



Proceedings of The New Jersey Biosciences Forum

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**Colonia High School:*****Commercial Skin Care Products as Enhancers of Dermal UV Absorption***

By: Ife Aridegbe - Colonia High School

Ultraviolet (UV) radiation has been shown to have a negative and often dangerous effect on the human skin, and is also the main cause of skin cancer. Previous experiments have shown that sodium polyacrylate gel (commonly found in contact lenses) has the ability to increase the UV radiation transmitted through the polymer. The experimental goal was to determine whether the commercial skin care products absorb or transmit the UV radiation. It was hypothesized that if commercial skin care products were exposed to UV radiation, then the amount of UV radiation transmitted would increase. Initially, a commercial skin care lotion was evenly spread on a glass microscope slide and exposed to UV radiation. Results of multiple trials showed that the commercial skin care product decreased UV transmission as compared to evenly distributed water droplets on microscope slides exposed to UV radiation. In conclusion, the commercial skin care products do not have the ability to increase UV transmission yet they do have the potential to block UV radiation. It was also shown that products may be chemically altered by UV rays.

Magnetic Drug Targeting via Electromagnetic Induction

By: Jenna Newman – Colonia High School

It has been said that tumors may be destroyed by heat generated by a magnetic field. A magnetic macrosphere was placed inside an open cylindrical non-magnetic metal container, and then these objects were put on top of a rotating magnet. Over time, the temperature of the magnetic macrosphere increased due to the oscillation of the magnet below it. This shows that heat (which could potentially kill tumors) was being produced from electromagnetic induction. More experiments will be conducted in the future to apply this information to tumors in human beings.

Inhibiting Bacterial Aerosols via Application of Organic Films

By: Mansimrat Kaur - Colonia High School

Previous studies have shown that when a toilet is flushed, the bacteria aerosols can be moved up to two meters in the air. Therefore, my experiment involved the use of an environmentally compatible method of reducing aerosolization. Glo Germ, a UV reactive polymer, was blended with water and then added to the water in a toilet. A black frame was placed to cover the toilet bowl, and toilet was flushed for the control trails.



The same procedure was repeated, only the second time vegetable oil was added to the surface of the toilet water. Black light was used to reveal the number of splash marks as a measure of aerosolization. The results suggested that the oil created a reduction of aerosolization.

Enzymatic Modification of Amylomaize to Enhance Shear-Thickening Properties

By: Stephen Hill - Colonia High School

Shear-thickening fluids have been shown to be effective at stopping projectiles when used in body armor. This is due to the fluid's ability to solidify with swift impact. The U.S. military is looking to use these fluids for protection on the battlefield, but the liquids are not cheap to manufacture, and are difficult to make. Amylomaize, (or cornstarch) when suspended in water will create a shear-thickening fluid, but it's much weaker than the STF made by the military. The goal of this experiment was to enzymatically engineer cornstarch particles to physically resemble the silica particles used by the military. The silica used by the military is rough, jagged, and porous, whereas amylomaize is round and relatively smooth. It was hypothesized that an enzyme (amylase) could be used to chaotically break down the starch particles, thereby rendering the shape to be more rough and jagged. Amylase does break down starch and it was used to make the starch particles more like silica particles, in order to make both a stronger and cheaper STF. The strength of these fluids was tested using a rheometer, which measures a fluid's ability to shear-thicken. Preliminary results suggested that shape has a positive effect on shear-thickening ability and will make a stronger STF.

Franklin High School:

By: Jessica Ramirez – Franklin High School

The Essay Competition event during the New Jersey BioSciences Forum required background knowledge on the topic of stem cells, in addition to skills in using rhetoric strategies of writing. An essay regarding the characteristics of embryonic and adult stem cells and their application in the medical world was provided. This essay prompted the competitors to create a thesis based on the information given, and expand on the information by using our prior knowledge. Material discussed included the stem cells' ability to differentiate into specialized cell types, as well as their future use in medical therapies.



By: Nicole Royer – Franklin High School

I recently participated in an essay competition at the New Jersey BioSciences Forum at Middlesex County College. I had to explain the benefits and concepts of stem cell research and tissue regeneration. This topic is highly fascinating and pertinent to modern science, as new discoveries regarding stem cells are often made. Embryonic stem cells can differentiate into most other types of cells. They are pluripotent, meaning they can differentiate into any of all three germ layers: endoderm, mesoderm, and ectoderm. This property explains how they have the ability to differentiate into a wide range of other types of cells. This can be a huge asset to fighting disease, because stem cells can replace damaged tissue cells. Stem cells look promising as candidates for future therapies.

Highland Park High School:

By: Diane Lee - Highland Park High School

For the New Jersey Biosciences Forum held by Middlesex County College I participated in the essay competition. In this event, I read a packet presenting different sets of data and information on Biofuels, and wrote about my opinion on using them as an environmentally friendly source of energy. After participating in the essay competition, I really enjoyed looking at other projects and presentations done by various groups of students. I definitely want to contribute my part to this kind of forum in the future.

By: Xiaotong Li - Highland Park High School

At the New Jersey BioSciences Forum this year, I participated in the debate competition along with several other students, where our rhetoric skills were challenged to defend specific positions on bioethical issues. For preparation, I researched information both in support and in opposition to stem cell research, gene therapy, and genetically modified organisms, while in the process developing my own personal opinion. The debate was a great experience because we looked outside the realms of our own views to consider the other effects of these scientific advancements.

**John P Stevens High School**

By: Parth Patel – J.P. Stevens High School

The New Jersey Biosciences Forum, held in October of 2009 at Middlesex County College, was a gathering of high school students who came together to participate in a number of activities. There were individual hands-on research projects, computer-based programs, debating on vital issues in the world and a writing competition. High school students from the surrounding area came to show their knowledge of the key issues afflicting the science community today.

I personally participated in the debate competition and debated over the implications of gene therapy, the pros and cons of stem cells and the morality behind genetically modified organisms. The key aspects to the debate were knowledge of the topic, projection of the information in a cohesive manner, and maintaining diplomacy in refutation.

Middlesex Academy of Allied Health and Biomedical Sciences:

By: Alan Gao – Middlesex Academy of Allied Health and Biomedical Sciences

During the New Jersey Biosciences Forum of 2010, I participated in the debate contest, a competition in which two students would discuss the benefits and detriments of a developing new field in Biosciences. Potential topics for the debate included genetically modified organisms, stem cell research, and the development of gene therapy. During the forum, I argued against the research on stem cells and was intrigued by the myriad of points that could be brought up on both sides of each issue. These points included religious and ethical issues, potential problems in a field not yet fully explored for the consequences, saving of lives through tissue created by the stem cells, and the methods of attaining stem cells from adults or used left over tissue. This debate was enlightening and taught me much information as well as debating skills.

Computer Science Presentation Abstract

By: Kimberly Lam – Middlesex Academy for Allied Health and Biomedical Sciences

Malaria is one of the deadly human diseases in the present-day world. The website I created delves into the history, symptoms, diagnosis, treatment, and facts of this disease. Malaria is a protozoan disease caused by the *Plasmodium* parasite. It is spread through contact with infected blood, most commonly through the Anopheles mosquito. The hosts which suffer the most are humans and animals, as this parasite infects the liver,



and is later released into the bloodstream causing flu-like symptoms and weakness. The ever-changing *Plasmodium* protein coat makes this parasite difficult to isolate and create a cure for. It is the third most deadly disease, killing approximately one million each year and infecting millions more. The parasite, once found all around the world, is currently only endemic in the tropics due to improved human living conditions elsewhere. Regardless of the fact that malaria is easily transmitted by mosquito, with the right resources and early detection, the deadly complications that arise can be avoided.

By: Monica Khattak – Middlesex County Academy for Allied Health and Biomedical Sciences

Three topics have been under much debate: the promise of gene therapy, stem cells, and tissue regeneration. These topics were up for debate at the New Jersey Biosciences Forum. I argued the cons of stem cells and tissue regeneration and argued the pros of the promise of gene therapy. Stem cells and tissue regeneration have the potential of curing injuries and protecting the body from diseases. However, not enough research has been done on the topic; researchers do not know the possible side effects of using stem cells as cures. Also, the most effective stem cells are those of the embryo. These can be collected from the umbilical cord and placenta at the time of birth. Preserving them cost a lot of money which some people cannot afford. This will lead to the fact that this cure is only available to the rich, not the poor and therefore makes the rich richer and the poor poorer. The other topic that was discussed was the promise of gene therapy. Gene therapy tackles hereditary diseases at the root of the problem. It involves injecting a vector into the body with a correctly coded DNA sequence that will correct the faulty DNA of the cell. The vector will inject the correctly coded DNA into the cell and it replaces the faulty DNA, therefore when the cell undergoes mitosis, the proper DNA is copied and the disease can no longer spread throughout the body. Gene therapy can also eliminate hereditary diseases from the human gene pool by correcting the DNA in gamete cells so that offspring inherit corrected DNA. Gene therapy can greatly benefit human life. In conclusion, there has not been enough research conducted on stem cells to know all the side effects. On the other hand, gene therapy can potentially delete harmful diseases from the human gene pool and improve the quality of human life.

By: Morissa Schwartz – Middlesex Academy for Allied Health and Biomedical Sciences

Lyme disease is one of the most commonly misdiagnosed diseases. Spread through the bite of a deer tick, Lyme disease often goes unnoticed, until symptoms occur in the ill patient. There are three stages to the disease: early localized disease, early disseminated disease, and late disease. In the first stage, there is often a “bulls eye” rash on the infected; however, the rash does not always show up or is sometimes in an area



that is not visible, like on the scalp. During the second stage, patients can experience a variety of symptoms affecting their cardiovascular system, nervous system, and muscular system. The last stage is most severe, and can even lead to death. Since Lyme disease victims have such a wide variety of symptoms, the disease is often misdiagnosed as a number of other diseases like Lupus, Hypothyroidism, Multiple Sclerosis, and many more. There are diagnostic blood tests for Lyme disease; however they are not always accurate and can imply that a person with Lyme disease that they are healthy, when they are not. For those reasons, awareness about Lyme disease must be spread. By informing others about the life-altering affects of Lyme disease, people will be better attuned to the signs and less often misdiagnosed. Lyme disease affects millions of people, and many people may never recover because they have been wrongly diagnosed. By letting people know the truths about Lyme disease, lives can be saved.

When faced with the task of creating a computer technology presentation about human diseases, I decided to make a dramatization about Lyme disease. I faced the hardships of Lyme disease when I was only eleven years old. It was a topic very dear to my heart. I began adding to my knowledge of the disease through vigorous research, and soon became an expert on the topic. For the competition, I filmed a video about a girl who experiences Lyme disease and gets misdiagnosed several times. My father played the doctor, my mother played the main character's mother, and I played the ill girl and narrator. Once my filming commenced, I began editing. I used every visual effect, sound effect, and educational tool in my video that I could. The main point of my video was that people get ill too often from Lyme disease, and awareness of Lyme disease must be spread so that it can be diagnosed earlier.

New Jersey Bioscience Forum Abstract

By: Navneet Goraya – Middlesex Academy for Allied Health and Biomedical Sciences

The New Jersey Bioscience Forum emphasized the importance of some of the most significant fields of scientific study today, including stem cell research, tissue regeneration, and genetically modified organisms. The essay competition allowed participants to learn that countless scientists and researchers today are hoping that stem cells will eventually be able to treat one of the most fatal diseases in the United States—heart disease. These scientists are conducting many experiments in order to form cells known as cardiomyocytes from stem cells. They hope to use these cardiomyocytes to regenerate dead tissue on the heart, a characteristic of heart disease. Stem cells are becoming a major part of the evolving field of science, as they have the ability to be specialized into any type of cell in the body. The different types of stem cells, particularly adult stem cells and induced-pluripotent stem cells (iPSCs), are gaining importance as certain diseases are taking the lives of many. The essay competition of the New Jersey



BioSciences Forum allowed participants to see just that, and gain a better understanding as to what medical breakthroughs may occur in the future regarding stem cell research.

Difference in Fungi Diversity on Large Trees versus Small Trees Linked to Global Climate Change and Habitat Fragmentation

By: Puneet Dhillon – Middlesex Academy of Allied Health and Biomedical Sciences

I researched previous work done in the field of fungi, and found that the growth of fungi is affected by the temperature, the environmental condition and the status of the host. We found that large trees in our study site, Thomas Alva Edison Park adjacent to Middlesex County College, had greater fungal growth than small trees. From this, we formed our hypothesis that fungi diversity will be greater on trees with a diameter greater than or equal to 16 cm (large trees) than trees with a diameter less than 16 cm (small trees). We took a census around our trees (at a 50 cm radius around the base of the tree, and 2 m high) and counted the number of fungi individuals on the large trees and small trees and calculated the species diversity using the Simpson's Diversity Index. We found that our hypothesis was supported and fungi diversity was greater on large trees. We then researched fungal role in habitat fragmentation and global warming.

BioScience Forum Abstract

By: Shreyank Desai – Middlesex Academy for Allied Health and Biomedical Sciences

The category I chose to compete in was the Computer Technology design and presentation. I had to research a human disease and present what I learned in the form of a website, power point, or video. I choose to research about the respiratory disease, Severe Acute Respiratory Syndrome (SARS). I developed a website to present my information. I researched the SARS epidemic of 2003 which originated from the Guangdong Province in China. It is a pneumonia-like virus that causes respiratory symptoms such as fever, chills, muscle aches, cough and headaches. It is contracted through droplets spread through the air, and after contracted, symptoms appear within 2 to 10 days. The treatments for this virus are antibiotics, steroids, or blood serums from previously infected patients. These treatments however may or may not work, as SARS can be a fatal disease. The SARS epidemic of 2003 could have become worse if it wasn't for the World Health Organization's (WHO) quick actions to restrict travel and limit the spread of the virus. SARS is a virus to be wary about.



Biosciences Forum Experience

By: Zankhesh Patel – Middlesex Academy of Allied Health and Biomedical Sciences

In the New Jersey Biosciences Forum, the essay topic was about the potential usage of stem cells to cure heart disease, which is one of the top killers within the United States. Heart disease is prevalent in the United States due to complications arising from other conditions such as diabetes and obesity. In the essay, the different characteristics of stem cells, their vital use in organ transplantation, and treatment of heart disease was discussed. The use of patients own stem cells which are directly involved with the creation of entire new organs, was also explained. This process reduces the chances of further complications that follow traditional organ transplants. The essay explored the great potential of stem cells in health care and their ability to solve the organ shortage problem that causes the death of innumerable Americans every year.

Middlesex County Academy:***Which Bathroom Has More Bacteria?***

By: Akshaya Uttamadoss – Middlesex County Academy

For my NJBSF hands-on research project, I decided to see whether the boy's or the girl's bathroom in my school had more bacteria. I took samples from the doorknobs of both the boys and girls bathrooms, and cultured the bacteria in petri dishes for several days. I then observed how much bacteria was present on each dish. I had hypothesized that the boy's bathroom would have much more bacteria than the girl's bathroom. However, my hypothesis was not supported by the experiment, because the girl's bathroom ended up having more bacteria than the boy's bathroom.

New Jersey Biosciences Forum

By: Kathryn Materna – Middlesex County Academy

At the NJBSF, I wrote an essay about the benefits and costs of biofuels emerging as a greater player in the world energy scene. Using the information I was given on the day of the forum, as well as research I had conducted previously, I focused on the advantages that ethanol and other biofuels have over gasoline, such as being carbon-neutral and being renewable. However, I also expanded to the economic side of the argument, describing how a system based on corn ethanol would drive the prices of food



higher. I concluded that corn-based ethanol is not the ideal solution to the energy problem in America, but that other types of biofuels have more promise.

Abstract: Arthropod Diversity in a Lawn vs. a Forest

By: Raeesa Soomar – Middlesex County Academy

Forests are generally very biologically diverse, providing habitats for a massive variety of living organisms. However, they are being depleted faster and faster as a result of damaging practices of humans, robbing numerous organisms of their habitats. This experiment tests how much difference there is in the biodiversity of a forest versus a location heavily influenced by humans (a lawn). I chose arthropods to study biodiversity. My hypothesis was that there would be a higher arthropod diversity as well as abundance in the forest. The two sites used in this experiment were a forest patch in Thomas Alva Edison Park near Middlesex County College, and my lawn. For each site, I set up 15 quadrants 5 ft by 5 ft scattered around the site. From these quadrants, I collected soil samples and tested the soil for nitrogen and phosphorous. Next, I set up pitfall traps in each quadrant to trap arthropods, and left them trapped for 24 hours. Then I returned and collected the traps, counting the number of arthropods and using the Simpson's Diversity Index to calculate the diversity. I found that the forest had a higher amount of nitrogen and phosphorous, and 84 arthropods were caught whereas I caught 31 in my lawn. However, the Simpson's Diversity Index showed the lawn had the higher diversity. The data disproved a part of my hypothesis which said the forest would show more diversity, but the abundance of arthropods in the forest seemed to be true. The sizes of the sites should have been bigger, as well as the amount of quadrants and their area – this would have provided more accurate results which could be relied on. The idea was to show that forests really play very important roles in this world, and we should do our best to conserve these ecosystems.

By: Ruchi Karsalia – Middlesex County Academy

I participated in the essay competition at the New Jersey BioSciences Forum. I researched the possible topics to prepare for the competition and on the day of the event, I wrote a brief essay on the promise of the effective use of biofuels. My essay highlighted the benefits of biofuel, and showed that it is quite possible using this alternative energy resource. My educational experience was enriching, and I am thoroughly satisfied by it.

By: Sayantan Deb – Middlesex County Academy

I researched the role of genetically modified foods in the current state of society. I debated the issue based on the recent proliferation of the technology, as well as future potential. The "punch line" of this debate is the fact that scientists do not have to use



technology all the time for advancement in a particular field. As scientists, we should also keep in mind the social implications of technology. This theme continued to the second debate where we discussed the current growth in stem cell research, the ethical and moral questions that have been raised, and the politics behind the scientific research. Again, the message that we carried home was that science allows for great advancement in medicine and other technologies that are created for the betterment of mankind. At the same time, it is our duty to keep our social obligations in mind, and the benefit of scientific knowledge does not preclude us from the concerns of society as science and society are not mutually exclusive.

By: Yegor Chekmarev

For the New Jersey Bioscience Forum, I presented information on necrotizing fasciitis. Using websites and encyclopedias as my references, I compiled all relevant information and created a website for the disease. Afterwards, I made sure that I could answer all questions regarding the disease. The forum pushed me to really know my material well and I certainly learned a lot about necrotizing fasciitis.

Woodbridge High School:

The Quantitative Measurements of Boat Hulls on Stability and Roll Angle

By: Alex Joseph James - Woodbridge High School

The objective of this experiment was to investigate which boat hull design would be the most stable among the variables tested that included the Mexican Navy Patrol boat as the control, Navy Patrol boats (YP 654 Class, YP 703 Class, YP 676 and YP 696 Classes), Catamarans (Alibi 53, Outremer 49, Summerland 40, Queensland 55), and Trimarans (B&Q Castorama, Adventure 24, Weta Trimaran, Magnum 21). Only the control was tested for its roll moment. To conduct this experiment, the Mexican Navy Patrol boat was equipped with the mounting plates, roll moment apparatus, digital protractor, weight pegs, and ballast weights. The mounting plates were used to hold the equipments in place, and then the roll moment apparatus was attached with the ballast weights and digital protractor. The roll moment apparatus was used to shift the boat at specific distances (0m, 0.15m, 0.3m, 0.46m) off the side of the boat with different metacentric heights (0.03m, 0.05m, 0.1m, 0.13m, 0.15m, 0.2m, 0.25m). All the roll moments of the control at different distances were recorded for comparisons. To find the stability, the inertia was calculated, followed by the volume, which will lead to finding the metacentric radius (BM) which is inertia volume. All the hull designs were then



compared at their BM. Of the various hulls tested, Trimaran Adventure 24 was found to be the most stable due to their side hulls that prevented them from flipping over easily.

A Survey of the Type of Soil and Its Organisms in the Local Community

By: Alexis Faye Tzikakos and Kayla Janine Brunal - Woodbridge High School

A recent random survey was conducted to show where unhealthy soil may occur in local neighborhoods. 20g of multiple samples from various locations in the state of New Jersey such as Fords, Newark Airport, Woodbridge, Fords Park, Woodbridge High school (Dumpster, A-wing, D-wing, Courtyard) and Avenel were placed in containers and mixed with 40mL of distilled water in order to determine the nitrate and pH levels. To determine how well the soil buffers, 40mL of rainwater were mixed with 20g of soil. This was done in order to see if the precipitation will acidify the soil to a lower level. The data from the experiment conducted was in all an endeavor to see the ideal areas of soil, in which plants can grow faster. Measurements of ShopRite fertilizer (the control) yielded 446.7 ppm. This quantitative survey revealed that there were high nitrate levels within the soil of the A-wing of Woodbridge High School with 391.4 ppm and Newark airport at 319.6 ppm. However, few areas had low levels of nitrate such as a location in Avenel, with 27.6 ppm along with the D-wing of the high school at a reading of 41.1 ppm. ANOVA suggested statistical differences among all the various sites. In addition, when 40mL of precipitation was added to 20 g of a sample, the buffering system of the soil appeared to be more efficient when the nitrate levels are high. This makes sense as higher pH was also associated with higher nitrate levels since nitrate is naturally basic. In any case, higher nitrate and pH levels appear to be in areas that are more industrialized, possibly from runoffs or erosions. However, further investigation must be done to determine consistency in these measurements, especially in regards to the soil buffering system.

The Effect of Used Cooking Oil on the Depletion of Dissolved Oxygen in Salt Water

By: Giselle Ann Cruz - Woodbridge High School

Oil spills caused by leaking cruise ships, kitchen sinks, and further proceedings could deplete the oxygen supply in the ocean, which will then disrupt its fragile ecosystems and food chains (Friends of the Earth, <http://www.foe.org>). Vicinities of low-oxygen, or hypoxia, can result in the extinction of many various underwater species ultimately giving a smaller food supply to humans. An experiment was conducted to test the effects of used cooking oil spills on oceans oxygen levels. In the experiment, eighteen plastic containers were divided into three main groups of six. All groups contained 300mL of synthetic ocean water. The three main groups were categorized as the control group which contained no oil, 300 mL of synthetic ocean water (Group A), which



contained an addition of 60 mL of Canola Oil, and Group B, which contained an addition of 60 mL of Corn Oil. These three main groups were then split into two secondary groups of three. The first secondary group of each main group contained 300 mL of synthetic ocean water and its variable of Corn or Canola oil, and the second secondary group contained the amount of synthetic ocean water with 5 mL of Marine Broth (a chemical substance that enhances the growth of marine bacteria). The pH levels and Dissolved Oxygen levels were measured and recorded every day throughout a 14-day period. The statistical results acquired showed that the total amount of oxygen depletion caused by canola oil and corn oil held no significance whatsoever compared to the control group. These results may have occurred due to the absence of microorganisms and/or because of human error.

The Effects of Various Buffers on Acidic pH Soils

By: Jordyn Stanley - Woodbridge High School

As acid rain becomes a more serious problem, new methods are being developed to salvage vegetation that is unable to grow adequately due to low pH in soils. In order to determine which particle size of calcium carbonate was most effective in neutralizing acidic soil and allowing plant growth, a set of one hundred fifty *Phaseolus lunatus*, or lima beans, were grown in soils with various liming materials (calcium carbonate chips and powdered garden lime). The seeds were planted in an 8:1 ratio of soil to liming materials. They were then watered with 3 mL per day of different pH levels varying from 4.4 to 7.0. Over two weeks, the plants were observed and noted for their germination and growth rates. After conducting a Chi-Square analysis, the results concluded that the larger particle sizes (calcium carbonate) were not as effective as the smaller particle sizes (powdered garden lime) in aiding seed germination. In regards to the final heights of the plants, ANOVA and T-test also suggest that there was no significant difference between high and low pH in both groups of different particle sizes. The natural buffering found in the soil may have attributed to this lack of difference. Thus, it can be concluded, at least in this study, that the calcium carbonate of smaller particle size was effective in aiding germination.

The Effects of Plant Hormones on *Pisum sativum* Germination and Growth

By: Julian Moises Donado - Woodbridge High School

In my experiment, the effect of varying concentrations and combination of hormones on plant growth was determined. The following experiment tested which combination of hormones produced the greatest results in growth when exposed to *Pisum sativum*, or the sugar pea. The sugar pea was planted in containers that were divided into six chambers; each container was exposed to a different combination of hormones among



four different types: abscisic acid (AA), gibberellic acid (GA), zeatin, cytokinins. Not only was each group of peas exposed to a different combination of hormones, but also a different combination of dosage (i.e. high dosage of AA and low concentration of GA). A high dosage of a hormone was equivalent to 5 mL of a hormone water solution, while a moderate dosage consisted of 3 mL, and a low dosage consisted of 1 mL of the solution. All hormones were mixed according to Flinn's Scientific Recommended Standards. An ANOVA revealed that the data presented was statistically significant and rejected the null hypothesis at a 95% confidence level. The combination of a high dosage of AA and a high dosage of GA produced the tallest average pea plants from the rest, the tallest reaching 37 cm. When a T-test was utilized to compare all groups including the control, the mean from the combination of high dosage of GA and AA was consistently higher than any other combination. A loose pattern appeared with GA; every combination that contained high doses of GA yielded taller plants. This makes sense as GA is associated with stimulation of plant growth while AA retards growth and prepares the plant under stressful environments (Campbell 1999). Unfortunately, there was not enough time to gather and observe data on the effects of zeatin and cytokinin. Our preliminary studies suggest that using certain combination of hormones may accelerate growth in *Pisum sativum*, but further research is needed to examine the intricate relationship among different plant hormones.

The Buffering Rates of Common Antacids versus Herbal Remedies

By: Kamil Agha Abbas - Woodbridge High School

Antacids are inexpensive, over-the-counter medicines that neutralize excessive gastric acid. This experiment was designed to determine which antacids can neutralize acids the quickest. Eight different, commonly used antacids were selected for this experiment. The four artificial antacids included: Alka Seltzer, Tums, ShopRite (Extra Strength) and Liquid Antacid, while the four natural remedies were cloves, coriander, ginger and fresh mint powders. Each antacid (5 grams) was dropped into 200mL of vinegar and the pH was recorded in 30 second intervals for a five minute period. ANOVA showed statistical differences among the artificial antacids as well as within the home remedies. In fact, all antacids used increased the pH overall. However, paired T-test analysis revealed that all artificial antacids consistently raised the pH to a higher level and at a quicker rate compared to that of all natural remedies. Alka Seltzer had the fastest buffering reaction, statistically significant over all other varieties except ShopRite extra strength. Compared to all other antacids, the paired T-test revealed that the natural remedy of mint flakes was statistically the worst. Although the natural remedies did increase the pH level after the five minute interval, it was minimal compared to artificial ones. In fact, difference in pH can be up to 46 times stronger (a pH difference of 1.66). Since ShopRite Extra Strength performed as well as Alka Seltzer, it was also the most cost effective (1/4 the cost).

***A Survey of the Mold in Different Classrooms within our High School***

By: Kerri Ann Shaw and Krystina Sophia Housel - Woodbridge High School

Many teachers in this high school building have been complaining for years about the mold in the classrooms. They claimed that it has made them feel sick and tired. Granted, some studies do indicate that people who are allergic to mold may suffer from fatigue (Anisman-Reiner 2008). Whatever the case, if teachers are affected, students could be too. This experiment was conducted by creating malt extract agar plates, and was left in open air in various locations of the building (classrooms in A-wing, D-wing, 2nd floor, 3rd floor, hallways, and gymnasium) at durations of 10 minutes. The plates were then incubated for 96 hours and the number of mold colonies was counted. From the quantitative analysis the results determined there was no significance when compared to EPA standards. However, it can be concluded that cold, dark, damp, places such as student lockers and gyms are prime spots for mold growth.

The Effects of Various Natural Repellents on Heterocera

By: Kwasi Opoku and Michael William Arena - Woodbridge High School

Do you remember grandma putting mothballs in your drawers to repel moths so that they would not destroy your clothing? Mothballs were and are still being used to repel and destroy both moths and their eggs. Unfortunately, the chemical naphthalene or dichlorobenzene is used, and both are associated with damaging the human body's physiological system (Philips 2005). Can natural scents repel moths and prevent them from laying eggs? In this experiment 50 *Manduca sexta*, or Tobacco Hornworm were grown until pupation. Unfortunately, only about 45 made it to the pupae stage. Over the course of four weeks, of the 45, only 4 emerged as moths. The rest remained in the pupae stage. It is possible that these pupae entered diapause, a dormant stage due to the lack of sunlight exposure and warm temperatures. The four moths that did emerge, they lasted between 3 to 14 days, not enough to gather ample data. Despite a heating lamp, their deaths may be attributed to the colder temperatures since they were left in the classroom by the window for sunlight exposure. The typical temperature needed for these moths is 80 to 85 degrees Fahrenheit but classrooms are set at 70 degrees. If they had grown and remained healthy, they would have been exposed to scents such as lavender, citronella, rosemary, and camphor to determine if they can repel these moths.

How effective are Hand Sanitizers in Killing Bacteria?

By: Lauren Elizabeth Drumm - Woodbridge High School

How much bacteria is in that money you are handling? Can you really trust hand-sanitizers? In this experiment, the amount of bacteria on common currency was measured to see how dirty money really is, as well as how effective hand sanitizer is in killing these bacteria. This was done by swabbing money from the school cafeteria and directly touching it to the nutrient agar lined R.O.D.A.C. dishes. Once the bacteria were incubated for 72 hours, the number of bacteria in each dish was counted and recorded. The currency included samples of nickels, dimes, and paper bills. In addition to this, the effectiveness of hand sanitizers such as Purell and CVS brands were measured. Purell was applied to the same hands that had contact with the source of bacteria and were pressed onto the agar. The same was done with the CVS brand of hand sanitizer. The results showed that paper money contains much more bacteria than hard currency. In addition, the data shows that bacterial transfer to hands from money is actually minimal. Finally, hand sanitizers appear to be effective in killing bacteria, removing about 84%.

The Effects of the Increase of Salinity on the Levels of Dissolved Oxygen

By: Miguel Angel Cepeda - Woodbridge High School

Water is one of the most important substances needed in order for life to exist due to its many properties, for example its ability to hold dissolved gases (Campbell 1999). An experiment was conducted to determine if the amount of dissolved oxygen in water will decrease because of higher salinity and/or higher temperature levels. 150mL plastic containers were filled with water and were calibrated with a specific salinity (3.3%, 3.2%, 3.1%, 3.0%, 2.9%, 2.8%, 2.7%, 2.6%, 2.5%, 2.4%, 2.3%, 2.2%, 2.1%, 2.0%). The 3.0% salinity is the control and is considered the average salinity level in the ocean. The amount of dissolved oxygen in the containers was recorded daily, consecutively for 3 days. Two different trials were conducted with different temperature settings and different salinity levels. A T-test and an ANOVA were used to determine if there were any statistical differences. ANOVA revealed data differences among the temperature and salinity groups. Unpaired T-test revealed statistical differences between the temperatures of 57 and 72 degrees Fahrenheit. In addition, it also showed significant differences between 57 and 43 degrees Fahrenheit. In other words, higher temperatures have less dissolved oxygen than lower temperatures. In addition, unpaired T-test revealed differences between higher salinity (3.3% and 3.2% combined) levels compared to low ones (2.1% and 2.2% combined). This means that at higher salinity levels, there is less dissolved oxygen. Unfortunately, this study revealed no statistical significance in dissolved oxygen reading between 3% and 3.3% salinity levels. The implication of this controlled experiment is that higher temperatures and higher salinity levels in the ocean



will reduce dissolved oxygen levels. Furthermore, higher temperatures will also dissolve more salts, and in turn will also decrease those dissolved oxygen levels. Further research must be done to determine if very minor changes in temperature and/or salinity levels may cause dissolved oxygen levels to go down. This is important since the implication is that over time, global warming will yield less dissolved oxygen in ocean water.

Bacteria Contaminated Ice

By: Monica Andrews - Woodbridge High School

This experiment was designed to test bacterial growth in ice found in local fast food restaurants. Ice was obtained from five various facilities: McDonalds, White Castle, Subway, Taco Bell, and Burger King. Three samples of ice were drawn from each of the facilities and stored into sterile jars that were kept frozen prior to incubation. Before incubation, a sample from each of the facilities was placed in a warm water bath to allow each sample of ice to melt at the same time. 0.1 mL of the melted ice was drawn out of the sample onto sterile petri dishes surfaced with tryptic soy agar. The samples were then put into an incubator for bacterial culturing under room temperature (20- 25 degrees Celsius) for precisely 48 hours. Results did show that there was significant growth of bacteria from the ice acquired from the facilities. In fact, some locations produced more bacterial colonies than found in toilet water. White Castle consistently had bacteria free ice throughout these trials; however McDonalds and Burger King had similar counts of bacterial colonies ranging from 24- 53 counts. Statistically, an ANOVA suggests major differences among the various restaurants. However, because this is a preliminary study, it would be more insightful to test more samples of ice.

Effect of Salt Concentrations on the Osmoregulation of Poa, Dactylis, and Bromus Grass Seeds

By: Sarvesh Shah - Woodbridge High School

Poa is a cool-season grass, which grows on a variety of soils, providing a dense green sod. *Dactylis* and *Bromus* are perennial grasses, which succeed on almost all good soils, germinating at a rapid rate. However, the germination and the growth of these grass seeds may be affected by the salts used during winter to melt snow and ice. Hence, this experiment is designed to determine resistance of these grass species to different concentrations of salt. The objective of this experiment is to observe the germination of grass in the salt concentrations, determine the salinity levels in the soil after the germination, and to ascertain amounts of salt left in soils after it has been leached. These grass species were exposed to various amounts of NaCl concentrations (0%, 1%, 2%, 3%, 4%, and 5%) over a period of one to two weeks. About 30 seeds were confined in a 250mL container with 5 grams of topsoil. 10 mL of each salt concentration were

delivered to the appropriate sample every other day. Each trial for each species of grass was repeated three times to ensure accurate results. Quantitative analysis of grass growth was conveyed after the seeds were germinated. The Chi-Square analysis revealed that there were statistical differences among the germination of seeds, no matter which species. In addition, when compared to the control group (0%), paired T-test analysis revealed significant differences in the height of the grass. Soil samples from each concentration level were measured for leached or runoff salinity levels. The salinity concentration ranged from 1.2ppm at 0% to 13.1ppm at 5%. According to this initial finding, compared by height and germination to other species, *Poa* species of grass appears to be the most resilient when exposed to high salinity.

The Enzymatic Effect of the Polyphenoloxidase Enzyme on Ambrosia and Helianthus Weeds

By: Shabbir Agha Abbas - Woodbridge High School

Polyphenoloxidase (PPO) has been shown to retard the growth of the Ambrosia weed when 1mL of a 1:1 ratio of PPO enzyme and distilled water was used everyday for 15 days (Abbas 2009). The *Bromus* grass produces this enzyme naturally in its roots. Thus, a question is proposed: Will Ambrosia growth retard if a mat of *Bromus* grass is grown in close proximity of this weed? Seeds from *Dactylis*(control) and *Bromus* grass species were grown for 10 days in a dense population on ten separate 20cm x 20cm grass mat. Germinated Ambrosia weed was then introduced into each mat. Over the course of 14 days, the height of the weed was measured daily. Unpaired T-test between *Dactylis* grass (control) and *Bromus* grass revealed statistical difference for the reduction of growth in Ambrosia, rejecting the null hypothesis at a 95% confidence level. The mean height at the end of 14 days for the weed in the *Dactylis* mat was at 5.480 cm compared to that of *Bromus* at 4.390 cm. Although statistically significant, the weed was not completely eradicated by *Bromus*. Instead, the growth was only stunted. On a separate experiment, Ambrosia weed was germinated and grown in PPO enzyme solutions of 100% (1:1 ratio of enzyme and distilled water), 75% (3:4), 50% (1:2 ratio), 25% (1:4 ratio), and 0% (distilled water). Unpaired T-test revealed that when the Ambrosia weed was compared from 100% PPO enzyme solution to that of 0%, 25%, and 50%, there was statistical significance. The 75% was just as effective as 100% when compared to the control. In other words, this study supported the research experiment done in the previous year (Abbas 2009). This also validates the fact that only a very strong concentration of enzyme can stunt, but not eradicate the growth of the weed.

***Quantitative Measurements of Inorganic Compounds in Drinking Water***

By: Stephanie Faye Medvetz - Woodbridge High School

The motivation for this project is to see if water filters can really filter out harmful contaminants. The Environment Protection Agency set certain standards for drinking water due to the fact that if those contaminants are above those standards, they put human beings at risk for serious health effects (EPA 2009). In this experiment, water from various sources such as lakes and rivers were tested before and after the water was purified of contaminants using simple cost effective filters such as PUR and Brita. The purpose of this project was to test the accuracy of these water filters. Inorganic compounds that were tested included arsenic, aluminum, silver, cadmium, chromium, iron, lead, mercury, manganese, antimony, and zinc. T-test analysis showed no statistical difference between PUR and Brita. However, Brita appears to consistently filter out more contaminants than PUR. Brita removed more silver, aluminum, chromium, mercury, antimony and zinc from all sources of water. Unfortunately, in some cases, both filters did not have a major measurable effect from the standard sample of the water source, indicating the inconsistency of these cost effective filters. In any case, all samples, regardless of filtration or not, were within EPA standards for inorganic contaminants tested

The Effects of Conditional and Unconditional Positive Reinforcement on Learning Motivation

By: Steven Andrew Kosakowski - Woodbridge High School

The purpose of my experiment was to differentiate between positive and negative reinforcements amongst teenagers ranging from the ages of 14-17, in regards to academic work ethic in learning a new language. An original test was designed in which 20 German phrases with their translations were given to the students to memorize within 10 minutes. Afterwards, the students were randomly given either a multiple choice or an open ended quiz to take. There were three main groups involved: the control group, in which an unconditional positive reinforcement incentive (candy) was rewarded if they just completed the test; a negative reinforcement group, in which an incentive (candy) was promised but would be removed if they tested below a standard score; a conditional positive reinforcement group, in which the amount of incentives (candy) was promised depending on if the score reached a certain standard. For example, at a score of 70 a student would receive 1 piece of candy, an 80 would be 2 pieces of candy, 90 is 3 pieces etc. The data from the experiments had mixed results. ANOVA revealed statistical significance among the groups tested; it did not matter if the students took the multiple choice or open ended quiz. The basic trend in the data for most but not all cases was that the positive conditional reinforcement groups scored consistently higher than other



groups. Qualitative assessment from student body revealed that the type of incentive was important in motivation in academic work ethic. When the students were asked to list their top positive reinforcements that would motivate them to develop better work ethics, they revealed that it should include: homework passes, exemption from finals, and class field trips.

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