennsylvanicus*, would predominate at the baits was refuted. Instead, *Formica* and *Lasius* ants clearly predominated. This may be due to antennal stroking (Sudd), liquid food sharing from the social stomach (Sudd), and use of the hindgut for laying recruitment trails by these genera (Holl Dobler and Wilson). Key Words: *Formica*, *Lasius*, Food Allocation; Social Stomach, Hindgut, Antennal Stroking, Chi-Square, Pennsylvania

#17 - Mouse Wheel Running Behavior: Contribution of Genetic Loci on A/J Chromosome 19 Julie M. Holland* and David A. Essig, Department of Biology, Geneva College.

There are large variations in voluntary wheel running performance across inbred mouse strains. Previous studies have shown that wheel running distance and speed is suspected to be due to the inheritance of gene alleles at multiple chromosomal loci. Our lab previously showed that C57BL/6J (C57) mice ran at a cruising speed twice the rate and accumulate twice the daily distance compared age matched mice from the A/J strain. In this study we investigated the contribution A/J chromosome 19 to wheel running phenotypic difference with the C57 strain. A breeding pair of the chromosomal substitution strain C57/AJ19 (CSS19) was obtained from Jackson Labs (Bar Harbor, ME). Wheel running performance phenotypes for C57, A/J and CSS19 strains of both genders (n=10 per each strain/gender) were determined on a daily basis for 7 days. Since previous work had identified a QTL for anxiety on chromosome 19, the mice were also tested for anxiety behavior on a plus maze task prior to wheel running. Wheel running analysis revealed expected significant differences between the parental C57 and A/J strains. CSS19 mice demonstrated reduced cruising speeds compared to C57 in both female ($p=0.052$) and male ($p=0.011$). All other measured variables showed values similar to the C57 strain. Plus maze results indicated a greater percent time spent in the open arms of the plus maze for C57 compared to A/J for both genders. CSS19 strains of either gender showed no difference in time spent in the open arm in comparison to C57. Our data suggests that chromosome 19 does not harbor a locus contributing to the higher anxiety levels in A/J measured in the plus maze. However, our data are consistent with the presence of one or more loci on chromosome 19 which contribute to the slower cruising speed of A/J compared to C57 mice.

#18 - cDNA-ALFP Analysis of Gene Expression Profiles in a Streptozotocin Induced Alzheimer's Model in Cultured Neuroblastoma Cells Bliss Kernodle*, Department of Biology, St. Vincent College.

Alzheimer's Disease (AD) is the most common form of dementia, but its cause remains largely unknown and there is no cure. Recently, it was demonstrated that intercerebral injection of the drug streptozotocin into mice induces an Alzheimer's phenotype characterized by deficits in learning and memory that are reversible upon administration of a PPAR- δ agonist. In this study, it was hypothesized that the induced Alzheimer's model could be translated to a cell culture system, and used to identify gene interactions critical to development of AD. To test this hypothesis neuroblastoma cells were exposed to streptozotocin, and aggregated β -amyloid peptide, as well as a PPAR- δ agonist, individually and in combination, with resulting cell lethality evaluated via trypan blue staining and apoptosis assays. cDNA-AFLP profiling was used to characterize changes in gene expression associated with the Alzheimer's phenotype, and its reversal. Results indicate that the inducible system can be modeled in culture and used to identify differentially regulated genes.

#19 - Carriage Rates Of Methicillin-Resistant *Staphylococcus Aureus* Among College Students Ryan Kitzinger* and Chad Sethman, Ph.D., Department of Biology, Waynesburg University.

Discovered in 1881 by Dr. Alexander Ogston, M.D., *Staphylococcus aureus* is a Gram-Positive cocci that has since emerged as one of the most medically significant pathogens. Recent studies suggest *S.aureus* has reached epidemic levels, and now asymptotically colonizes approximately 30% of the population at any given time. *S.aureus* has also developed into one of the most common resistant pathogens, with greater than 50% of all community-acquired *S.aureus* infections being caused by a MRSA strain in some populations. Previous studies have suggested that individuals who engaged in contact sports are at an increased risk for the transmission of MRSA. This increase is thought to come from the physical contact and increased risk for skin abrasion, as well as the sharing of improperly sanitized athletic equipment and facilities. Prior research has also suggested that there is a significant rise in risk in MRSA contraction among healthcare workers due to the frequent exposure to disease which is associated with the profession. Based on these findings, it was hypothesized that college students engaging in these activities (contact sports and nursing clinicals) would have the highest risk of *S. aureus* and MRSA contact, and would thus demonstrate a higher prevalence of *S.aureus* and MRSA carriage. Nasal swabs of student participants were screened for the presence of *S. aureus*, which was characterized by its resistance to methicillin. Each subject also completed a brief questionnaire, with special attention given to the identification of potential risk factors and assessing public health awareness. Our data reveals that football players are more likely to carry *S. aureus*, but the prevalence of MRSA in this group is significantly lower than the control group. We also show that carriage rates among nursing students were comparable to a control population with 26.9 percent *S. aureus* carriage rate and 10.5 percent MRSA carriage rate.

#20 - The Effects Of Concealment On Nestling Survival Heather Mae Kraus*, Department of Biology, Washington & Jefferson College.

Nest failure results from desertion, destruction due to inclement weather, and predation. But, predation is the main reason for nest mortality in many bird species. In order to avoid nest predation, birds choose nesting sites with increased vegetative cover because it reduces nest visibility to predators. To test whether well-concealed nests have higher nest survival rates, active nests at the Abernathy Field Station were monitored during the 2009 breeding season and measurements of vegetation surrounding each nest were collected. Classification tree analysis was performed using nest fate (failed nests did not produce at least one fledgling) as the target variable and 14 predictor variables (nest height, concealment, orientation, health, canopy cover, ground cover, number of forbs, number of sapling trees, number of subcanopy trees, number of canopy trees, number of shrubs, number of dead shrubs, and number of dead trees). The model suggests that nest concealment by vegetation was not an important predictor of nest success; instead canopy class of the nest substrate appears to contribute to the success of nests. The forest canopy may provide more potential nest sites, thereby reducing the risk of predation according to the potential-prey-site hypothesis. For ground and shrub-nesting species, nest height also contributed to nest success with low nests having greater survival than those nests higher up in shrubs.

#21 - Assessing The Health Of Abe's Creek And Jefferson's Run Through Benthic Macroinvertebrate Sampling Ryan Lehman*, Department of Biology, Washington and Jefferson College.

Perennial streams are very diverse ecosystems, with a wide variety of organisms living in and around them. Therefore, it is important to monitor these streams to determine if they are remaining in their natural state. The composition of the macroinvertebrate community is an excellent indicator as to the overall health of a stream. This method is superior to just chemical tests because the organisms are constantly exposed to the stream's environment. In this study, the macroinvertebrate communities of two perennial streams in southwestern Pennsylvania at W&J's Abernathy Field Station (AFS) were sampled in order to determine their overall health. The streams were sampled using a modified version of the PA Department of Environmental Protection (DEP) multi-habitat stream assessment protocol. The overall biological score for Abe's creek was 46.20 and the score for Jefferson's Run was 23.52. Biological scores for both streams fall under the benchmark of 55 set by the DEP and are therefore considered impaired. However, both scores will be useful as baseline measures for further monitoring of the health of both streams at AFS.

#22 - Seasonal And Environmental Effects On *Ixodes* Populations In Northwestern Pennsylvania Sarah McAfee*, Department Biology, Thiel College.

Understanding the seasonal and geographical activity of *Ixodes scapularis* (common deer tick), the primary vector of Lyme disease, can help determine who may have the highest risk of coming in contact with *Ixodes scapularis* and possibly contracting Lyme disease. Tick distribution in woodland and field environments with mixed vegetation and hardwoods were studied in 3 northwestern Pennsylvania counties: Butler, Mercer and Venango. Three counties were studied to determine if geographic location had any effect on tick distribution in northwestern Pennsylvania, while two types of environments were studied to determine if environment type had any effect on tick distribution. Tick prevalence was estimated by physically traveling to each county and using a cost-effective method to collect the ticks by hand. Each county was tested four times from June 2009-March 2010 to determine if time of year had any effect on tick distribution. It was concluded that Mercer and Venango counties had far fewer ticks when compared to Butler County because of insufficient data. After performing a two-way ANOVA test for Butler County, it was determined that time of year and the type of environment had a significant effect on tick distribution.

#23 - Quality Assurance Testing Of Microbial Populations Within Beer Products Of The City Brewing Company Steven Monnich*, Department of Biology, Thiel College.

The quality control procedures, with respect to yeast populations, water sources, and finished products, of the Latrobe Iron City Brewery were tested and assessed. Samples were collected from the city water source, yeast storage tanks, finished product tanks, and water storage tanks and were plated to test for common beer spoiling bacteria. These plates were cultured in both aerobic and anaerobic environments on a nutrient agar. The aerobic plates were allowed to culture for 3 days and the anaerobic were allowed to culture for 5 days. As expected, the city water and water stored in the facility contained trace amounts of contaminants, but the yeast populations and final products were clear of any beer spoiling bacterial growth or that would be harmful to any consumers. These results suggest that the quality control procedures that are in place in the Latrobe Iron City Brewing Company are compliant with methods necessary to maintain a suitable and safe product to be distributed to the public in respects to both quality and safety.

#24 - Female Mouse Wheel Running Behavior: Contribution of Genetic Loci on A/J Chromosome 1 J'ney K. Moretti* and David A. Essig, Department of Biology, Geneva College.

Inbred strains of mice display considerable variation in wheel running behavior suggesting a genetic contribution. Our lab previously showed that female C57BL/6J (C57) mice ran twice the total daily distance at twice the cruising speed compared to age matched A/J mice. Our objective was to investigate the contribution of loci on A/J chromosome 1 (AJ1) for this complex trait. A breeding pair of the chromosomal substitution strain C57A/J1 was obtained from Jackson Labs (Bar Harbor, ME). Female mice from C57, A/J and C57A/J1 strains (n=10 per strain) were tested over 7 days of wheel running. Parental strains C57 and A/J showed the expected differences in wheel running behavior. Compared to C57, C57A/J1 strains showed no significant difference in distance at any time point. In contrast, the initial cruising speed of C57A/J1 was characteristic of C57 but over time regressed toward A/J. By day 7, C57A/J1 daily cruising speed was significantly ($p=.01$) less than C57 and not significantly different from A/J. C57A/J1 also demonstrated an increased daily number of bouts to values similar to that of A/J ($p>0.05$) and greater compared to C57 ($p=.04$). Previously identified QTL's on chromosome 1 include the candidate gene EphA4. In A/J and C57A/J1, EphA4 shows reduced expression and is associated with smaller motor axon diameters. This may contribute to the similarities determined between A/J and C57A/J1 in cruising speed and daily number of bouts. In conclusion, our findings indicate a contribution of loci on A/J chromosome 1 that may result in reduced wheel running behavior in female A/J mice.

#25 – Synaptic Plasticity Of The Nucleus Accumbens In Rodent Models Of Psychiatric Disorders Mary Patton*, Pauline Belujon, Kathryn Gill, Anthony Grace, Neuroscience Program, Washington & Jefferson College and Departments of Neuroscience, Psychiatry, and Psychology, University of Pittsburgh.

The nucleus accumbens (Nac) receives glutamatergic inputs from limbic structures such as the ventral subiculum (vSub) of the hippocampus and the basolateral amygdala (BLA), as well as from cortical structures such as the medial prefrontal cortex (mPFC). The vSub is proposed to gate information flow within the Nac and is thought to play a key role in psychiatric disorders such as schizophrenia and anxiety disorders. Hyperactivity is seen in the hippocampus of patients with schizophrenia while a hypoactivity is seen in patients with anxiety disorders. It is thought this hyperactivity causes an inappropriate interaction between the vSub and the Nac, and thus we investigated the roles of this afferent in a schizophrenia model. We also hypothesized that within a model of anxiety, chronic stress will induce an overactive hippocampus and thus interfere with synaptic plasticity in the vSub-Nac pathway. Using in vivo extracellular recordings in anaesthetized rats, we examined the effect of high and low frequency (HFS, LFS) on the vSub pathway to the Nac in two animal models of psychiatric disorders. We found LFS elicits a heterogeneous result in an animal model of schizophrenia in which both LTP and LTP occlusion are seen. However, HFS to the vSub-Nac pathway in an anxiety model elicited a potent LTD in the non-stimulated BLA-Nac pathway. While further investigation is required to fully understand the mechanisms behind these phenomena, these data indicate possible rostral/caudal and/or core/shell differences in the Nac due to these conflicting data. These differences could be due in part by separate messaging systems in these distinct regions of the Nac.

#26 – Anterior Cruciate Ligament (ACL) Injuries and Rehabilitation Heather Peck*, Department of Biology, Thiel College.

The purpose of this project is to determine if more female and male athletes in high school or college level athletics have more ACL tears, to determine if there is a significant difference between the number of male and female ACL tears in high school and collegiate sports, to determine which sport overall has the most ACL injuries, and if age and gender affects the time of recovery after surgery. Data was collected from the following colleges and high schools; Thiel College, Westminster College, Grove City College, Greenville High School, Reynolds High School, and Hickory High School. For the second part of this study, my subjects included current and former patients at Specialty Orthopaedics Rehabilitation Center in Hermitage, Pennsylvania. Each patient participates in the same rehabilitation program designed by the Physical Therapists at Specialty Orthopaedics. It was concluded that there were more ACL tears in college athletics than in high school athletics. The most ACL tears in the past three years occurred in football. After performing a two sample t-test, there is no significant difference between the number of male and female ACL tears in high school and collegiate sports. Also after performing correlation tests, age and gender do not affect the time of recovery after surgery.

#27 – Effects Of Phosphatidylinositol 4,5-Bisphosphate (PIP₂) On Alveolar Fluid Clearance In Rats Adil M. Qarni* Washington & Jefferson College and Hans G. Folkesson, Ph.D. Department of Integrative Medical Sciences, Northeastern Ohio Universities Colleges of Medicine and Pharmacy.

Pulmonary edema is swelling or fluid accumulation in the lungs caused by failure to remove fluid from lung interstitial spaces or due to a direct injury to the lung endothelial-epithelial barrier. There is evidence that Na⁺ and Cl⁻ transporters are expressed in the distal lung epithelium that are responsible for the ability of the lung to remove alveolar fluid at parturition as well as in the adult lung if pathological conditions lead to the development of pulmonary edema. The general model of transepithelial fluid movement is that active salt transport drives osmotic water transport. The alveolar epithelium covers more than 99% of the surface area of the lung, which suggests removal of edema fluid may primarily occur across the alveolar epithelium. Studies have demonstrated that the distal epithelium transports Na⁺ in to the cell at the apical membrane and Na⁺ at the basolateral cell membrane through a Na⁺,K⁺-ATPase. Therefore, removing edema fluid is accomplished by the polar distribution of Na⁺,K⁺-ATPases and Na⁺ channels on opposite sides of the epithelial cells. Membrane components may regulate Na⁺ transport as well as alveolar fluid clearance. The phospholipid phosphatidylinositol 4,5-bisphosphate (PIP₂) is present in the membrane and regulates alveolar fluid clearance, but the exact mechanism of its effect is not clear. This study found intrapulmonary PIP₂ stimulates alveolar fluid clearance in a dose dependent manner that directly involves epithelial Na⁺ channels. Female rats respond better to PIP₂ stimulation of alveolar fluid clearance than do male rats.

#28 – Deer Activity In Comparison With Moon Phases Joe Reinke*, Department of Biology, Thiele College.

My main objective of the study is to determine whether or not there is a significant difference in deer movement during different phases of the moon. I believe that the most daytime deer activity will occur during the new moon because deer will do most of their foraging at night during the full moon when visibility is better. In order to observe the deer movement I waited and watched, motionless and scentless, from an elevated tree stand for the duration of the fall archery season, recording the number of deer and the moon phase nightly. I found that there was no significant difference in deer numbers during different moon phases. From a hunter's standpoint, the study showed that the moon phase actually has minimal influence on deer movement and hunters should be more focused on weather conditions when choosing the most favorable days to hunt.

#29 – The Effects Of Allografts Versus Autografts On Rehabilitation Length In Anterior Cruciate Ligament Surgeries: A Comparison Corey Salomon*, Department of Biology, Thiel College.

The purpose of this research was to test the hypothesis that an allograft type anterior cruciate ligament surgery would require a shorter rehabilitation period compared to an autograft type anterior cruciate ligament surgery. Patient office visits as well as physical therapy reports were obtained and studied in order to fully understand the patient's rehabilitation process. The patient's ranges of motion or (ROM) angles were averaged bi-weekly. Regression analysis showed that both grafts demonstrated a definite positive trend in the range of motion over a short rate of recovery. Allograft patients were gaining 7.53 degrees within their range of motion every bi-weekly measurement over a six week period. On the other hand, Autograft patients were gaining 5.15 degrees within their range of motion. However, due to the sample size and other factors there was not enough data to determine whether one graft type would decrease the patient's period of rehabilitation.

#30 – Linking Trends In Population Size Of Freshwater Mussels To Their Host Fishes In The St. Croix River, Minnesota Brandon Sansom^{1*}, Mark C. Hove², and Daniel J. Hornbach^{2,3}, Department of Biology¹, Washington and Jefferson College and Departments of Biology² and Environmental Studies³ Macalester College,

Freshwater mussels are the most imperiled taxonomic group in North America. One potential reason for this is their complex life cycle. Most freshwater mussels have a parasitic relationship with fish that is vital for reproduction and dispersal. Female mussels release their larvae (glochidia) into the water, often in ways that elicit fish to feed on or brush against them. Glochidia that infect a suitable host have the ability to metamorphose into juveniles. Some mussel species rely on specific fish species as hosts, while others utilize a wide range of fish hosts. The objective of this research was to determine if variations in mussel populations are correlated with host fish populations in the St. Croix River. Mussel data were obtained from Macalester College while fish data were obtained from Minnesota and Wisconsin State Agencies. Linear regressions were performed to test for significant relationships between mussel populations and their host populations. Comparisons among all mussel species and all fish species, and all juvenile mussels and all fish species, revealed no relationships. However, strong trends were observed between mussels with restricted hosts. The strongest trend in the linkage between fish and mussel density was between *Quadrula pustulosa* and *Cyclonaias tuberculata* mussels and their host, the catfish family. *Q. pustulosa* and *C. tuberculata* peak densities lagged that of catfish by 3-5 years. Four genera of mussels, *Potamilus*, *Ellipsaria*, *Truncilla*, and *Leptodea* also lagged their host, freshwater drum, by 3-5 years. Inconsistencies between fish and mussel sampling limited our ability to accurately calculate lag periods and therefore, no trends were significant. However, we have obtained additional fish data and have begun researching known growth equations for mussels to hindcast/forecast population densities. A better understanding of the link between freshwater mussels and their host fishes will improve our ability to manage these highly threatened species.

#31 – Inhibitory effects of mouthwashes on the cavity-causing (cariogenic) bacterium *Streptococcus mutans* Ryan Schell*, Tonya Tanner, and Dr. Chad R. Sethman, Department of Biology, Waynesburg University.

A dental carie (cavity) is defined as damage to the tooth enamel caused by certain bacterial metabolic processes. During the period of time between brushings many layers of bacteria accumulate on the surface of teeth forming what is called a bio-film. One of the early colonizers of this bio-film, *Streptococcus mutans*, is the bacterium responsible for the carious nature of the bio-film. Anti-cavity mouthwashes are marketed as an effective means of inhibiting the growth of bio-film forming bacteria and thus preventing the formation of caries. The goal of our research is to evaluate the efficiency of various commonly available mouthwashes at inhibiting the growth of *S. mutans*. We first compared the growth of *S. mutans* in various media by assessing maximum density and doubling time using plots of optical density versus time. We found that Trypticase Soy Broth (TSB) provided one of the quickest doubling times and the highest maximum density. Using TSB as the growth medium, we found that the growth rate of *S. mutans* is inhibited by Listerine® in a concentration-dependant manner. Additionally, we plan to compare multiple mouthwashes as well as multiple toothpastes for their effectiveness at inhibiting *S. mutans* growth using this same methodology.

#32 – Factorial Analysis of Variation in Heart Rate Reactivity during Cognitive Stress Tyler Schoenberger* and David A. Essig, Department of Biology, Geneva College.

Cognitive stressors are associated with an increase in heart rate. Our objective was to determine if college students displayed variable degrees of increased heart rate reactivity while given a cognitive stressor. Secondly, we assessed contributions of respiratory sinus arrhythmia (RSA), history of physical activity, and gender to variations in heart rate reactivity. Measurements were made on 6 male and 18 female college students. A pulse plethysmograph was used to monitor the subject's heart rate. The subjects' heart rate was measured at baseline, and during the cognitive stress (spelling aloud 12 different 5 letter words either forwards or backwards in 60 second time frames). Daily physical activity was assessed by a survey. RSA values were measured by using a pulse plethysmograph and spirometer. Cognitive stress increased heart rate significantly compared to baseline ($p < 0.05$). Heart rate reactivity (backwards spelling heart rate – baseline heart rate) was correlated with RSA ($r = 0.22$; $p < 0.05$) but not physical activity ($r = 0.46$; $p = 0.3$). Females had a 40% higher heart rate reactivity than males, but this was not a significant difference ($p > 0.05$). Cognitive stressors produced a wide range in differences in heart rate reactivity in college students. Variability in this subject population was in part explained by variations in RSA but not history of physical activity or gender.

#33 – Take It Or Leave It- Attitudes Towards The 2009 Pandemic Influenza A/H1N1 Vaccine Among College Students In Pennsylvania Brittany Spitznogle^{1*}; Chad Sethman¹; and Owen Simwale²; The Influenza Sentinel Surveillance Workgroup³, Biology Department¹, Waynesburg University; Pennsylvania Department of Health, Bureau of Epidemiology²; Penn State University, Messiah College, Dickinson College, Washington & Jefferson College, Gettysburg College, Shippensburg University, Clarion University, Lycoming College, Westchester University³

Every year, 15-20% of the 15.9 million college students in the U.S experience influenza like illness (ILI) or lab confirmed influenza. During the 2008/09 flu season, sentinel colleges in Pennsylvania reported 10-30% ILI- three to four times higher than other out-patient settings. In November 2009, the newly developed pH1N1 vaccine was distributed to Pennsylvania colleges and Universities. No published study, to our knowledge has examined the pH1N1 vaccine uptake and acceptance in the United States. The objective of this study is to examine factors that influence acceptance and refusal of the pH1N1 vaccine among college aged students attending Pennsylvania Colleges and Universities. A cross-sectional survey of full time students attending 10 Pennsylvania colleges was conducted from November 1st, 2009 through January 2010. The survey consisted of questions about demographics, vaccine acceptance and reasons for acceptance or declination of the vaccine. The main measurement was pH1N1 acceptance as a correlate of knowledge about the vaccine, gender, previous vaccination and academic years in college. Out of 868 students who completed the survey, 196 were males and 672 were females. Forty-three percent of students said they received the pH1N1 influenza vaccine, while 57% said they never received the pH1N1 vaccine. When asked why they declined the vaccine 48% said they don't know much about the vaccine and 37% said it was not safe. The results showed that the pH1N1 acceptance is higher than the seasonal influenza vaccine acceptance rate. Addressing misconceptions and fears about the vaccine safety and effectiveness may improve pH1N1 acceptance among college students.

#34 – Programmed Death Ligand 1 is Neuroprotective During Acute Viral Infection. Katie J. Steider^{1*}, Robert S. Schreiner², Rodolfo D. Vicetti Miguel³, Robert L. Hendricks^{4,5,6}, and Thomas L. Cherpes², ¹Biology Department, Washington & Jefferson College, Washington, Pennsylvania 15301, ²Department of Obstetrics, Gynecology, and Reproductive Sciences, ³Graduate Program in Immunology, ⁴Department of Ophthalmology, ⁵Department of Molecular Genetics and Biochemistry, ⁶Department of Immunology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania 15213

The adaptive immune response is dependent upon the actions of effector T cells. In locations such as the nervous system where cells lack regenerative ability, it is necessary to accomplish pathogen clearance with minimal collateral damage to host cells. Recent evidence from infectious hepatitis models suggest a role for programmed death 1 (PD-1) – PD-ligand 1 (PD-L1) pathway in regulation of balance between pathogen clearance and host immunopathology elicited by CD8⁺ T cells. In this study, we examined the kinetics and role PD-L1 expression during acute infection with herpes simplex virus type 1 (HSV-1) in a murine model. Mice were ocularly infected with HSV-1 and trigeminal ganglia (TG) were harvested on various days post infection. The TG were processed for confocal microscopy imaging or dispersed into single cell suspensions for analysis via flow cytometry. PD-L1 expression on TG neurons was found to increase significantly during acute viral infection, indicating that expression is induced by infection with HSV-1. Additionally, flow cytometry results from acutely infected Balb/c mice indicate that expression of PD-L1 is comparable between CD4⁺ T cell deficient and CD4⁺ / CD8⁺ T cell deficient mice. This suggests that neither CD4⁺ nor CD8⁺ T cells play a mediatory role in the neuronal expression of PD-L1. Flow cytometry results indicate that blocking of PD-L1 with antibodies in acutely infected mice resulted in significantly increased CD4⁺ and CD8⁺ T cell numbers. These results suggest that neuronal PD-L1 expression may dampen the inflammatory response generated by ocular HSV-1 infection. Additionally, confocal microscopy imaging of TG showed that blocking of PD-L1 increased the number of apoptotic neuronal nuclei in the TG of acutely infected mice, indicating that PD-L1-mediated dampening of the inflammatory response may be neuroprotective. Our findings suggest a novel anti-inflammatory, neuroprotective role for neuronal PD-L1 expression during acute viral infection

#35 – Salamander Species Richness At The Abernathy Field Station Jeremy P. Trussa^{*} Biology Department. Washington and Jefferson College.

In response to the proposed alteration of an existing gas-line right-of-way and the possible disruption of two perennial streams that run through the Abernathy Field Station (AFS), I collected pre-disturbance salamander richness and density data at AFS. This information could be used to help assess the effects of the gas-line construction on salamander communities at AFS. I applied two commonly used herpetofaunal sampling methods during the summer of 2009. The two sampling methods, coverboard transects and area-constrained searches, were used because of their relative simplicity and ease of use. Three salamander species were observed using the coverboard transects, with 10 of the 11 observed salamanders being found within 10m from one of the streams. Five species were observed using area-constrained searches, with the midslope sampling areas indicating a density of 0.05 individuals per m². While the area constrained search method had a higher species richness (S=5), only one species of salamander not observed with the sampling methods was found during subsequent sampling within and immediately adjacent to the two streams at AFS. My results are consistent with the salamander species richness previously reported using coverboard transects at AFS, stream sampling should compliment coverboard and area-constrained searches in order to provide a more accurate description of species richness and density at AFS, and all three sampling methods will be used to track post-disturbance species richness and densities.

#36 – A Simple Assay For Demonstrating Enzyme Kinetics And Inhibition. Rodney C. Austin and Seth Turnbull*, Department of Chemistry, Geneva College.

Demonstrating enzyme kinetics in the undergraduate laboratory traditionally has been accomplished by measuring changes in reactant or product concentrations via a spectrophotometer. Educational-grade spectrophotometers can yield uneven results, break easily and be hard to maintain. Here, we present an assay that uses a simple apparatus to monitor the enzyme kinetics and inhibition of a yeast-based catalase. Catalase facilitates the decomposition of H_2O_2 yielding water and O_2 . The gaseous O_2 production is monitored with an apparatus consisting of a reaction chamber, buret and leveling bulb plus a small amount of tubing, all commonly available to most undergraduate laboratories. Furthermore, the model reaction system of H_2O_2 and yeast catalase were both obtained from house-hold products. The O_2 was measured from a series of H_2O_2 concentrations yielded rates of reaction proportional to peroxide concentration, which mirrors published results. Moreover, inhibition of catalase by pyruvate and malate was successfully demonstrated. Taken together, these data support the use of the simple, economical gas measuring apparatus to monitor enzyme-catalyzed reactions where gas is produced.

#37 – Effects Of Protein Shakes On The Tenebrionidae Beetle Rebecca Walton*, Department of Biology, Thiel College

Protein Shakes are used for weight gain in muscles, as the desirable result. In this experiment we supplemented beetle food with two different types of protein shakes, in hopes that weight gain will be increased. Weight gain was observed during the beetles pupation phase. The beetles were separated into three groups: a control group, a myoplex protein shake group and a boost protein shake group. The desirable result was increased weight gain in the two protein enhanced beetle groups. The experiment resulted in weight of the two protein supplemented beetle group having a lower weight average than that of the control group. We can infer that the protein shakes inhibit weight gain in beetles.

Keynote Speaker

Dr. Brad Goodner
Hiram College, Hiram, Ohio

“The Good of the Many: Genomics & Undergraduate Education as a Mutually Beneficial Collaboration”



Dr. Goodner is currently Professor of Biology as well as director of the Center for Deciphering Life’s Languages at Hiram College. He holds the Edward J. Smerek Endowed Chair in Mathematics, the Sciences, & Technology. His academic background includes a B.S. in biochemistry (Texas A&M University) and a Ph.D. in biology (Purdue University). After stints at University of North Carolina and University of Richmond as a postdoctoral fellow and assistant professor, respectively, he joined the Hiram College faculty in 2001. At Hiram, Goodner teaches molecular and cellular biology, genetics, microbiology, medical microbiology, and bioinformatics. The basic question that he and his undergraduates try to address is, “What can the genes of an organism tell us about its lifestyle and how can that information impact the future of agriculture, medicine, and energy policy?” Goodner incorporates research from several collaborative genome sequencing efforts into courses and independent projects at Hiram College and into outreach research projects with area high schools. Over the past few years, Goodner has worked with others (Howard Hughes Medical Institute, American Society of Microbiology, U.S. Department of Energy Joint Genome Institute) on some emerging efforts in undergraduate research on genomics and bioinformatics at a national scale.

Oral Presentations

SESSION 1

1:00 – 1:15: PM Effect Of Fertilizer And Soil On The Growth Of *Lycopersicon Lycopersicum*.

Sarah Echenoz*, Biology, Thiel College.

I wanted to find the best combination of fertilizer and soil to produce maximum growth and productivity of tomato plants. I know from my experience of working in a greenhouse that the type of fertilizer as well as the type of soil used effects how well the plant does during its lifetime. The tomato plants that were treated with Miracle-Gro Water Soluble Tomato Plant Food yielded a high number of tomatoes that were smaller in size, but heavier in weight over the three month time than any other treatment. This shows that in a single growing season that Miracle-Gro Water Soluble Tomato Plant Food helps maximize the overall yield of tomatoes that were planted in regular potting soil. That plants that were grown with regular potting soil and are treated with Miracle-Gro Water Soluble Tomato Plant Food will produce the maximal yield, maximal productivity and happens to be the most cost efficient combination.

1:15 – 1:30: Carriage Rates Of Methicillin-Resistant *Staphylococcus Aureus* Among College Students Ryan Kitzinger* and Chad Sethman, Ph.D. Department of Biology, Waynesburg University.

Discovered in 1881 by Dr. Alexander Ogston, M.D., *Staphylococcus aureus* is a Gram-Positive cocci that has since emerged as one of the most medically significant pathogens. Recent studies suggest *S.aureus* has reached epidemic levels, and now asymptotically colonizes approximately 30% of the population at any given time. *S.aureus* has also developed into one of the most common resistant pathogens, with greater than 50% of all community-acquired *S.aureus* infections being caused by a MRSA strain in some populations. Previous studies have suggested that individuals who engaged in contact sports are at an increased risk for the transmission of MRSA. This increase is thought to come from the physical contact and increased risk for skin abrasion, as well as the sharing of improperly sanitized athletic equipment and facilities. Prior research has also suggested that there is a significant rise in risk in MRSA contraction among healthcare workers due to the frequent exposure to disease which is associated with the profession. Based on these findings, it was hypothesized that college students engaging in these activities (contact sports and nursing clinicals) would have the highest risk of *S. aureus* and MRSA contact, and would thus demonstrate a higher prevalence of *S.aureus* and MRSA carriage. Nasal swabs of student participants were screened for the presence of *S. aureus*, which was characterized by its resistance to methicillin. Each subject also completed a brief questionnaire, with special attention given to the identification of potential risk factors and assessing public health awareness. Our data reveals that football players are more likely to carry *S. aureus*, but the prevalence of MRSA in this group is significantly lower than the control group. We also show that carriage rates among nursing students were comparable to a control population with 26.9 percent *S. aureus* carriage rate and 10.5 percent MRSA carriage rate.

1:30 – 1:45: Effects Of Penta And Deca Brominated Diphenyl Ethers On Intestinal Glucose Absorption And Sciatic Nerve Functions Of Rats. *Nathan R. Kubeldis, Department of Chemistry, Gannon University; Charles F. Nelatury, Department of Biology, Penn State Behrend; Josh Reynolds, Department of Biology, Gannon University, and Mary C. Vagula, PhD; Biology, Gannon University.

Polybrominated Diphenyl Ethers (PBDEs) are a class of synthetic flame retardant compounds found in many household products such as computers, television sets, polyurethane foam mattresses, cushions, carpets and furniture. Being largely non-polar and chemically stable, these chemicals are extremely lipophilic and resist degradation in the environment, giving them a high affinity for bioaccumulation. Once ingested, these compounds have been shown to elicit a variety of less-than-desirable physiological effects including changes in neurological, reproductive, and endocrine function. Neurological damage manifests as behavioral change, reduced nicotinic receptors in the hippocampus, and learning and locomotor delay. The easiest route into the body for these chemicals is ingestion. Being liposoluble, these compounds tend to accumulate in lipid-rich areas of the body such as adipose, glandular, and nervous tissue. In the light of these facts the present study is undertaken to evaluate the effects of these compounds on intestinal glucose absorption and sciatic nerve functions following exposure to penta and deca brominated diphenylethers, each a representative of the lower and higher-brominated subclass respectively. Preliminary analyses of experimental data shows strong evidence for toxicity of these compounds in both areas tested. The absorption of glucose was remarkably reduced in exposed small intestines compared to controls. The nerve conduction velocity of the exposed sciatic nerves was reduced following exposure to these toxicants. Both penta and deca BDE induced similar effects on the parameters studied however the effects were more pronounced in penta BDE treated than with deca BDE. (This study is supported by Faculty Research Grant, Gannon University, Erie, PA)

1:45 – 2:00: Suppressing fire: Transfer of CD4⁺CD25⁺ T cells from infected donors quell HSV-2 vaginal infection Jaclyn M. Phillips*, Robert S. Schreiner†, Rodolfo D. Vicetti Miguel†, Thomas L. Cherpes†, Robert L. Hendricks†
*Washington & Jefferson College, † Department of Immunology, University of Pittsburgh.

Herpes simplex virus (HSV-2), the most common cause of genital herpes, is one of the most frequently transmitted sexual infections worldwide. After primary infection in genital epithelial tissues, HSV-2 becomes latent in sacral ganglia from where it spontaneously reactivates to cause intermittent genital tract shedding. Better understanding of genital herpes is hindered by the absence of an effective murine model, as mice typically succumb to infection within 7-10 days. We have observed a drastic increase in survival among HSV-2 infected mice who received concomitant transfer of splenocytes harvested from HSV-2 infected donor mice. We next observed that adoptive transfer of CD4⁺, and not CD8⁺, splenocytes conferred protection. The population of T cells conferring this protection was further specified to be the CD4⁺CD25⁺ splenocytes from infected donors. We next compared the efficacy of CD4⁺CD25⁺ splenocytes from infected donors to that of CD4⁺CD25⁺ T cells from naive donors (a population identified as natural regulatory T cells). We found that mice receiving CD4⁺CD25⁺ splenocytes from infected donors exhibited lower pathology scores than did those that received natural T-regs. Interestingly, 90.9% of mice that received these virally induced CD4⁺CD25⁺ T cells survived in comparison to 33.3% of the natural regulatory cell recipients, and 26.6% of infected controls. This suggests that viral specific CD4⁺CD25⁺ splenocytes may have roles in reducing pathology and increasing survival following vaginal HSV-2 infection in mice.

SESSION 2

2:15 – 2:30: Characterization Of Aeromonad And Pseudomonad Populations In A White Perch, *Morone Americana* Skin Lesion From Presque Isle Bay Jillian P. Rhoads^{1*}, Gregory Delost¹, Greg Andraso¹ and Troy Skwor^{1,2}
¹Gannon University, Morosky College of Health and Professional Sciences-Biology Department, ²Children's Hospital Oakland Research Institute, Center of Immunobiology and Vaccine Development, Oakland, CA

According to a 2009 EPA statistic, Great Lakes commercial and sport fishing generates over four billion dollars in revenue annually. Fishing provides thousands of jobs in the Great Lakes states and is a main contributor to the success of the economy. Diseases affecting Great Lakes fish populations are therefore of great concern because of their possible impact. A critical component of limiting the spread of any disease is determining its etiologic agent. In this case study, we investigated bacteria found in skin lesions and healthy skin of a white perch, *Morone americana*, collected from Presque Isle Bay. To identify the etiologic agent, samples from skin lesions were plated on tryptic soy agar (TSA). The majority of colonies presented as gram negative, oxidase positive coccobacilli, all of which are characteristic of pseudomonads and aeromonads. This corresponds with previous research associating both genera with fish diseases. Prevalence of *Aeromonas* and *Pseudomonas* on wounded and healthy skin was determined using selective agars, and results suggested a high prevalence of aeromonads colonizing the wounded skin. Sugar fermentation assays were performed to further differentiate between *Aeromonas* species and DNA sequencing of the 16S rRNA gene further confirmed genus and species identity. All results suggest *Aeromonas sobria* as the etiologic agent.

2:30 – 2:45: Chicken Egg White Shows Promise as a Viable 3-D Matrix for the Physiologically Relevant Co-Culture of Rat Embryonic Hippocampal Neurons and Their Supporting Glia. Gilbert V. Schaeffer, II*, Department of Biology, St. Vincent College.

Cells cultured in a three-dimensional matrix exhibit greater phenotypic similarity to those in vivo than cells grown in monolayer. Unfortunately, commercially available biological matrices are often cost prohibitive. Recently, chicken egg white has been reported to serve as a functional 3-D matrix for the culture of breast cancer cells. In this study chicken egg white was evaluated as a three-dimensional matrix for the co-culture of rat embryonic hippocampal neurons, astrocytes and oligodendrocytes. Culture conditions were optimized for cell seeding density and growth medium formulation. Under most conditions tested the growth of all neural cell types was supported and neuronal phenotypes were observed. However functional synaptic analysis was not performed. Specific technical issues relating to the gellation properties of, and immunodetection in, the egg white remain to be resolved, but the data obtained suggest significant promise for egg white as a readily available and inexpensive 3-D growth matrix for neural tissues.

2: 45 – 3:00: Anti-Bacterial Effects Of Near-Ultraviolet (405nm) Light-Emitting Diodes On *Staphylococcus Aureus* Amanda Stolz^{*1}, Greg Delost¹, (Janis Eells² and Troy Skwor^{1,3}); ¹Gannon University, Morosky College of Health Professions and Sciences – Biology, Erie, PA; ²University of Wisconsin – Milwaukee, College of Health Sciences, Milwaukee, WI; ³Children's Hospital Oakland Research Institute, Center of Immunobiology and Vaccine Development, Oakland, CA.

The increasing prevalence of antibiotic resistance has led scientists to pursue new methods of treating bacterial infections. Research studies have demonstrated an alternative method of controlling bacterial growth through the use of different wavelengths of light. Particularly, the use of 405-nm (blue) from light-emitting diodes (LEDs) has restricted growth of various gram-positive and gram-negative bacterial pathogens. The objective of this study was to determine the effect of portable blue LEDs on *Staphylococcus aureus* growth. Dilutions of an overnight culture were exposed to 4.0 – 7.68 Joules/cm² of blue light emitted from portable LEDs (Quantum WARP 10A, Quantum Devices, Inc.). After varying durations of LED exposure, viability of bacteria was assessed by determining bacterial colony-forming units (CFUs) on tryptic soy agar (TSA) and comparing the plates to controls that were not exposed to LEDs. Our data demonstrates a significant decrease in CFUs due to blue LEDs and dependent on exposure time. Additionally, *S. aureus* colony sizes were smaller after exposure to blue LEDs compared to control TSA plates not exposed to blue LEDs. Together, these data demonstrate the use of LEDs as a portable anti-bacterial device against *S. aureus*, which could aid in future food handling and medical applications.

3: 00 – 3:15: Effects Of Portable Light-Emitting Diode On Human Epithelial And Primary Keratinocyte Cellular Proliferation *Cassandra Wasson¹, Janis Eells², Matthew Ruston¹, Elisa Konieczko¹ and Troy Skwor^{1,3}

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Near Infrared Light (NIR) emitted by a portable Light-Emitting Diode (LED) has multiple applications ranging from environmental purposes to providing a non-invasive method of assessing brain damage. Furthermore, medical applications of NIR have been associated with tissue healing and pain reduction, including therapy for osteoarthritis, sports injuries, burns, muscular degeneration, and fibromyalgia to name a few. Because of its diverse usage, we were curious what effects NIR had on cellular proliferation of primary (epidermal keratinocyte cells) and immortalized (human cervical epithelial (HeLa)) cell lines. The keratinocyte cells and HeLa cells were stimulated with NIR at 50 or 150 miliwatts/cm² and 150 or 250 miliwatts/cm², respectively, using a portable Quantum Warp 10A (Quantum Devices). At different time points, cells were trypsinized and counted using a hemocytometer. After 48 and 72 hours, increased proliferative effects were demonstrated amongst both primary keratinocyte and immortalized epithelial cells, though optimal NIR intensities differed between cell lines. Exposure to NIR also resulted in healthier looking cells with increased adherence compared to control cells. This effect was visible only within a narrow range of near-infrared light intensities, and primary cells were more sensitive to its effect. Together our results demonstrate NIR’s prolific effect on two different cell types, primary epidermal keratinocytes and immortalized epithelial cells. These data suggest a “healing” phenotype associated with NIR treatment via a portable LED, which further supports the medicinal applications of NIR.

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