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Editorial

The purpose of the *Science and Technology Undergraduate Research Notes (SATURN) Journal* is to provide a venue for publication of undergraduate research. This research may include any novel findings of note while providing an opportunity for undergraduates to experience dissemination of their findings to the scientific community. Our goal is for the *SATURN Journal* to serve as both an educational and research tool.

The National Science Foundation has recommended that undergraduate students participate in research experiences during their freshman and sophomore years. Worthwhile data from embedded research in laboratory course curricula can be disseminated to the world community. By contributing their own novel findings for the greater good, students can be engaged in science through embedded research pedagogy more than through conventional pedagogy, and a source of large scale cataloging information is developing by many students contributing novel data.

The *SATURN J.* began its' first issue with students from a Principles of Biology class at Suffolk County Community College (SCCC) in New York contributing their findings from a research project embedded in the laboratory curriculum. Specimens of each tree found on residential properties were brought to class. The species of each tree was identified by using a traditional dichotomous key. Students collaborated in groups to develop hypotheses based on the locations of the properties where the trees were found, the distribution of species, sizes of trees and population densities. The students followed the instructions for authors at the web site for the *SATURN Journal* (www.saturnjournal.org), and submitted their manuscripts to their instructor who acted as a peer reviewer. Those students whose manuscripts were accepted upon revision received a grade of 'A' and were given extra credit for the revision and publication. This has been a cost effective exercise that has resulted in enthusiastic student engagement, and is building a catalogue of the distribution of tree species on residential properties in Suffolk County, New York. There was also a publication in this issue by a group of students taking a course in statistics in which they compared the growth rates of different cultivars of the American Elm (*Ulmus Americana L*.) planted in an on campus experiment at SCCC.

In the second issue of the *SATURN Journal* there was a continuation of student publications pertaining to the embedded research project analyzing tree species distribution. Students found it helpful to compare their findings to the findings of student investigators who have published previously in the *SATURN Journal*, which resulted in citations of previously published students. The second issue also contained publications from a research project embedded in a microbiology course from which students reported their findings from tests of the antimicrobial properties of spices.

In the third issue of the *Saturn Journal* there was continuation of research projects that produced publications in the previous journals. New publications have compared findings to a larger battery of previously identified trees. Students used the web site from the United Stated Geological Survey (www.usgs.gov) to report the latitude and longitude of properties included in the studies. Additional web based tools used by students include online dichotomous keys such as vTree at Virginia Tech located in Blacksburg, Virginia (http://dendro.cnre.vt.edu/dendrology/idit.htm).

In this fourth issue of the *SATURN J.* we are happy to present the abstracts from the 2014 Northeast Regional Sigma Xi Conference held at SUNY Old Westbury, an article published by students at Molloy College regarding sweeteners and inflammation in macrophages, three additional articles from the microbiology course at SCCC, and a continuation of the *SATURN J.* tree survey.

We encourage instructors to have their students participate in the *SATURN Journal*. The publications in the journal are a source of embedded research project designs that instructors may include in their curricula. Instructors are welcome to design additional projects from which their students can submit manuscripts.

Louis Roccanova, Ph.D.
Editor in Chief
SATURN Journal

There is a Large Diversity of Native Tree Species in Central Islip, N.Y.

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Abstract: Thirty eight tree branches were gathered from seven properties in Central Islip. Using a dichotomous key, each species of tree was identified. The following trees were found: Honey Locust (*Gleditsia triacanthos*), Eastern Cottonwood *(Populus deltoides*), Northern Red Oak (*Quercus rubra*), Pitch Pine (*Pinus rigida)*, Norway Spruce (*Picea abies*), Red Maple *(Acer rubrum*), Sugar Maple (*Acer saccharum*), Flowering Dogwood (*Cornus florida*), Yellow Birch (*Betula alleghaniensis*), Pin Oak (*Quercus palustris)*, American Beech (*Fagus grandifolia*), White Spruce (*Picea glauca*), Weeping Willow *(Salix babylonica)*, American Sycamore (*Platanus occidentalis*), Northern White Cedar *(Thuja occidentalis*), White Ash (*Fraxinus americana*), Shortleaf Pine (*Pinus echinata*) and Wild Black Cherry (*Prunus serotina*). Many of the trees were found on more than one property. Those include Honey Locust (*Gleditsia triacanthos*), Norway Spruce (*Picea abies*), Red Maple *(Acer rubrum*), Sugar Maple (*Acer saccharum*), Flowering Dogwood (*Cornus florida*), Pin Oak (*Quercus palustris*), American Sycamore *(Platanus occidentalis*) Pitch Pine (*Pinus rigida*) and White Spruce *(Picea glauca*). Among a sample of thirty eight trees, eighteen different species were identified. Of those eighteen species, sixteen of them were native to New York. The remaining two, Weeping Willow (*Salix babylonica*) and Norway Spruce (*Picea abies*), turned out to be non-native species.

Introduction: There are many different species of trees to be studied on Long Island. They can be categorized into different families, such as the Pinaceae family. Included in that is the Norway Spruce *(Picea abies)*, which can grow from 35 to 50 feet. The leaves are small and dark with green needles and can appear slightly wavy (Reviewed in Townes 2013). The Pitch Pine (*Pinus rigida*) can grow up to 60 feet high. The leaves are needlelike, in clusters of three and are 3 to 5 inches long. The cones are 2 to 3 inches long, egg-shaped, but flat-topped when open. The White Spruce *(Picea glauca*) can grow up to 60 feet tall with bluish green needlelike leaves approximately ¾ inch long. Also, the Shortleaf Pine (*Pinus echinata*) can reach between 80 to 90 feet in height. The leaves, which are needles, are in clusters of two and grow from 2 to 4 ½ inches long. The egg shaped cones can grow up to 2 inches long and have small, sharp prickles (Reviewed in Leopold 2005).

The Fagaceae family consists of the Northern Red Oak *(Quercus rubra*) whose leaves are simple reaching 7 inches long. They are lobed with slender bristles. The leaves are green, but turn red, orange and bronze in the fall. This tree can grow up to 75 feet high. The Pin Oak (*Quercus palustris)* can reach 70 feet high, with simple leaves that alternate. The leaves are about 5 inches long, deeply lobed and a dark green color that changes to red, reddish brown or bronze during autumn. Lastly is the American Beech *(Fagus grandifolia*). This is a tree with simple, alternating leaves about 2 to 5 inches long. They are a glossy green color turning golden bronze in the fall. They can grow to 70 feet and over (Reviewed in Leopold 2005).

Another family is the Salicaceae family. The Eastern Cottonwood *(Populus deltoides)*, is a large tree reaching 100 feet in the air. The leaves alternate and are simple, 3 to 5 inches long with a slight triangular shape. The leaves are green, but when autumn comes they turn brown, yellow or golden (Reviewed in Leopold 2005). Weeping Willow *(Salix babylonica*) is a member of this family. It is known to have a short trunk with a broad, rounded crown. It has a height of 30 to 50 feet and a width of 20 to 40 feet (Reviewed in De Anda 2013).

The Aceraceae family includes the Red Maple *(Acer rubrum*) tree. This tree can grow to 60 feet with simple leaves going opposite of each other. They can grow 2 to 4 inches long, medium to dark green in color. In the fall they turn yellow, red and orange. A close relative is the Sugar Maple (*Acer saccharum*) tree. The leaves are simple and opposite reaching 3 to 6 inches long and usually five-lobed. In the fall, the leaves will change colors, such as deep orange, red and yellow. This tree can grow to 75 feet and over (Reviewed in Leopold 2005).

The Honey Locust (*Gleditsia triacanthos*) tree is part of the Fabaceae family. This tree can grow from 50 to 70 feet high, with leaves pinnately and bipinnately compound; alternating and 6 to 8 inches long. The leaves are a shiny bright green turning yellow in the cooler months of autumn. Another family is the Platanaceae family, which includes the American Sycamore (*Platanus occidentalis*) tree. This is a very broad, massive tree reaching over 100 feet in the air. The leaves are simple, alternate, 3 to 5 lobed and are 4 to 9 inches wide. Next is the Oleaceae family, with White Ash *(Fraxinus americana*) being a member. The leaves are pinnately compound (5 to 9 leaflets), opposite and 8 to 15 inches long. They are dark green, changing over to shades of purple, red, orange and yellow in the fall. The tree can grow to 80 feet high. The Cornaceae family includes Flowering Dogwood (*Cornus florida*) which will grow to about 25 feet tall with simple leaves going opposite each other with a height of 3 to 6 inches long. The leaves are dark green, changing over to red, orange and purple in the fall. Betulaceae is another family that consists of the Yellow Birch (*Betula alleghaniensis*) tree. It is a large tree growing to approximately 75 feet high, with simple, alternating leaves that are 3 to 5 inches long. The dark green leaves turn yellow in autumn. Also, we have the Cupressaceae family. Included in this family is the Northern White Cedar (*Thuja occidentalis*) tree, which grows to 60 feet tall with scale-like leaves; bright green above, pale below (Reviewed in Leopold 2005). Lastly, there is the Wild Black Cherry (*Prunus serotina*) tree which is a member of the Rosaceae family. This is a medium size tree and can grow to 100 feet tall. The dark green leaves are 2 to 5 inches long, alternate and turn yellowish-brown in autumn (Reviewed at www.vt.edu 2013).

Method: To perform this experiment, a total of 38 tree branches were collected from seven different residential properties within a four block radius. At least three leaves were still attached. Out of the 38 samples taken, 18 different tree species were found. The remaining twenty were repeats. A dichotomous key found on the Virginia Tech website (www.vt.edu) was then used to identify each tree. A dichotomous key is a tool used in plant or animal identification. To be sure of the findings, a textbook (Native Plants of the Northeast) was used as backup. The latitude and longitude of each property was then found on the U.S. Geological Survey website (www.usgs.gov).

Results: The following six trees were found on residential property number one: Eastern Cottonwood (*Populus deltoides*), Northern Red Oak *(Quercus rubra*), Pitch Pine *(Pinus rigida)*, Norway Spruce (*Picea abies*), Flowering Dogwood (*Cornus florida*) and White Ash (*Fraxinus americana*).

Residential property number two had five trees. Those trees were as follows: Red Maple (*Acer rubrum*), Pin Oak (*Quercus palustris*), White Spruce (*Picea glauca*), Weeping Willow (*Salix babylonica*) and American Sycamore *(Platanus occidentalis*).

Residential property number three had four trees. Those include Pitch Pine *(Pinus rigida*), Sugar Maple (*Acer saccharum*), Pin Oak *(Quercus palustris*) and White Spruce *(Picea glauca*).

Five trees were located on residential property number four. Those trees are Honey Locust *(Gleditsia triacanthos*), Norway Spruce *(Picea abies*), Red Maple (*Acer rubrum*), Yellow Birch (*Betula alleghaniensis*) and American Sycamore (*Platanus occidentalis*).

Residential property number five had five trees. The following trees were found at this location: Sugar Maple *(Acer saccharum*), Flowering Dogwood *(Cornus florida*), American Beech

(Fagus grandifolia), American Sycamore (*Platanus occidentalis*) and Northern White Cedar *(Thuja occidentalis).*

Seven trees were located on residential property number six. They include Honey Locust (*Gleditsia triacanthos*), Sugar Maple *(Acer saccharum*), Flowering Dogwood *(Cornus florida)*, three American Sycamore *(Platanus occidentalis*) and Shortleaf Pine *(Pinus echinata*).

Residential property number seven had six trees. They consist of Honey Locust *(Gleditsia triacanthos*), Pitch Pine *(Pinus rigida*), Norway Spruce *(Picea abies*), Red Maple *(Acer rubrum)*, Pin Oak (*Quercus palustris*) and Wild Black Cherry (*Prunus serotina*).

Table 1
Location of Residential Property

Property	Latitude	Longitude
1	**40.7730**	**-73.1881**
2	**40.7733**	**-73.1883**
3	**40.7726**	**-73.1881**
4	**40.7762**	**-73.1809**
5	**40.7728**	**-73.1887**
6	**40.7766**	**-73.1818**
7	**40.7738**	**-73.1883**

(U.S. Geological Survey 2013)

Table 2
Identification of Trees on Seven Properties in Central Islip

Tree Name	Species	1	2	3	4	5	6	7
Honey Locust	*Gleditsia triacanthos*				**1**		**1**	**1**
Eastern Cottonwood	*Populus deltoides*	**1**						
Northern Red Oak	*Quercus rubra*	**1**						
Pitch Pine	*Pinus rigida*	**1**		**1**				**1**
Norway Spruce	*Picea abies*	**1**			**1**			**1**
Red Maple	*Acer rubrum*		**1**		**1**			**1**
Sugar Maple	*Acer saccharum*			**1**		**1**	**1**	
Flowering Dogwood	*Cornus florida*	**1**				**1**	**1**	
Yellow Birch	*Betula alleghaniensis*				**1**			
Pin Oak	*Quercus palustris*		**1**	**1**				**1**
American Beech	*Fagus grandifolia*					**1**		
White Spruce	*Picea glauca*		**1**	**1**				
Weeping Willow	*Salix babylonica*		**1**					
American Sycamore	*Platanus occidentalis*		**1**		**1**	**1**	**3**	
Northern White Cedar	*Thuja occidentalis*					**1**		
White Ash	*Fraxinus americana*	**1**						
Shortleaf Pine	*Pinus echinata*						**1**	
Wild Black Cherry	*Prunus serotina*							**1**

Of all the species of trees studied, many of them appeared on more than one property. Seven of them were found on three properties, one was found on two properties and one was found on four properties. Honey Locust *(Gleditsia triacanthos*) was found on properties 4, 6 and 7. Norway Spruce *(Picea abies*) was found on properties 1, 4 and 7, while Pitch Pine (*Pinus rigida*) was found on properties 1, 3 and 7. Properties 2 and 3 had White Spruce (*Picea glauca*) and Pin Oak (*Quercus palustris*) was found on 2, 3 and 7. Red Maple *(Acer rubrum)* was found on properties 2, 4 & 7 and its relative, the Sugar Maple (*Acer saccharum*) tree could be found on properties 3, 5 and 6. Flowering

Dogwood (*Cornus florida*) is on properties 1, 5 and 6. Finally, the American Sycamore (*Platanus occidentalis*) tree was found on properties 2, 4, 5 and 6.

Discussion: The tree species in this study were identified in the region by other investigators. Townes et al. (2013) found Weeping Willow *(Salix babylonica*), Pin Oak (*Quercus palustris),* Red Maple (*Acer rubrum*), Norway Spruce (*Picea abies*) and White Ash *(Fraxinus americana)* in the Central Islip area. DeAnda (2013) also made similar findings. Red Maple *(Acer rubrum),* Sugar Maple *(Acer saccharum*), Weeping Willow *(Salix babylonica*) and Flowering Dogwood (*Cornus florida*) were located in the East Islip/Bayshore area.

Conclusion: Although research was done within a small space of only a four block radius, eighteen different species of trees were found. Nine species were found on more than one property. The American Sycamore was found on four properties. All of the trees turned out to be native to New York with the exception of Weeping Willow *(Salix babylonica)* and Norway Spruce (*Picea abies*). Five trees were found to be coniferous, which means a tree grows cones and has green leaves all year round. Those five trees are Pitch Pine *(Pinus rigida*), Norway Spruce (*Picea abies*), White Spruce (*Picea glauca),* Northern White Cedar *(Thuja occidentalis*) and Shortleaf Pine (*Pinus echinata*). The other thirteen trees are deciduous, which means they shed their leaves in the drier part of the year and grow fresh new ones in the wet season. There is a large diversity of tree species in Central Islip, N.Y.

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Comparing Maple and Oak Tree Species between Westbury, Copiague, and Hauppauge, New York

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Abstract:
In this investigation, forty tree samples were taken from three different towns on Long Island in Nassau and Suffolk County; Westbury, Copiague and Hauppauge. Two dichotomous keys were used to classify these trees. The samples found in Westbury were American Larch (*Tamarack*), Sycamore Maple (*Acer pseudoplatanus L*), Mountain Maple (*Acer spicatum*), American Holly (*Iiex opaca*), Eastern Hemlock (*Tsuga canadensis*), and Colorado Spruce (*Picea pungens*). In Hauppauge Oriental Pear *(Pyrus calleryana*), Kwanszan Cherry Tree (*Prunus serrulata*), Gingo Biloba (*Maidenhair tree*) and Japanese Maple (*Acer palmatum*). In Coiague, three Sample of Swamp white oak (*Quercus bicolor*), and one sample of Chinquapion Oak (*Quercus muehlenbergii*) were found**.** It was found that Maple tree species were most common to Westbury (Nassau County) in central Long Island. Oak trees were most common to Copiague (Suffolk County) in southern Long Island. Hauppauge is the dwelling place to a great variance of tree species and not one in particular as demonstrated in this study.

Introduction:

Throughout the state of New York, there are approximately 18 million acres of trees which cover 62% of New York State (Leopold 2003). Due to the northeastern region having such dramatic climate changes, the variety of different species is much more unique compared to that of different parts of the United States. It is pertinent to the local conservationists and researchers to know which types of trees are invasive and which are native to the environment. In order to identify tree species in this study, dichotomous keys were used. Dichotomous keys are utilized to identify the species of a particular organism by sorting through characteristics of the organism until it matches with the described specimen. The organisms are divided by their differences. This type of key gives a description of different traits that lead to the species of tree being identified. There is also recently developed technology that allows mobile phone cameras to identify the tree species through an electronic dichotomous key application. The dichotomous key is one of the best methods adopted by modern day biologists to identify plants and trees. The samples collected for this experiment came from the town of Westbury (Nassau County), Copiague (Suffolk County) and Hauppauge (Suffolk County) on Long Island, New York. The towns included both had a variety of similar and different tree species. Variance between tree species may be attributed to their location and climate. Trees found in parts of northern long island in comparison to samples native to central long island may differ due to relative distance to ocean waters.

Methods:

Samples of trees were taken from three different towns in Nassau and Suffolk county. The samples from Nassau County were taken from the town of Westbury. The specimens of Suffolk County were taken from the towns of Copiague and Hauppauge. To conduct the experiment, multiple dichotomous keys (Petrides 1998) were used to determine the species of trees collected from three properties in each chosen town. The samples were categorized by the color, shape, size, and type of leaves or needles. These characteristics were used to eliminate the incorrect species until the true specimen was found in the key. After finding the common name and kingdom for the sample they were cross checked with another dichotomous key source (Petrides 1998)

Results:
A vast array of foliage species were found in the three Long Island Towns. In Westbury (Nassau County), one sample of American Larcho, two samples of Sycamore Maples, two samples of Mountain Maple, one sample of American Holly, one sample of Eastern Hemlock, one samples of Colorado Spruce, four samples of Red Maple, three samples of Sugar Maple, and two samples of White Oak were found. In Hauppauge (Suffolk County), two samples of Oriental Pear, two samples of Kwanzan Cherry Tree, two samples of Ginkgo Biloba, two samples of Japanese Maple, one sample of Red Maple, one sample of Dog Wood, one sample of White Oak and one sample of Spruce trees were found. In Copiague (Suffolk County), three samples of Swamp White Oak, one sample of Chinquapin Oak, five samples of Red Oak and two Sugar Maple samples were found.

Table 1 - Tree Species found in Nassau County Long Island

Town	**Amount found**	**Common Name**	***Species***
Westbury	1	American Larcho	*Tamarack*
Westbury	2	Sycamore Maple	*Acer pseudoplatanus l.*
Westbury	2	Mountain Maple	*Acer spicatum*
Westbury	1	American Holly	*Liex opaca*
Westbury	1	Eastern Hemlock	*Tsuga canadensis*
Westbury	1	Colorado Spruce	*Picea pungens*
Westbury	4	Red Maple	*Acer rubrum*
Westbury	3	Sugar Maple	*Acer saccharum*
Westbury	2	White Oak	*Quercus alba*

Table 2 - Species found in Suffolk County Long Island

Town	**Amount Found**	**Common name**	***Species***
Hauppauge	2	Oriental Pear	*Pyrus calleryana*
Hauppauge	2	Kwanzan Cherry Tree	*Prunus serrulata*
Hauppauge	2	Ginkgo Biloba	*Maidenhair*
Hauppauge	2	Japanese Maple	*Acer palmatum*
Hauppauge	1	Red Maple	*Acer rubrum*
Hauppauge	1	Dog Wood	*Cornus drummondii*
Hauppauge	1	White Oak	*Quercus alba*
Hauppauge	1	Spruce	*Picea*
Copiague	3	Swamp White Oak	*Quercus bicolor*
Copiague	1	Chinquapin Oak	*Quercus muehlenbergii*
Copiague	2	Sugar Maple	*Acer saccharum*
Copiague	5	Red Oak	*Quercus rubra*

Table 3 - Latitude and Longitude of Sampled Locations

Town	**County Name**	**GPS Latitude**	**GPS Longitude**
Westbury	Nassau	40°.770600	-73°.572571
Hauppauge	Suffolk	40°.816467	-73°.203883
Copiague	Suffolk	40°.691479	-73°.404816

Discussion:

Tree studies from Northern and Central Long Island show many differences and similarities between the specimens gathered on all of the properties. On Northern Long Island properties, Puca et al.(2013) found Silver Maple (*Acer saccharinum*), Tree of Heaven (*Ailanthus altissima*) and Sassafras (*Sassafras albidum*). Ambrogio et al. (2013) discovered, Black Walnut (*Juglans naira*), Mimosa Silk Tree (*Albizin julibriss*), Horse Chestnuts (*Aescuius hippocastanum*), Flowering Dogwoods (*Cornus florida*), White Pines (*Pinus strobes*), Water Oak (*Quercus naira*), Eastern Hemlock (*Tsunace canadensis*), Black Locust (*Robinia psedoacacia*), Cockspur Hawthorn, (*Crateaequs crusgalli*), Gray Birch (*Betula populitolia*), English Holly (*Ilex aquifolium*), Arbor Vitae (*Thuja occidentalis*). From Central Long Island, Marrone (2013) identified the following species in Brentwood: Balsam Poplar (*Populous balsamifera*), Serviceberry (*Morus alba*), White Mulberry (*Amelanchier arborea*) and European Beech (*Fagus syluatica*). Siddiqui et al. (2013) found a Sugar Maple Tree (*Acer saccharum*), Black Lotus (*Robinia psedudoacacia*), Norway Maple Tree (*Acer platanoides*) Black Gum Tree (*Nyssa sylvatica*) and Red Spruce (*Picea rubens*) in Central Long Island. From the samples gathered from this research and the research of other investigators, Arbor Vitae was found to be a popular species on the North Shore and Central Long Island. From the findings on Central Long Island properties, Red Spruce was found to be common.

Conclusion:

Forty tree samples from three towns on Long Island were identified and verified using three dichotomous keys. Based on the results, Maple tree species were most common to Westbury (Nassau County). Oak tree species were most common to Copiague (Suffolk County). Hauppauge is the residence to a large gambit of species including maples, spruces and cherry trees. Despite its small size, Long Island is home to a large diversity of trees.

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Analysis of Bacteria Found in Almond, Milk and Soy Yogurt Samples

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Keywords: Microbiology, Yogurt, Soy, Almond, Milk, Probiotic, Antibiotic sensitivity

Abstract:

Bacteria found in three types of yogurt, namely, milk, soy, and almond were examined for colony morphology, cell morphology and antibiotic sensitivity. Colonies of bacteria from almond and milk samples were minute and pinpoint. The colonies of bacteria in the soy sample, on the other hand, were slightly larger. All three samples had gram positive bacteria. Both bacilli and cocci were observed in the almond and milk samples. However, only cocci were seen in the soy sample. It was found that the bacteria in the almond and milk yogurt showed resistance to the seven antibiotics tested in the study while the bacteria in the soy sample was resistant only to one of the antibiotics.

Introduction:

Certain species of bacteria ferment the carbohydrates in the milk and release lactic acid, which then coagulates the protein in the milk, and thus solidify the milk (Kailasapathy *et al*., 2007). This substance is referred to as yogurt. Probiotics are live microorganisms found in yogurt, which when administered in adequate amounts confer a health benefit on the host (Food and Agriculture Organization, 2001). The presence of certain probiotic cultures such *as Lactobacillus bulgaricus, Bifidobacterium lactis*, and *Streptococcus lactis* benefit the digestive tracts of humans; these and other species take up residence in the gut and prevent harmful bacteria from growing. Other benefits of probiotic bacteria include the treatment of urogenital infections, antibiotic associated diarrhea, and gastrointestinal diseases such as Crohn's disease (Farnworth and Mainville, 2006). As developing countries face issues such as increasing allerginicity to certain substances such as cow's milk, and personal choices such as vegetarianism, non-dairy based probiotic alternatives have been developed (Farnworth and Mainville, 2006), including the use of soy milk and almond milk.

Antibiotics are chemicals that inhibit or kill bacteria. Some bacteria are resistant to certain antibiotics and are therefore able to grow even in the presence of these substances. Although antibiotic resistance has developed a negative connotation, this resistance can be beneficial. For example, antibiotic resistant bacteria in the human gastrointestinal tract can survive when certain antibiotics are taken, thus sparing the host symptoms such as diarrhea due to the loss of this normal flora. Harmful effects of antibiotic resistance include increased virulence of certain bacteria due to the transfer of antibiotic resistance genes to disease-causing species of bacteria (Willey *et al.,* 2010). The goal of this study was to determine the characteristics of probiotic bacteria found in three types of milk based yogurt: soy, almond, and cow's milk, as well as to determine the level of resistance to antibiotics in the species of bacteria present in the yogurt samples.

Methods and Materials:

Three yogurt samples were examined in this experiment: a milk based yogurt, a soy based yogurt, and an almond based yogurt. Samples from each of the three types of yogurts examined in this experiment were gram stained, observed, and photographed using light microscopy. Aseptic procedure was used to inoculate each sample on Tryrptic Soy Agar (TSA) plates as well as Brain Heart Infusion Agar (BHIA) plates using the streaking for isolation technique. The plates were incubated at 37ºC for

24 hours. The isolated colonies from the BHIA plates for each of the three samples were then used to make pure cultures in BHI (Brain Hear Infusion) broth using aseptic procedure. The BHI broth samples were incubated at 37ºC for 24 hours. Isolated colonies from the BHIA plates for the almond and soy samples and a sample of confluent growth for the milk sample were then Gram stained, observed, and photographed using light microscopy.

Antibiotic sensitivity testing was conducted using disc diffusion method (Harley, 2008). Each of the three pure cultures from the BHI broth was inoculated on Mueller-Hinton agar plates for confluent growth. Two plates were made for each sample, with 4 antibiotic discs placed in each of the two plates. The plates were then incubated at 37ºC for 24 hours. Seven antibiotic discs were used to test susceptibility: gentamicin (GM), erythromycin (E), penicillin G (P), ampicillin (AM), triple sulfa (SSS), streptomycin (S), and tetracycline (TE). Note that gentamicin was used twice as it was included in both plates for each sample.

Results:

The initial gram stain of the yogurt samples were observed under light microscopy, The almond based sample revealed gram positive streptococci as well as gram positive diplobacilli (Figure 1a). Majority of the cells in the milk based yogurt were gram positive diplococci. However a few gram positive bacilli were also seen (Figure 1b). Many gram positive streptococci were seen in the soy based yogurt sample (Figure 1c).

Bacteria in all three yogurt samples grew on both TSA and BHIA media, and isolated colonies were obtained for all three samples. The soy sample showed the most amount of growth on both the TSA and BHIA plates. The almond sample had fewer colonies than that of the soy sample. Milk sample had the least amount of growth. All three yogurt sample showed better growth on the BHIA plates. The isolated colonies of the soy sample were uniform and circular in morphology with a beige color (Figure 2c). The isolated colonies of both the almond and milk samples showed a pinpoint morphology and were transparent (Figure 2a and 2b). It was noted that a couple of contaminant colonies were seen in the almond sample on the BHIA plate (Figure 2a).

Isolated colonies from the BHIA plates for the almond and soy sample were gram stained. A colony from the almond sample had gram positive bacilli (Figure 3a). A colony from the soy sample had gram positive cocci (Figure 3c). Due to the pinpoint nature of the colonies from the milk sample on the BHIA plate, a sample was used from the confluent growth region for gram staining. Although mainly gram positive streptobacilli were observed, a few streptococci were also seen in this sample (Figure 3b).

Based on the zones of inhibitions measured for the soy sample the bacteria in this sample were found to be susceptible to ampicillin (AM), gentamicin (GM), penicillin (P), streptomycin (S), and tetracycline (TE). The sample was found to be intermediate to erythromycin (E), and resistant to triple sulfa (SSS) (Table 1). Both the milk and almond based samples showed no zones of inhibition indicating that the two samples were resistant to the seven antibiotics tested. (Table 1).

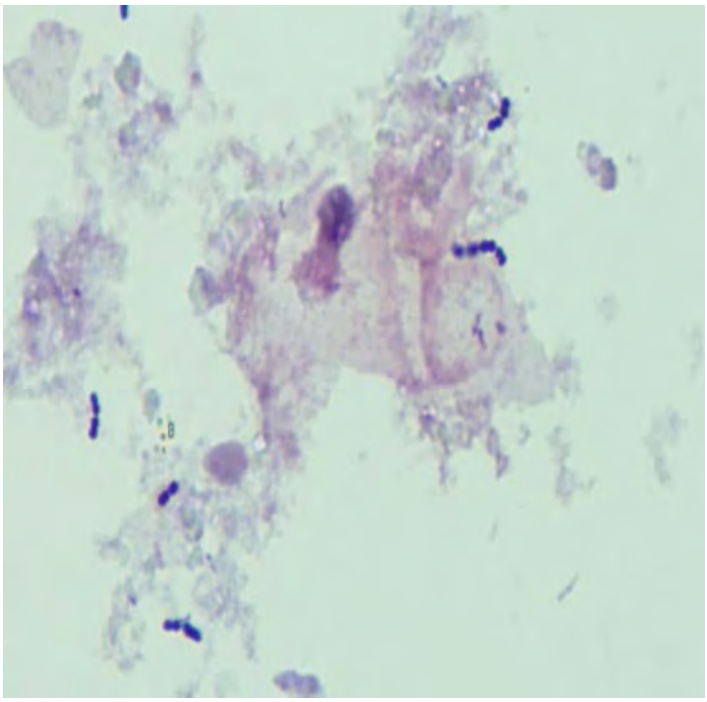

Figure 1a: Gram stained almond yogurt smear.

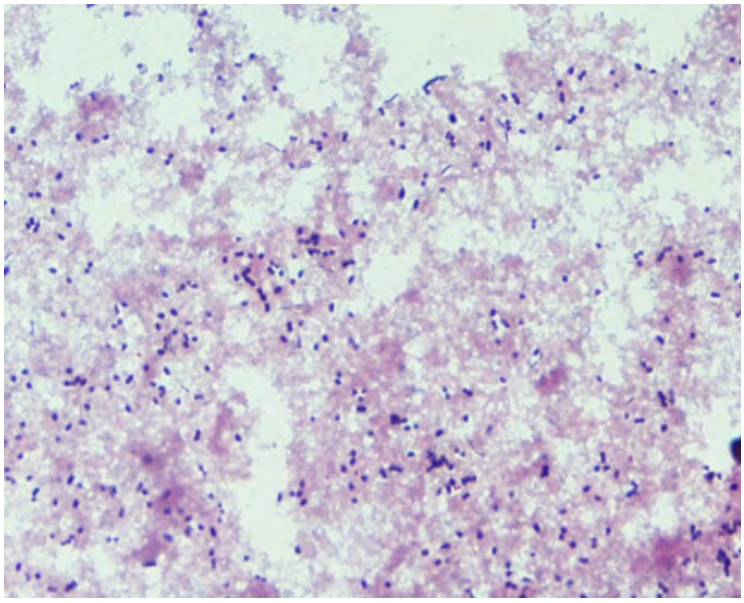

Figure 1b: Gram stained milk yogurt smear.

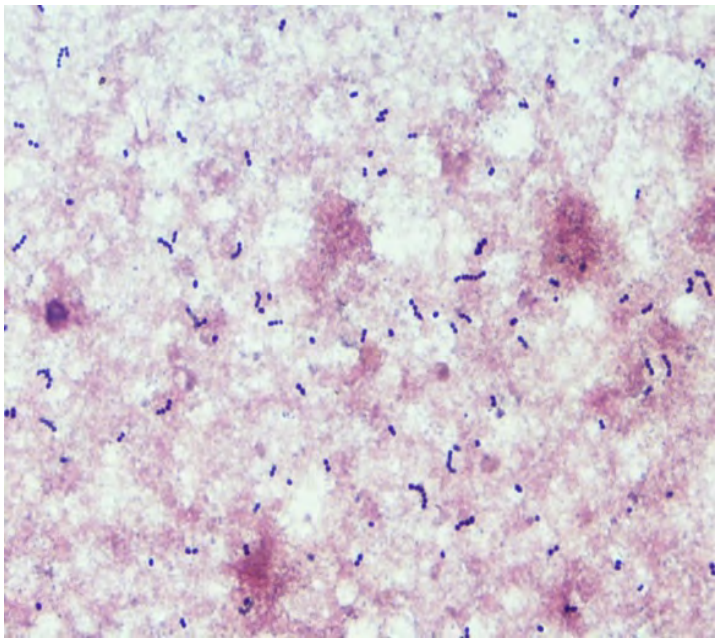

Figure 1c: Gram stained soy yogurt smear.

Figure 2a: Colony morphology of bacteria from almond yogurt on BHIA plate.

Figure 2b: Colony morphology of bacteria from milk yogurt on BHIA plate.

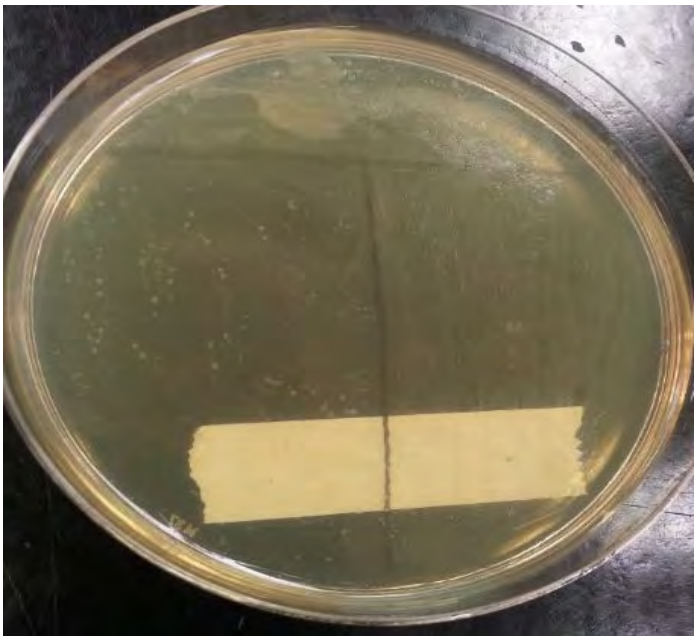

Figure 2c: Colony morphology of bacteria from soy yogurt on BHIA plate.

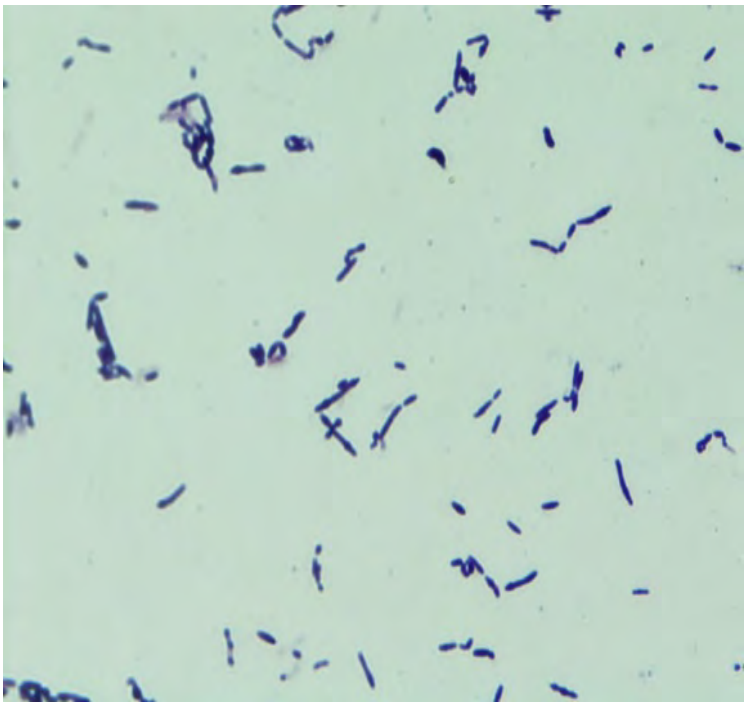

Figure 3a: Gram stained smear of an isolated colony of the almond sample on BHIA plate .

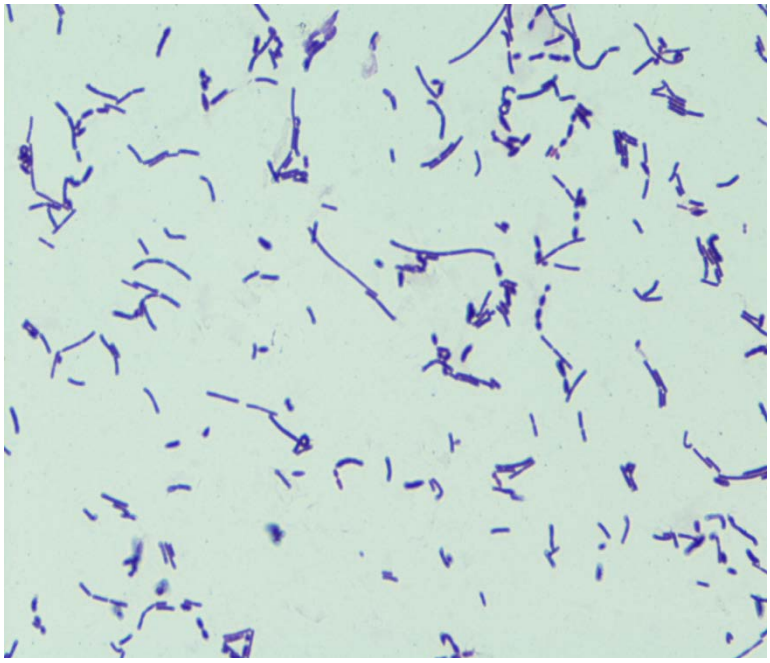

Figure 3b: Gram stained smear of confluent growth of the milk sample on BHIA plate .

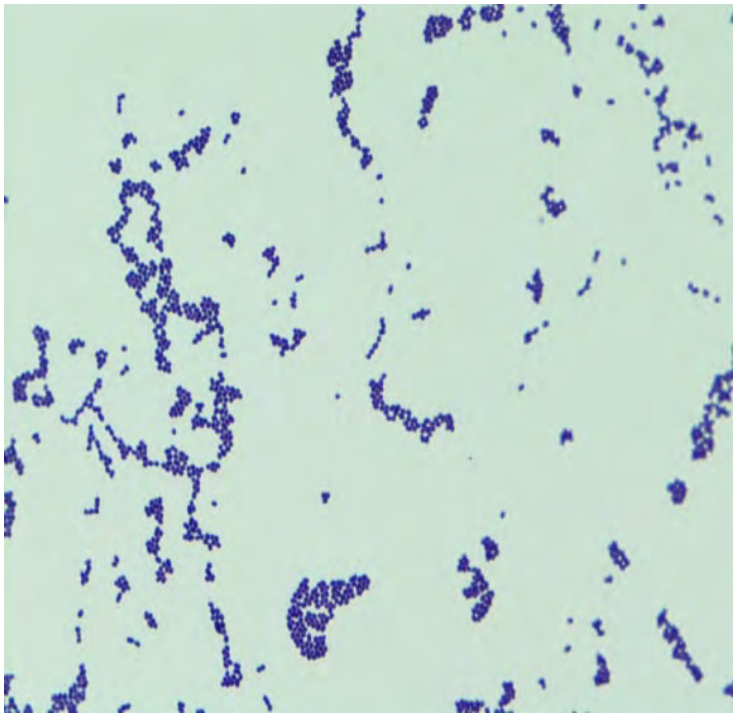

Figure 3c: Gram stained smear of an isolated colony of the soy sample on BHIA plate .

Table 1: Zones of Inhibition Observed in Soy, Almond, and Milk Based Yogurt Samples

Yogurt Type	GM	E	P	AM	SSS	GM	S	TE
Soy	19 mm	18 mm	32 mm	34 mm	0 mm	19 mm	19 mm	31 mm
Almond	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
Milk	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm

Gentamicin (GM), erythromycin (E), penicillin (P), ampicillin (AM), triple sulfa (SSS), streptomycin (S), tetracycline (TE), millimeters (mm).

Discussion:

The purpose of this experiment was to observe the characteristics of the bacteria used in probiotic yogurt production, as well as the differences found in three different types of yogurt: almond, soy, and milk based. The most common type of bacteria used in yogurt production are lactic acid bacteria, specifically *Lactobacillus* and *Bifidobacterium* are the two most common genera considered to have probiotic benefits (Sanders, 1997). The lactic acid bacteria (LAB) produce lactic acid as a product of fermentation, and are usually classified as gram positive cocci or rods. These findings are consistent with those of this study, as the bacteria observed were all found to be gram positive. The soy based yogurt sample was found to contain stretptococci. The almond based sample and the milk based sample had both cocci and bacilli. It was noted in this experiment that the soy based sample showed the most amount of growth in all types of media used, followed by almond, and lastly milk based yogurt which

showed markedly less growth. Farnworth *et al*. (2006) have found that the probiotic bacteria usually do not grow rapidly in cow's milk. Kailasapthy *et al*. (2007) also state that probiotic viability of bacteria in yogurt depends on factors such as the interaction between species present, culture conditions, fermentation time and storage conditions. Little information was found regarding the growth of lactic acid bacteria in almond based yogurts, however it was observed to have more bacteria than that of the milk based yogurt and it is most likely due to the lower pH levels providing a better growth media.

Antibiotic sensitivity testing was conducted on all three of the yogurt samples, as a growing concern has arisen concerning bacterial antibiotic resistance due to the increasing use of probiotic bacteria in foods. Kyriacou *et al.* (2008) have noted that "fermented products may act as a reservoir of antibiotic-resistant genes, which can be transferred to pathogens found in the gastrointestinal tract." In this study, it was found that the bacteria in milk based and almond based yogurt were resistant to the 7 antibiotics while those of soy sample resistant to only one of the antibiotics.

Conclusion:

The characteristics of bacteria observed in the three yogurt samples were consistent with those of the lactic acid bacteria, which are frequently used in probiotic yogurt. The bacteria of all three samples were gram positive. The soy sample contained cocci while the almond sample and the milk sample had a mixture of cocci and bacilli. It was found that the bacteria of the almond and milk samples were resistant to all seven antibiotics tested in this experiment. The soy based sample was found to be susceptible to ampicillin, gentamicin, penicillin, streptomycin, and tetracycline, erythromycin and resistant to triple sulfa.

Further studies could be conducted to investigate the pH differences of each of the three yogurt samples. In addition, other types of yogurt could be investigated including coconut milk and fruit-based yogurts in order to compare a wider array of results.

Acknowledgements:

We thank Debbie Kaufmann for providing the materials for the study. Our thanks to MaryPat Takacs for her instructions on the literature search.

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Identification And Comparison of Tree Species From Urban Queens and Suburban South-Central Suffolk County, New York Using A Dichotomous Key

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Abstract:

Samples of tree branches from 47 trees were cut from residential properties of Suffolk County and Nassau County as well as New York City. These samples were then identified by the use of dichotomous keys. After the species were identified the results showed that multiple species of trees can be found across the Long Island, New York Region,

Introduction:

New York State has a diverse population of tree species due the areas frequently varying temperatures. It enables many different species of trees to survive year to year. The importance of knowing which species live in what areas is vital to botanist and the scientific community in order to know what species are invasive and native to each ecosystem. Dichotomous keys were used in order to identify each sample. Dichotomous keys help classify different species using the tree's traits as indicators to which species a tree may or may not be. These traits include alternating or opposite branches and simple or compound leaves. The three areas sampled all display different environmental conditions. The average temperatures for Amityville, Lindenhurst, Smithtown and Deer Park ranged from 52-55 degrees Fahrenheit during the days that the samples were collected. Flushing was slightly lower and averaged 48-53 Fahrenheit degrees. The temperatures of all the towns were similar and only varied by a couple of degrees (nysc.eas.cornell.edu). Lindenhurst resides at an elevation of two meters above sea level (http://www.floodmap.net/). Amityville resides at an elevation of four meters above sea level. Smithtown resides at an elevation of sixteen meters above sea level. Deer park resides at an elevation of six meters above sea level. Flushing resides at an elevation six meters above sea level. Valley Stream is three meters above sea level.

Methods:

Each student brought in tree samples from different places of residence. Each member brought in about five to six branches found from different residential properties. Each sample was identified by their leaves using the Tree Finder book by May Theilgaard Watts (1991), and used the Eastern Trees book by George A. Petrides and Janet Wehr (1998), to validate our findings. Using the Tree Finder book by Watts (1991), the dichotomous key presented a set of choices in the book by determining whether leafs had opposite leaf pairs or alternate leaf pairs. By identifying its characteristic, the book guided the group to a starting point. After the first choice is made in the first step, a second set of choices appears and guides to the next step depending if the description of the leaf in the book best describes the sample. Eventually the choices lead to the name of a tree genus. In this process the identification of leaf arrangements (opposite leaf pairs or alternate leaf pairs), whether they were simple or compound leaves, leaf shapes: needlelike, scalelike, elliptic, ovate, lance-shaped, heart shaped, circular, triangular and fan shaped were observed. The identification of leaf tips and bases and margins were also observed. After categorizing each species to its attribute, the group was able to identify the tree species found in our residential areas. Using the Eastern Trees book by Petrides and Wehr (1998), the group was then able to receive more information on our species. It informed the group

with the locations of where the different species might be found, described its characteristics and compared our specie with similar species. Each sample was compared and recorded on the table below. Using the U.S Geological Survey information on the environment, climate, and ecosystems, the latitude and longitude of each town from which tree samples were collected.

Results:

There were six branches from six different trees in the residential town of Deer Park, New York, Suffolk County located on the South Shore. The species one sample was The Tree of Heaven (*Ailanthus altissima*). The second identified tree was called the American Holly (*Ilex Opaca).* The last identified species was the Sycamore Maple (*Acer Pseudoplatanus)*. Three samples of this same species were found. The characteristics of this tree was identified in the keys by Watts (1991) and Petrides & Wehr (1998). Various branches of three different species where found the town of Smithtown, New York. The first of these species was identified as Honeylocust, or *Gleditsia triacanthos*. The next of the collected branches is a species known as Flowering Dogwood, or *Cornus florida*. The last species collected were samples of Northern Catalpa, or *Catalpa speciosa.* This species can spread simply by planting. Five different tree branch samples were retrieved from Lindenhurst, New York. The first tree branch sample was identified as Live Oak (*Quercus virginiana*) tree branch. The second sample retrieved was a Striped Maple (*Acer pensylvanicum*). The third sample retrieved was a Box Elder (*Acer negundo*). The fourth sample retrieved was a Pitch Pine (*Pinus Rigida).* The final sample collected was a Pin Oak (*Quercus palustris*). Five tree branches were brought in from Flushing, New York. Two samples were Red Oak *(Quercus rubra).* The next tree sample was Northern Red Pine Oak. There were three other species; the White Ash *(Fraxinus americana),* Silver Maple *(Acer saccharinum)* and Green Ash *(Fraxinus pensylvanica)*. Ten tree branches were brought in from Lindenhurst, New York. Six samples were Black Walnut *(Juglans nigra),* two samples were Mountain Maples *(Acer spicatum),* and two samples were Willow Oak *(Quercus phellos).* From Amityville, samples of American Mountain Ash (*Sorbus americana*) were collected. In addition to the American Mountain Ash, a Bitternut Hickory (*Carya cordiformis*) sample was collected. Norway Maple (*Acer platanoides*) was also among the species found and is considered an invasive tree species by New York State. The final species collected was the Red Cedar (*Juniperus virginiana).* One of our major findings is that some species are far more common than others in New York. The species that had the most samples is Sycamore Maple, or *Acer psuedo-plananus.* The samples for this specific species were collected primarily in Amityville and Deer Park. No species from the urban community of Flushing, Queens were repeated in the suburban south central area of Suffolk.

Table 1: Location of Collected Samples

Queens, New York	Valley Stream, New York	Amityville, New York	Lindenhurst, New York	Deer Park, New York	Smithtown New York
Lat 40.75661 Long -73.799115 Elevation 6 meters	Lat 40.665693 Long -73.00661 Elevation 3 meters	Lat 40.6717 Long -73.4150 Elevation 4 meters	Lat 40.700911 Long -73.39037 Elevation 2 meters	Lat 40.761666 Long -73.329722 Elevation 6 meters	Lat 40.855931 Long -73.200668 Elevation 16 meters

Table 2: Identification of Samples

Quantity of Samples	Common Name	Scientific Name	Location of Samples
2	American Mountain Ash	*Sorbus americana*	Amityville
1	Bitternut Hickory	*Carya cordiformis*	Amityville
7	Sycamore Maple	*Acer psuedo-plananus*	Amityville/Deer Park
1	Norway Maple	*Acer platanoides*	Amityville
1	Red Cedar	*Juniperus virginiana*	Amityville
6	Black Walnut	*Juglans nigra*	Lindenhurst
3	Mountain Maple	*Acer spicatum*	Lindenhurst
2	Willow Oak	*Quercus phellos*	Lindenhurst
1	Live Oak	*Quercus palustris*	Lindenhurst
1	Striped Maple	*Acer pensylvanicum*	Lindenhurst
1	Box Elder	*Acer negundo*	Lindenhurst
1	Pitch Pine	*Pinus rigida*	Lindenhurst
1	Pine Oak	*Quercus palustris*	Lindenhurst
1	Flowering Dog	*Cornus florida*	Smithtown
1	Northern Catalpa	*Catalpa speciosa*	Smithtown
1	Honeylocust	*Gleditsia triacanthos*	Smithtown
1	Tree of Heaven	*Ailanthus altissima*	Deer Park
2	American Holly	*Ilex opaca*	Deer Park
1	White Ash	*Fraxinus Americana*	Flushing
3	Silver Maple	*Acer saccharinum*	Flushing/Valley Stream

2	Green Ash	*Fraxinus pennslyvanica*	Flushing/Valley Stream

Discussion:

This Study suggests that different species of trees can be found in different areas from across Long Island and Queens. Many of the trees found were found in other studies. Such as the Red Cedar found in North Long Island (Altenburg & Hempel 2011) These trees include the Silver Maple, Flowering Dogwood and the White Ash. Other tree species include Honeylocust and Northern Catalpa. The species *A. altissima* is a small to medium- sized, thicket-forming tree with deciduous, pinnately compound leaves. The leaf is 12-36" long with about 11-41 leaflets. The leaflets are 2-6" long, ovate to lance-shaped, with pointed tip, and one or two small, blunt teeth near the base. The bark is smooth and gray, eventually turning rougher with age. The bark and leaves produce chemicals that inhibit the growth of other plants. This species grows rapidly and is found in North America, and is native to China. These trees can be found across the United States in several different regions showing again that many of the samples found in this study can survive in several different environmental conditions.

By comparing the tree species and results we gathered with those published Altenburg and Hempel (2011), we had similarities between the trees collected. A sample of the Red Cedar was collected in both experiments and both were found on the northern part of Long Island. Townes et al. (2012) found samples of a Silver Maple in Central Islip, and we found the same tree species in similar parts of Long Island. Along with the Silver Maple there was White Ash collected, of which our group also found samples. These examples signify that there are tree species specific to different areas all across Long Island, and the climate, environment, rainfall, latitude and longitude all play a part in the growth and survival of the tree. Also there were no similarities found between Flushing and the Long Island area.

The American Holly found is a small tree with evergreen, simple leaves. It has a short and narrow trunk and light gray bark that is smooth. They are capable of surviving at temperatures as low as -20 Celsius degrees (Seiler et al. 2013). Their leaves are 2-4" long. They are elliptic with pointed tips; coarsely prickly toothed margins. The species, *Acer Pseudoplatanus*, is a medium-sized tree. It has a straight, stout trunk that is rounded crown. The leaves are 5-lobed, with relatively small coarse teeth. It is introduced to North America; escapes around cities and is invasive in some woodlands. They are native to Europe and western Asia (Seiler et al. 2013). *G. triacanthos* is pinnately compound and the leaves also alternate on each side. This tree species can reach up to about 80 feet tall and is generally considered a medium sized tree. This species' leaf is approximately 5 to 8 inches long and contains around 15 to 30 leaflets. The leaflets are from half an inch to one and a half inches long, elliptical or round in shape, and are usually green to a yellow-green (Seiler et al (2013)). The bark of *G. triacanthos* is gray-brown to bronze. It is smooth with many horizontal lenticels. *G. triacanthos* is native to North America, and the flower that grows between late spring and early summer is very fragrant (Seiler et al. 2013).

The Flowering Dogwood (*Cornus florida)* species is native to North America although it can spread by planting. The leaf of *C. florida* is opposite, simple, as well as approximately 3 to 5 inches long. The leaf is oval in shape and the entire margin is wavy. It is green on top and slightly lighter underneath. The bark is smooth and gray in color (Watts et al. 1991). This tree species is generally small with a short trunk. The branches are quite low and they are opposite. The flowers that grow from this species are large, white, and very showy. They can occasionally be pink and appear in the spring. Northern Catalpa has leaves that are whorled or opposite. Its length is approximately 5 to 12 inches and it is soft and flexible. On top, the leaf is light green to green and the bottom is a soft pubescence. This tree species produces a very short flower as well (Watts et al. 1991). It blooms in the late spring and it

is white with yellow and purple spots inside. The Live Oak species is a spreading southern evergreen tree of the White Oak group, with leathery leaves that are usually 2-4 inches long. The Virginiana Live Oak leaves sometimes have moderately rolled edges, shiny above and mostly gray- or white-hairy beneath. The bark of *C. Speciosa* is gray to a reddish brown and is separated into regular shallow fissures and scaly ridges. The overall form of this tree species is medium sized to about 80 feet tall. These branches are crooked and spread in an irregular crown. *C. Speciosa* is native to North America (Watts et al. 1991).

The Striped Maple also known as the Moosewood tree; is a small, slender, and mostly northern tree with green bark vertically marked with thin white stripes. The leaves on the Striped Maple are three-lobed, sometimes marked with thin white stripes. The leaves sizes range anywhere from 2 inches to 10 inches. The Striped Maple's height is 5-15' feet (35') and has a diameter of 1"-2" feet (9"). The Box Elder tree is a medium-sized tree of moist, fertile soils with hairless, green or purplish, glossy, frequency white-powdered twigs. The leaves are 4"-1" inches long and a height of 50'-75' feet with a diameter of 2'-4' feet. The Pitch Pine is a 3-needle pine with half-inch branches that are fibrous and tough. The needles do not snap cleanly when bent sharply. The Pitch Pine tree is a medium sized tree of the Northeast and Appalachians with needles 3"-5" inches long. The trunk sprouts are usually short and tufted, sometimes present, especially after fires. Cones are 1"-3" inches long and often remain on the tree long. The height of the Pitch Pine tree is 40'-60' feet (70') with a diameter of 1'-2' feet (3'). The Pin Oak tree is quite similar to the Scarlet Oak tree, but end buds are hairless, small, and sharp. Twigs are hairless. The lower branches of the tree characteristically slope downward. The leaves are 3'-7' inches long and he dead leaves tend to remain on the tree during winter. The Pin Oak tree reaches a height of 70'-80' feet (110') and a diameter of 2'-3' feet (5').

The Red Oak is a fast growing tree that can grow up to 43m and is native to the Northeast of the United States and South East of Canada. The northern Red Pine Oak is a medium sized tree growing up to 23 meters tall with leaves of 7-23cm long and 5-10 centimeters wide that is native to the northeast of North America. The white ash is a tree found mostly in the north part of North America. The silver maple tree grows in the northern parts of North America and can grow between 15 and 23 meters tall. Green Ash is a medium sized tree growing up to an average of 25 feet tall. The *J. nigra* is native to North America and grows heavily in the eastern part of the United States. They can grow to be up to 100 feet tall. The leaves are alternatively arranged and innately compound. The leaves grow to be 12-24 inches long with 10-24 leaflets. The *A. spicatum* is native to North America and grows in the north-east corner of the United States. They can grow to be up to 25 feet tall. The leaves grow opposite and simple. They can grow to be up to 3-4 inches long and have 5 short lobes. The *Q. phellos* is native to North American and grows on the northern coast of the gulf of Mexico and the eastern coast of the United States. They can grow to be 80 feet tall. The leaves grow alternately and simple. The leaves can grow to be 2-5 inches long and are linear or lanceolate in shape.

American Mountain Ash collected from Amityville is distinguished by alternating compound leaves that can be anywhere from 6-10 inches long. It is native to Eastern North America and is considered a relatively small tree; reaching about 40 ft in height. Bitternut Hickory trees are large and deciduous, growing up to 35 meters tall. On average the leaves are 16-30 cm long and there can be anywhere from 7-11 leaflets per tree. Despite the fact that this tree thrives in swampy regions, it can be found all along the East Coast of North America and also all the way north in Quebec. A Norway Maple tree is a deciduous tree with opposite and lobed leaves; this tree grows to be about 20-30 m in height. A Red Cedar, which is native to eastern North America, but can also be found in southeastern Canada and all the way down to the Gulf of Mexico was collected. It is considered a dense, but slow growing evergreen tree and grows anywhere between 15-60 feet tall depending on its environment. The bark is a reddish-brown color and can be peeled away easily.

Conclusions:

Through the use of three different dichotomous keys the group was able to identify nineteen different species of trees from different areas from across Long Island area. The results show where different species there were found for each residential area of Long Island. In Flushing Queens, New York, the Red Oak *Quercus rubra* was found along with the Northern Red Oak (*Quercus ellipsoidalis*) and Green Ash (*Fraxinus pennsylvanica).* In Nassau County (Valley Stream), the Silver Maple (*Acer saccharum),* Green Ash (*Fraxinus pennsylvanica)* and White Ash (*Fraxinus americana)* were found. This experiment illustrated that even if a species is not native to an area, it can be found on different residential properties all across Long Island and Queens. Many of the tree samples were taken from Suffolk County and they include the Black Walnut (6 samples), Sycamore Maple (7 samples), American Mountain Ash, Black Walnut, Flowering Dogwood, White Ash, Mountain Maple, Bitternut Hickory, Honey Locust, Silver Maple, Willow Oak, Norway Maple, Hardy Catalpa, Green Ash, and Red Cedar. There was no overlapping of tree species from the urban and suburban communities.

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Non-Native Trees Out Populate Native Trees on Five Randomly Selected Residential Properties in Suffolk County New York

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Keywords: Non-native trees, Native trees, Residential, New York, Suffolk County, Long Island

Abstract:

There were a total of fifty-eight tree specimens found on five residential properties in Long Island. Out of the fifty-eight specimens, thirty species were identified and one species was unidentifiable. The unidentifiable species had a yellow leaf with a green center. It had opposite simple pinnate leaves and marginal uniformed teeth. Out of thirty different species found, thirteen species are native to Long Island and seventeen are non-native species.

The native species are as follows: Dogwood (*Cornus genus*), Big Leaf Maple (*Acer macrophyllum*), White Pine (*Pinus strobus*), Sugar Maple (*Acer saccharum*), Silver Maple (*Acer saccharinum*), Atlantic White Cedar (*Chamaecyparis thyoides*), Mockernut Hickory (*Carya tomentosa*), Sassafras (*Sassafras albidum*), The Slippery Elm (*Ulmus rubra*), Swamp Cotton Wood (*Populus heterophylla*), River Birch (*Betula nigra*), Apple Tree – Red McIntosh (*Matus x domestica*), and Hydrangea – Blue (*Hydrangea macrophylla, "Nikko Blue").*

The non-native species found were: Weeping Cherry (*Prunus subhirtella var 'Pendula'*) Norway Maple (*Acer platanoides*), Weeping Norway Spruce (*Picea abies 'Pendula'*), Blue Atlas (*Cedrus atlanica*), False Cypress (*Genus chamaecyparis*), Eastern Hemlock (*Tsuga canadensis*), and Dwarf Alberta Spruce (*Picea glauca 'Cornca'*), Northern White Cedar (*Thuja occidentalis*), Eupropean Beech (*Fagus sylvatica*), Red Bud (*Cercis canadensis*), Crapemyrtle (*Lagerstroemia indica*), Forsythia (*Forsythia x intermediate*), Winged Sumac (*Rhus copallina*), Southern Magnolia (*Magnolia grandiflora*), Cork Elm (*Ulmus thomasii*), Japanese Maple (*Acer palmatum*), White Spruce (*Picea glauca*).

The trees were identified and confirmed using two dichotomous keys. The results suggest that a significant number of non-native species are being planted in Suffolk County, Long Island.

Introduction:

Trees occupy a large part of Long Island. In this study we tested whether a significant portion of non-native species live on residential properties. According The Untied States National Arboretum (2006), a native tree is a tree that occurs naturally in a geographic region and is not brought from outside of that specific region. Some of the common native trees on Long Island include Red Maple (*Acer rubrum*), Silver Maple (*Acer saccharinum*), Sweet Birch (*Betula lenta*), Sassafras (*Sassafras albidum*) (Plant Native, 2004). There are many non-native trees to be found on Long Island as well. A few of these common non-native to Long Island species of trees include Norway Maple (*Acer platanoides*), Japanese Maple (*Acer palmatum* Thunb), and White Poplar (*Populus alba*). (Plant Native 2004). There are 183 non-native plant species in the whole state of New York and many of these are found on Long Island (Brooklyn Botanic Garden, 2006).

Two dichotomous keys were used to identify and confirm different species on five different residential priorities. A dichotomous key is a manual book that helps in finding types of natural species such as trees.

Method:

Five students did a study of types of trees on five different residential properties on Long Island. All participants first counted the numbers of trees on their properties. These properties are in the towns of Islip, West Islip, Commack, and Ronkonkoma as recorded in Table 1. The lot size, geographic region, longitude, and latitude of all properties (Google Maps 2014) were included in table 1 as well. A sample of every tree on each property was then brought to a school classroom laboratory and was identified and confirmed with the use of two dichotomous keys (Petrides & Wehr 1988, Watts 1998) and recorded in Table 2. All students identified common and genus names of the trees found on their properties and found out whether these trees are native or non-native to Long Island (PlantNative, 2004) and submitted their data in table 3.

Results:

According to results of this study, it has been ascertained that a wide range of tree species are located on residential properties in Suffolk County. These species are native and non-native to the land. There were a total of fifty-eight tree specimens found on five properties across Suffolk County. Out of the thirty different species found, thirteen trees are native to Long Island and seventeen are non-native trees, resulting in non-native trees out numbering the native trees.

The native trees are as follows: Dogwood (*Cornus genus*), Big Leaf Maple (*Acer macrophyllum*), White Pine (*Pinus strobus),* Sugar Maple *(Acer saccharum),* Silver Maple *(Acer saccharinum),* Atlantic White Cedar *(Chamaecyparis thyoides),* Mockernut Hickory (*Carya tomentosa*), Sassafras *(Sassafras albidum),* The Slippery Elm (*Ulmus rubra*), Swamp Cotton Wood (*Populus heterophylla*), River Birch (*Betula nigra*), Apple Tree – Red McIntosh (*Matus x domestica*), and Hydrangea – Blue (*Hydrangea macrophylla "Nikko Blue").*

The non-native trees are as follows: Weeping Cherry (*Prunus subhirtella var 'Pendula'*) Norway Maple (*Acer platanoides*), Weeping Norway Spruce (*Picea abies 'Pendula'*), Blue Atlas (*Cedrus atlanica*), False Cypress (*Genus chamaecyparis*), Eastern Hemlock (*Tsuga canadensis*), and Dwarf Alberta Spruce (*Picea glauca 'Cornca'*), Northern White Cedar (*Thuja occidentalis*), Eupropean Beech (*Fagus sylvatica*), Red Bud (*Cercis canadensis*), Crapemyrtle (*Lagerstroemia indica*), Forsythia (*Forsythia x intermediate*), Winged Sumac (*Rhus copallina*), Southern Magnolia (*Magnolia grandiflora*), Cork Elm (*Ulmus thomasii*), Japanese Maple (*Acer palmatum*), White Spruce (*Picea glauca*).

Some trees were found on multiple properties. The Weeping Cherry *(Prunus subhirtella var 'Pendula'),* which was found on two different properties located in West Islip. The Sugar Maple *(Acer saccharum)* was found on properties in Ronkonkoma and Commack. Both the Silver Maple *(Acer saccharinum*) and the Norway Maple *(Acer platanoides)* were found in Islip and Ronkonkoma. The Atlantic White Cedar *(Chamaecyparis thyoides)* was found in Ronkonkoma and West Islip. The Sassafras *(Sassafras albidum)* was found in West Islip and Islip.

The species of trees, which were found in the West Islip area were the Dogwood (*Cornus genus*), Weeping Norway Spruce (*Picea abies 'pendula'*), Blue Atlas (*Cedrus atlanica*), Big Leaf Maple (*Acer macrophyllum*), White Pine (*Pinus strobus),* False Cypress (*Genus chamaecyparis*), Eastern Hemlock (*Tsuga canadensis*), Dwarf Alberta Spruce (*Picea glauca 'cornca'*), The Slippery Elm (*Ulmus rubra*), Red Bud (*Cercis canadensis*), Crapemyrtle (*Lagerstroemia indica*), Forsythia (*Forsythia x intermediate*), River Birch (*Betula nigra*), Apple Tree – Red McIntosh (*Matus x domestica*), and a Hydrangea – Blue (*Hydrangea macrophylla "Nikko Blue").* There was also an unidentifiable tree found in West Islip. The unidentifiable tree is described as a yellow leaf with a green center. It has opposite simple pinnate leaves and marginal uniformed teeth. According to two dichotomous keys (Petrides, 1988, Watts, 1998), the sample may be either a Burring bush (*Euonymus*

atropurpureus) or a Smooth blackhaw *(pruifolium)* both being non-native to Long Island. Found on the property of Islip, was a Winged Sumac (*Rhus copallina*), Mockernut Hickory (*Carya tomentosa*), and Southern Magnolia (*Magnolia grandiflora)*. On properties in Commack a Cork Elm (*Ulmus thomasii*), Japanese Maple (*Acer palmatum*), White Spruce (*Picea glauca*), and Swamp Cotton Wood (*Populus heterophylla*) were found. In Ronkonkoma the Northern White Cedar (*Thuja occidentalis*), and the European Beech (*Fagus sylvatica*) were found.

All trees were identified and confirmed using two dichotomous keys. The results suggest that more trees being planted on residential properties are non-native than native.

Table 1: Properties on Long Island

	Property 1	**Property 2**	**Property 3**	**Property 4**	**Property 5**
Town	West Islip	West Islip	Islip	Ronkonkoma	Commack
Region	South Shore	South Shore	South Shore	South Shore	North Shore
Lot Size	10,019 Sq. Ft	10, 890 Sq. Ft	21,344 Sq. Ft	4,356 Sq. Ft.	20,000 Sq. Ft
Latitude/ Longitude	40.7034/ 73.2938	40 ◦ 42’N / 73◦ 17’W	40.756745/ -73.202690	40.813496/ -73.138114	40.826082/ -73.266739
Tree Count	**23**	**11**	**9**	**9**	**6**

(This table reports the location used on long Island, as well as their lot size and the total tree count on each individual property. The lot size was identified using redfin, a real estate site to find properties for sale. The latitude and longitude were identified using Google Maps.)

Table 2: Trees found on each property

Property 1	**Property 2**	**Property 3**	**Property 4**	**Property 5**
West Islip	**West Islip**	**Islip**	**Ronkonkoma**	**Commack**
1 Dogwood	1 Atlantic White Cedar	2 Norway Maple	1 Sugar Maple	2 Sugar Maples
1 Weeping Norway Spruce	1 Slippery Elm	1 Silver Maple	1 Silver Maple	1 Cork Elm
1 Weeping Cherry	1 Red Bud	2 Winged Sumac	1 Atlantic White Cedar	1 Japanese Maple
2 Blue Atlas	1 Crapemyrtle	1 Mockcernut Hickory	1 Norway Maple	1 White Spruce
2 Big Leaf Maple	1 Weeping Cherry	1 Southern Magnolia	4 Northern White Cedar	1 Swamp Cotton Wood
2 False Cypress	1 Forsythia	2 Sassafras	1 European Beech	
3 White Pine	1 River Birch			
3 Eastern Hemlock	1 Apple tree – Red McIntosh			
8 Dwarf Alberta Spruce	1 Hydramgea-Blue			
	1 Sassafras			
	1 Unidentifiable tree			
23	**11**	**9**	**9**	**6**

(This table organizes to the count of each tree and their species with regard to each individual property.)

Table 3: Tree Analysis

Common Name	Scientific Name	Native	Non-native
1 - Dogwood	*Cornus genus*	✓	
1 - Weeping Norway Spruce	*Picea abies 'Pendula'*		✓
2 - Weeping Cherry	*Prunus subhirtella var 'Pendula'*		✓
2 - Blue Atlas	*Cedrus atlanica*		✓
2 - Big Leaf Maple	*Acer macrophyllum*	✓	
2 - False Cypress	*Genus chamaecyparis*		✓
3 - White Pine	*Pinus strobus*	✓	
3 - Eastern Hemlock	*Tsuga canadensis*		✓
8 - Dwarf Alberta Spruce	*Picea glauca 'Cornca'*		✓
3 - Sugar Maple	*Acer saccharum*	✓	
2 - Silver Maple	*Acer saccharinum*	✓	
2 - Atlantic White Cedar	*Chamaecyparis thyoides*	✓	
1 - European Beech	*Fagus sylvatica*		✓
3 - Norway Maple	*Acer platanoides*		✓
4 - Northern White Cedar	*Thuja occidentalis*		✓
2 - Winged Sumac	*Rhus copallina*		✓
1 - Mockernut Hickory	*Carya tomentosa*	✓	
1 - Southern Magnolia	*Magnolia grandiflora*		✓
3 - Sassafras	*Sassafras albidum*	✓	
1 - Cork Elm	*Ulmus thomasii*		✓
1 - Japanese Maple	*Acer palmatum*		✓
1 - White Spruce	*Picea glauca*		✓
1 - Swamp Cotton Wood	*Populus heterophylla*	✓	
1 - Slippery Elm	*Ulmus rubra*	✓	
1 - Red Bud	*Cercis canadensis*		✓
1 - Crapemrytle	*Lagerstroemia indica*		✓
1 - Forsythia	*Forsythia x intermediate*		✓
1 - River Birch	*Betula nigra*	✓	
1 - Apple Tree- Red McIntosh	*Matus x domestica*	✓	
1 - Hydrangea- Blue	*Hydrangea macrophylla "Nikko Blue"*	✓	

(The trees that were listed in this table along with their scientific name, and whether or not they are native or non-native to Long Island. 17 out 30 species and 35 out of the 58 trees collected on Long Island were not native to the region. The species were identified using Petrides & Wehr (1988) and Watts (1998).

Discussion:

There is a range of non-native species in Suffolk County on Long Island. From the small sample size of our group, we concluded from our research, that a significant number of species in Suffolk County maybe non-native. We found that there were sixteen of these non-native species in Suffolk County. One of the first non-native species is a Weeping Norway Spruce (*Picea abies 'pendula'*). It is a conifer and its growth varies upon the nursery it had been in (Cregg, 2009). The next non-native species is a Weeping Cherry (*Prunus subhirtella var 'pendula'*) and is native to the Himalayas but is also divided to other regions such as, West Siberia, Europe, Japan, China and the United States (Brooklyn Botanic Garden, 2006). Another non-native species is the False Cypress (*Genus chamaecyparis*) and is commonly native to Taiwan, Japan, and North America (Nickel, 2012) The Eastern Hemlock (*Tsuga canadensis*) is a non-native species in Suffolk County and is often found in Eastern North America (Preisser, 2008). The Dwarf Alberta Spruce (*Picea glauca 'comca'*) is commonly found in the Northlands and can deal with the cold weather rather quite easily (Klingaman, 2004). The European Beech (*Fagus sylvavtica*) can be found in Central Europe (Dudik and Vaclav, 2008). The Norway Maple is commonly found in Europe (Abbey, 2000). The Northern White Cedar can be found in Northern lake states (Johnson, 1976). The Winged Sumac (*Rhus copallina*) is commonly found in the Eastern North America (Gilman & Watson 1994). The Southern Magnolia (*Magnolia grandiflora*) is often found in Southeast and East Asia, Central America, South America, North America and the West Indies (Crane 1988, Plumier 1703). The Cork Elm (*Ulmus thomasii*) also known as the Rock Elm can be found in the Midwestern United States as well as, South to Tennessee, Southern Ontario and Quebec, North to Minnesota and West to Northeastern Kansas (Bean 1981). The Japanese Maple (*Acer palmatum*) is native to Korea, China and Japan (Frank et al. 2014). The White Spruce (*Picea lauca*) can be found in North America, Northern to Southern Montana, Wisconsin, Minnesota, Michigan, Upstate New York, Northwestern Pennsylvania, New Hampshire, Maine, Vermont, Wyoming, South Dakota, and from Alaska to the far East of the Avalon Peninsula in Newfoundland (Smith & Wilson 2010). The Red Bud (*Cercis canadensis*) is most commonly found in a range from Central Mexico to Southern Canada (Ward et al. 2012). The Crape Myrtle (*Lagerstroemia indica*) often grow in regions such as, Southeast Asia, parts of Oceania, Northern Australia and the Indian Subcontinent (Blanc et al. 2000). Forsythia (*Forsythia x intermediate*) can be found mostly in Eastern Asia but one of its species has been found in Southeastern Europe (Huxley 1999).

Conclusion:

Of the fifty-eight tree specimens identified on residential properties in Suffolk County New York, there were thirty species. In this study, twenty-two specimens belonging to thirteen species were native and thirty-five specimens belonging to seventeen species were non-native.

The native species were Dog Wood (*Cornus genus*), Big Leaf Maple (*Acer macrophyllum*), White Pine (*Pinus strobus*), Sugar Maple (*Acer saccharum*), Silver Maple (*Acer saccharinum),* Atlantic White Cedar (*Chamaecyparis thyoides*), Mockernut Hickery (*Carya tomentosa*), Sassafras (*Sassafras albidum*), Swamp Cotton Wood (*Populush heterophylla*), Slippery Elm (*Ulmus rubra*), River Birch (*Betula nigra*), Apple Tree-Red McIntosh (*Matus x domestica*), Hydrangea Blue (*Hydrangea macrophylla "Nikko Blue"*). The non-native species were Weeping Norway Spruce (*Picea abies 'Pendula'*), Blue Atlas (*Cedrus atlanica),* Weeping Cherry (*Prunus subhirtella var 'Pendula'*), False Cypress (*Genus chamaecyparis*) Eastern Hemlock *(Tsuga canadensis),* Dwarf Alberta Spruce *(Picea glauca 'Cornca'),* European Beech (*Fagus sylvatica*), Norway Maple (*Acer platanoides*), Northern White Cedar (*Thuja occidentalis*), Winged Sumac *(Rhus copallina),* Southern Magnolia (*Magnolia grandiflora*), Cork Elm (*Ulmus thomasii*), Japanese Maple (*Acer palmatum*), White Spruce(*Picea glauca*), Red Bud(*Cercis canadensis*) Crapemrytle (*Lagerstroemia indica*), and Forsynthia (*Forsythia x intermediate*).

One of the specimens was found to be unidentifiable by the dichotomous keys written by Petrides (1985) and by Watts (1998). Its characteristics were a yellow leaf with green center. It had opposite simple pinnate leaves and marginal uninformed teeth.

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The Coniferous and Deciduous Tree Ratio does not differ between the North Shore and Central Long Island NY when Compared between Huntington and Brentwood

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Abstract: This study compared various species of trees. Forty samples from Huntington Station and Brentwood, with the help and guidance of three tree dichotomous keys, were identified and labeled. From the North Shore, the trees that were identified were; the Atlantic White Cedar, Red Spruce, American Smoke Tree, Northern Hackberry, White Poplar, Tree of Heaven, Kentucky Coffee Tree, and the Swamp White Oak. Of these trees nine were coniferous and eleven were deciduous. Bald Cypress, Eastern Hemlock, Atlantic White Cedar, Red Spruce, English Holly, Red Maple, Tulip Tree, and Norway Maple were identified in Central Long Island. Of those, eight were coniferous and twelve were deciduous. In total seventeen were coniferous and twenty-three were deciduous.

Introduction: The following is reviewed in Sirkin (1996). When comparing the different species of coniferous and deciduous trees on the North Shore and Central Long Island, the geology and climate have to be studied. Long Island is part of the Outer Lands region, it was formed from Glacial Moraines. These Moraines consist of gravel and loose rocks that have been left behind from the Ice age. The North Shore of Long Island borders the Long Island Sound. The North Shore contains many bays and harbors. Small, irregular hills with swamps and ponds fill the areas in between. The South Shore was a flat outwash plain, which is now made of mainly sand and gravel and gradually slopes to the sea. The difference in the island's geography was a result of the North Shore being covered with ice. Long Island lies in a transitional zone between a humid subtropical climate and a humid continental climate. The Island's climate is similar to coastal areas of the Northeastern side of the United States. There are warm humid summers and cool wet winters.

Methods: This study focused on the North Shore and Central Long Island. Forty specimens of coniferous and deciduous trees, twenty from each property, were collected. The first property was at latitude 40◦ 49' 57.6726'' and longitude -73◦ 24' 48.5454'' and located in the North Shore. The second was at latitude 40◦ 45' 33.462'' and longitude -73◦ 12' 38.5266'' and resided in the Central of Long Island. The tree samples were identified using a dichotomous key. The dichotomous key is a reference tool that is used to identify tree species by their common and scientific names. Based on their characteristics the samples were identified. The identifications of these samples took place over weeks; some of the samples were harder to identify then others. Once every sample was identified a chi-square analysis was performed to see if there was a significant difference between the deciduous and coniferous tree ratio at the 5% level of probability.

Results: Table 1- Location

	Property 1	**Property 2**
Latitude	40◦ 49' 57.6726''	40◦ 45' 33.462''
Longitude	-73◦ 24' 48.5454''	-73◦ 12' 38.5266''
Lot Size	0.37 acres	0.40 acres
Region	North Shore	Central Long Island
Tree count	20	20
Town	Huntington Station	Brentwood

Table one shows that property one has a latitude of 40◦ 49’ 57.6726’’ and a longitude of -73◦ 24’ 48.5454’’. It has a lot size of 0.37 acres, it is located in the North Shore region in the town of Huntington Station and has a tree count of twenty. The second property has a latitude of 40◦ 45’ 33.462’’ and a longitude of -73◦ 12’ 38.5266’’. The lot size is 0.40 acres, it is located in Central Long Island in the town of Brentwood and has a tree count of twenty.

Table 2- Tree species found in Huntington

Scientific Name	Common Name	Type	# of samples
Chamaecyparis thoyodies	Atlantic White Cedar	Coniferous	3
Picae rubens	Red Spruce	Coniferous	6
Continus	American Smoke tree	Deciduous	3
Cletis occidentails	Northern Hackberry	Deciduous	3
Popolos alba	White Poplar	Deciduous	2
Ailanthus altissima	Tree of Heaven	Deciduous	1
Gymnocladus dioicus	Kentucky coffee tree	Deciduous	1
Quercus bicolor	Swamp White Oak	Deciduous	1

Table two shows that the Atlantic White Cedar (*Chamaecyparis thoyodies*) is a coniferous tree and contained three samples. The Red Spruce (*Picae rubens*) also a coniferous tree contained six samples. The deciduous trees were; the American Smoke tree (*Continus*) with three samples, the Northern Hackberry (*Cletis occidentails*) with three samples, White Poplar (*Popolos alba*) with two samples, Tree of Heaven (*Ailanthus altissima*) with one sample, Kentucky coffee tree (*Gymnocladus dioicus*) with one and Swamp White Oak (*Quercus bicolor*) with one sample.

Table 3- Tree species found in Brentwood

Scientific Name	Common Name	Type	# of samples
Taxiodium distichum	Bald Cypress	Coniferous	1
Tsuga canadensis	Eastern Hemlock	Coniferous	1
Chamaecyparis thoyodies	Atlantic White Cedar	Coniferous	4
Picae rubens	Red Spruce	Coniferous	1
Ilex aquifolium	English Holly	Coniferous	1
Acer rubrum	Red Maple	Deciduous	2
Liriodendron tulipifera	Tulip Tree	Deciduous	5
Acer platanoides	Norway Maple	Deciduous	5

Table three shows that the Bald Cypress (*Taxiodium distichum*) is a coniferous tree and contains one sample. The Eastern Hemlock (*Tsuga canadensis*) also a coniferous tree contained one sample. The Atlantic White Cedar (*Chamaecyparis thoyodies*) a coniferous tree has four samples, the Red Spruce (*Picae rubens*), coniferous, has one sample and the English Holly (*Ilex aquifolium*) also coniferous with one sample. The deciduous trees were; the Red Maple (*Acer rubrum*) with two samples, the Tulip Tree (*Liriodendron tulipifera*) with five samples, and the Norway Maple (*Acer platanoides*) with five samples.

According to a chi-square analysis using a 2x2 contingency table, the difference between the coniferous and deciduous trees between the North Shore and Central Long Island is not significant at the 5% level of probability ($x^2 = 0.02762148$).

Discussion: When comparing the findings between the North Shore and Central of Long Island there were many differences and a few similarities, there were only two kinds of trees that were common to both areas, the Atlantic White Cedar (*Chamaecyparis thoyodies*) and the Red Spruce (*Picae rubens*). In comparing our findings to those of Altenburg and Hempel (2013), they too had the Atlantic White Cedar (*Chamaecyparis thoyodies*) and the Red Spruce (*Picae rubens*) in both their North Shore and Central Long Island properties. The other trees that they identified on the North Shore were; Red Cedar (*Juniperus virginiana),* Honey Locus (*Gieditisia triacanthos),* Arbor Vitae (*Thuja occidentalls),* and Black Spruce (*Picea mariana*). They also identified these trees; Arbor Vitae (*Thuja occidentalls),* Siberian Elm (*Ulmus pumila*), White Pine (*Pinus strobus*), Horse Chestnut (*Aesulus hippocastamum*), and an unknown specimen in Central Long Island. Other trees found in this study on the North Shore that differed from theirs were; American Smoke tree (*Continus*), Northern Hackberry (*Cletis occidentails*), White Poplar (*Popolos alba*), Tree of Heaven (*Ailanthus altissima),* Kentucky Coffee Tree (*Gymnocladus dioicus*), Swamp White Oak (*Quercus bicolor*). In the Central region the remaining trees located that were different were; Bald Cypress (*Taxiodium distichum*), Eastern Hemlock (*Tsuga Canadensis*), English Holly (*Ilex aquifolium*), Red Maple (*Acer rubrum*), Tulip Tree (*Liriodendron tulipifera*), and the Norway Maple (*Acer platanoides*). This indicates that there is a very large variety of tree samples in these areas.

Conclusion: There are two types of trees that were found to be located in the North Shore and Central of Long Island; these samples were the Atlantic White Cedar and the Red Spruce tree. According to the chi-square analysis using a 2x2 contingency table, the difference between the coniferous and deciduous trees between the North Shore and Central Long Island is not significant at the 5% level of probability.

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Evergreen Trees May be Dominant to Deciduous Trees on the North Shore of Long Island

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Keywords: Biology, tree, species, Suffolk, Long Island, New York, comparison

Abstract:

Different species of trees from five residential towns of Long Island were compared. Thirty eight tree samples were collected and identified using two dichotomous keys. In Commack and in Huntington Bay, the only species that were commonly found was *Juniperus virginiana*. In East Northport and in Huntington Bay, the only species that was found was *Cornus florida*. In East Northport, Commack and in Huntington Bay, the species that was found at each location was *Ilex opaca* and *Ilex aquifoliun*. In Commack, Huntington Bay and in Brentwood, the species that was commonly found was *Picea pungens*. In Commack and East Northport, the species that was commonly found were *Thuja occidentalis*. In Brentwood and in Huntington Bay, the species found was the *Chamaecyparis thyoides*. In Brentwood and East Northport, the species commonly found was the *Pinus strubos*. In total, twenty two evergreen trees (57.90%) and sixteen deciduous trees (42.11%) were found on the North Shore. This indicates that evergreen trees may be dominant to deciduous trees on the North Shore.

Introduction:

By collecting samples of trees from different parts of Long Island, it is possible to identify which locations have similar species. Throughout Long Island there are many different types of trees. Trees are able to spread over large areas by the process of seed dispersal. Many animals can help spread seeds by consuming the seed from a tree and then defecating in a new area. Along with animals the wind can also transport seeds. Since trees can come from any area and are difficult to identify just by looking at them one can use a dichotomous key in order to identify it properly based on the characteristics of the tree. The dichotomous keys used in this experiment were *A Pocket Manual for the Identification of Tree* (1963) and *Winter Tree Finder for Identifying Deciduous Trees* (1970). The only tree that was found in three of the four locations used was the American Holly.

Methods:

Four students gathered up about thirty eight tree samples from their home properties. The students then split the thirty eight tree samples into two groups. One group was categorized solely on whether it had leaves and the second group was categorized if it had no leaves. (The reason the samples were split into two groups was because this study was conducted during late winter and early spring season.) After collecting the samples, two dichotomous key were used to identify each tree species. Based on the characteristics of the tree samples the steps provided in the dichotomous key to successfully identify the tree sample were fulfilled. After identifying the samples, the students organized their results into a chart based on the location of each finding. By looking at the chart, you are now able to differentiate which locations had similar tree species.

Results:

In this study, the students found that out of the five locations where data was collected, there was a species from at least one location found at another. From the data collected, they were able to find eight different species that were at either two or three of the five locations. In Commack and in Huntington Bay, the species that was found in common was the Red Cedar (*Juniperus virginiana).* In

East Northport and in Huntington Bay, the species that was found in common was, the Flowering Dogwood (*Cornus florida)*. In East Northport, Commack and in Huntington Bay, the species that was found at all three locations was the American Holly (*Ilex opaca)*. In Commack, Huntington Bay and in Brentwood, the species that was found in common was Colorado Spruce (*Picea pungens)*. In Commack and East Northport, the species that was commonly found was the Arbor Vitae (*Thuja occidentalis)*. In Brentwood and in Huntington Bay, the species found in common was the Atlantic White Cedar (*Chamaecyparis thyoides)*. In Brentwood and East Northport, the species found in common was the White Pine (*Pinus strubos)*. In Hauppauge and in Huntington Bay two trees were found in common. Though they were not the same species, both are from the same genus. The Sweetbay Magnolia (*Magnolia virginiana*) was found in Hauppauge and the Umbrella Magnolia (*Magnolia tripetala*) was found in Huntington Bay. Every tree species found in Huntington Bay was also found at another location. Out of the thirty eight tree samples collected 42.11% were deciduous trees and 57.90% were evergreen trees.

Table 1: The percentage of deciduous and evergreen trees found.

Towns	**% of Deciduous or Evergreen**
Hauppauge	100% Deciduous
Commack	16.67% Deciduous & 83.33% Evergreen
East Northport	50% Deciduous & 50% Evergreen
Huntington Bay	16.67% Deciduous & 83.33% Evergreen
Brentwood	42.86% Deciduous & 57.14% Evergreen

Table 2: Residential properties which tree samples were retrieved.

Towns	**Latitude & Longitude**
Hauppauge	40.823512, -73.181343
Commack	40.855993, -73.289418
East Northport	40.874996, -73.335199
Huntington Bay	40.901242, -73.417736
Brentwood	40.765219, -73.216264

Table 3: Tree species found at two or more of the locations.

Location	**Tree Name**	**Genus Name**
Huntington Bay and Commack	Red Cedar	*Juniperus virginiana*
Huntington Bay and East Northport	Flowering Dogwood	*Cornus florida*
Huntington Bay and Hauppauge	Sweetbay Magnolia	*Magnolia virgiana*
	Umbrella Magnolia	*Magnolia tripetala*
Huntington Bay and Brentwood	Atlantic White Cedar	*Chamaecyparis thyoides*
Commack and East Northport	Arbor Vitae	*Thuja occidentalis*
Commack, East Northport and Huntington Bay	American Holly	*Ilex opaca*
	English Holly	*Ilex aquifolium*
Commack, Huntington Bay and Brentwood	Colorado Spruce	*Picea pungens*
Brentwood and East Northport	White Pine	*Pinus strubos*

Table 4: All the tree species found and categorized by location, tree name and species.

Towns	Name		Species
Hauppauge	Red Cedar		*Juniperus virginiana*
	Eastern Hemlock		*Tsuga canadensis*
	Colorado Spruce		*Picea pungens*
	Arbor Vitae		*Thuja occidentalis*
	English Holly		*Ilex aquifoliun*
	Bitternut Hickory		*Carya cordiformis*
Commack	Sweetbay Magnolia		*Magnolia virginiana*
	Black Locust		*Robinia pseudo-acacia*
	Horse Chestnut		*Aesculus hippocastanum*
	Sweet Buckeye		*Aesculus octandra*
			Betula alba
	Sycamore		*Platanus occidentalis*
	Norway Maple		*Acer platanoides*

East Northport	Flowering Dogwood		*Cornus florida*
	American Holly		*Ilex opaca*
			Betula papyrifera
	White Pine		*Pinus strubos*
	Arbor Vitae		*Thuja occidentalis*
	Redbud		*Cercis canadensis*
Huntington Bay	Colorado Spruce		*Picea pungens*
	White Pine		*Pinus strubos*
	Bald Cypress		*Taxodium distichum*
	English Holly		*Ilex aquifoliun*
	American Holly		*Ilex opaca*
	Umbrella Magnolia		*Magnolia tripetala*
	Bald Cypress		*Taxodium distichum*
	White Spruce		*Picea glauca*
	Red Cedar		*Juniperus virginiana*
	Flowering Dogwood		*Cornus florida*
			Chamaecyparis thyoides
	American Larch		*Larix laricina*
Brentwood			*Chamaecyparis thyoides*
	Pitch Pine		*Pinus rigida*
	Colorado Spruce		*Picea pungens*
	Loblolly Pine		*Pinus taeda*
	Scarlet Oak		*Quercus coccinea*
	American Basswood		*Tilia americana*
	Sassafras		*Sassafras albidum*

Table 5: Tree species found more than once in the study.

Tree Name	**Species**	**Times Found**
Flowering Dogwood	*Cornus florida*	2
Bald Cypress	*Taxodium distichum*	2
American Holly	*Ilex opaca*	2
English holly	*Ilex aquifoliun*	2
White Pine	*Pinus strubos*	2

Red Cedar	*Juniperus virgiana*	2
Colorado Spruce	*Picea pungens*	3
Arbor Vitae	*Thuja occidentalis*	2
Atlantic White Cedar	*Chamaecyparis thyoides*	2

Discussion:

In this study it was found that Eastern Hemlock *(Tsuga canadensis)* and the Red Cedar *(Juniperus virginiana)* were found in Hauppauge, and in a previous study. Curtrone et al. (2013) found Eastern Hemlock *(Tsuga canadensis)* in Brentwood. The Norway Maple *(Acer platanoides)* was found in Brentwood and Commack by Curtrone et al. (2013), and we found it in Commack. In Huntington Bay we found White Spruce *(Picea Glauca)* and White Pine *(Pinus strubos).* Cruz et al. (2013) found the White Pine *(Pinus strubos,* in East Northport. We also collected a sample from that same location which shows that the White Pine *(Pinus strubos)* may be commonly found in East Northport. In Brentwood we found Scarlet Oak *(Quercus coccinea)* and in Deer Park Walsh et al. (2012) also found Scarlet Oak *(Quercus coccinea).* In Brentwood we found the Atlantic White Cedar *(Chamaecyparis thyoides),* and Kim et al. (2012) found the same tree sample in Wantagh. This suggests that some tree species can be found in different locations of Central and North Shore of Long Island. This also displays a large variety of tree species found on Long Island in the towns of Hauppauge, Commack, East Northport, Huntington Bay and Brentwood.

Conclusion:

Evergreen trees may be dominant to deciduous trees in the North Shore of Long Island, New York in some towns. Out of thirty eight samples 42.11% of the species were deciduous and 57.90% were evergreen. Five locations, Huntington Bay, Commack, Hauppauge, East Northport and Brentwood, were used for the collection of these samples and it was found that Huntington Bay had the most species that matched at least one species found in each of the other four locations.

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Maple Trees May Be a Dominant Species in the Town of Babylon NY But Not in the Neighboring Town of Islip NY

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Keywords: Maple, Dominant, Babylon, Islip

Abstract:

Forty tree samples were collected and identified in the Town of Babylon and the Town of Islip using two dichotomous keys. The findings of the different types of trees in Brentwood were the Yellow Birch (*Betula alleghaniensis*), American Mountain Ash *(Sourbus americana),* White Pine (*Pinus strobus*), Red Cedar (*Juniperus virginiana*), and Atlantic White Cedar (*Chamaecyparis thyoides)*. In West Babylon the types of trees that were identified were, Mountain Maple (*Acer spicatum*), Norway Maple (*Acer platanoides*), Eastern White Pine (*Pinus strobus*), and Sugar Maple (*Acer saccharum*). In Central Islip the trees that were identified were, Japanese Red Maple (*Acer palmatum*), Eastern White Pine (*Pinus strobus*), White Oak (*Quercus alba*), and Austrian Pine (*Pinus nigra*). In Islip Terrace the samples were Red Cedar (*Juniperus virginiana*), Bald Cypress (*Taxodium distichum*), Black Ash (*Fraxinus-nigra*), Pignut Hickory (*Carya glabra*), and Sugar Maple (*Acer saccharum*). In Babylon Village the tree samples were, Japanese Red (*Acer palmatum*), Red Maple (*Acer rubrum*), and White Birch (*Betula papyrifera*). Maple trees were found to be a dominant species on the properties surveyed in Babylon, but not in Islip.

Introduction:

There are many different tree species on Long Island. The Town of Babylon contains the Hamlet of West Babylon and the Village of Babylon (Town of Babylon, 2014), which are where these samples were collected in the Town of Babylon. Two properties in West Babylon were surveyed and one property in the Village of Babylon was surveyed for tree samples. The Town of Islip contains the Hamlets of Brentwood, Central Islip, and Islip Terrace (Town of Islip, 2014), which are where these samples were collected in the Town of Islip. One property in Brentwood was surveyed, one property in Islip Terrace was surveyed, and two properties in Central Islip were surveyed for tree samples. Among these seven properties, forty tree samples were collected and identified by their characteristics using two dichotomous keys.

Method:

The experiment that was conducted compared and identified different species of trees that exist in the Town of Islip and the Town of Babylon, Long Island, NY. The tree trunk diameters were measured with the dichotomous keys titled: Tree Finder (Watts 1991), Eastern Trees (Petrides & Wehr 1988) and Winter Tree Finder (Watts 1970). The first step in the keys directed us to measure the width of each branch. It also instructed us to identify if there were pointed, sharp or stubby buds on the samples of the branches. The dichotomous keys described the orientation, arrangements and length of the tree branches. The locations where the samples of the tree branches were taken from was the Town of Islip; Brentwood, Islip, and Central Islip. The other samples of branches were found in the Town of Babylon; North Babylon, West Babylon and Babylon. The latitude and longitude of each property were found using Google Maps.

Results:

Table I- Trees found in the town of Islip

Common name	**Species type**	**Number of Trees**
Austrian Pine	*Pinus nigra*	*2*
Red Cedar	*Juniperus virginiana*	*4*
White Oak	*Querous alba*	*2*
Bald Cypress	*Taxoduim distichum*	*4*
Eastern White Pine	***Pinus strobus***	***2***
Japanese Red Maple	***Acer palmatum***	***2***
Yellow Birch	*Betula allegnaniensis*	*2*
American Mountain Ash	*Sorbus americana*	*2*
Atlantic White Cedar	*Chamaecyparis thyoides*	*2*
Black Ash	*Fraxinus-nigra*	*1*
Pignut Hickory	*Carya glabra*	*1*
Sugar Maple	***A.saccharum***	***1***

Trees Found in both Islip and Babylon are in bold

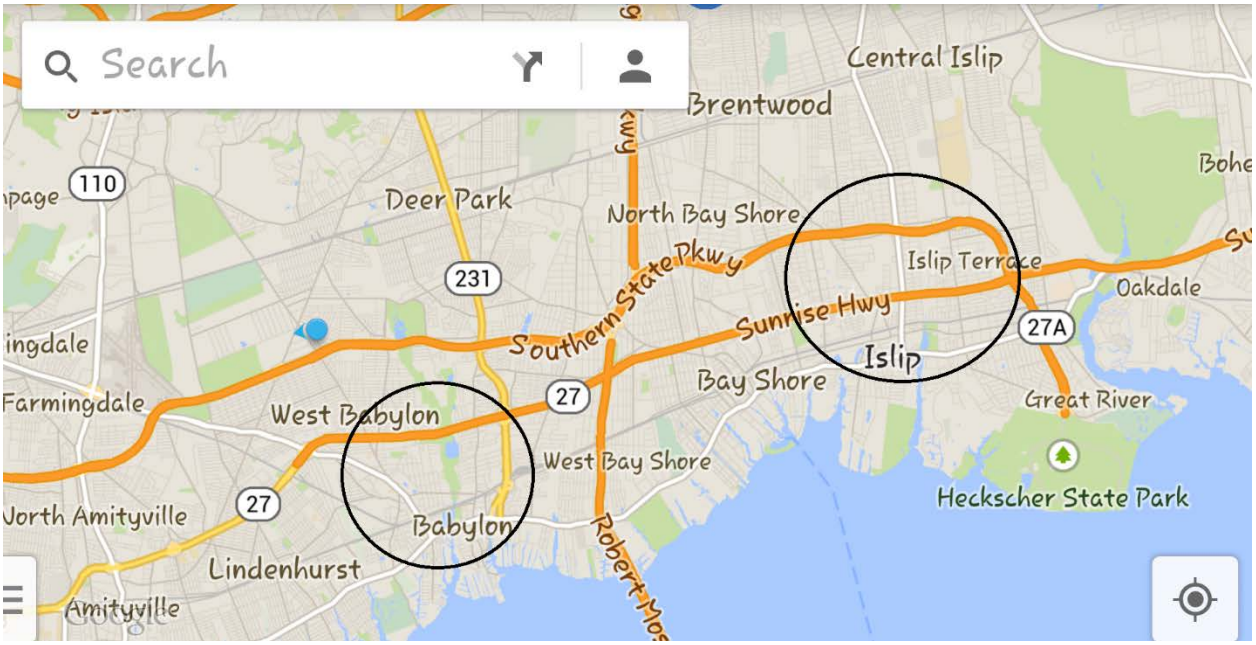
The above table shows the following species were found in the Town of Islip, two Austrian Pine *(Pinus nigra),* four Red Cedar *(Juniperus virginian),* two White Oak *(Querous alba),* four Bald Cypress *(Taxoduim distichum),* two Eastern White Pine *(Pinus strobes),* two Japanese Red Maple *(Acer palmatum),* two Yellow Birch *(Betula allegnaniensis),* two American Mountain Ash *(Sorbus americana),* two Atlantic White Cedar *(Chamaecyparis thyoides),* one Black Ash *(Fraxinus-nigra),* one Pignut Hickory *(Carya glabra)* and one Sugar Maple (*Acer saccharum).*

Table II - Trees found in the town of Babylon

Common name	**Species**	**Number of Trees**
Red Maple	*Acer rubrum*	*2*
White Birch	*B.papyrifera*	*1*
Norway Maple	*A.platanoides*	*3*
Mountain maple	*A.spicatum*	*2*
Eastern White Pine	***P.strobus***	***2***
Sugar Maple	***A.saccharum***	***3***
Japanese Red Maple	***Acer palmatum***	***2***

Table two shows the following species found in the Town of Babylon, two Red Maple *(Acer rubrum),* one White Birch *(B.papyrifera),* three Norway Maple (*Acer platanoides),* two Mountain Maple *(A.spicatum),* two Eastern White Pine *(P.strobes),* three Sugar Maple *(A.saccharum),* and two Japanese Red Maple *(Acer palmatum).*

Table III – Location of the existing trees



(Reproduced with permission of Google Maps)

Table IV: Location of properties

Town of Islip	***Town of Babylon***
Location: 4 Ninth Ave, Brentwood, NY **Latitude:** 40.769202 **Longitude:** 73.253106 **Height Above Sea Level:** 91 feet	**Location:** 54 Lighthouse Rd, Babylon, NY **Latitude:** 40.683429 **Longitude:** 73.321519 **Height Above Sea Level:** 25 feet
Location: 72 Richard Ave, Islip Terrance, NY **Latitude:** 40.749932 **Longitude:** 73.186874 **Height Above Sea Level:** 52 feet	**Location**: 84 Fulton St, West Babylon, NY **Latitude**: 40.735442 **Longitude**: 73.364736 **Height Above Sea Level:** 65 feet
Location: 166 Branch Ave, Central Islip, NY **Latitude:** -40.781878 **Longitude:** -73.21637 **Height Above Sea Level:** 82 feet	**Location**: 74 Fulton St, West Babylon, NY **Latitude:** 40.735551 **Longitude**: 73.365072 **Height Above Sea Level:** 65 feet
Location: 169 Branch Ave, Central Islip, NY **Latitude:** 40.782149 **Longitude:**-73.215898 **Height Above Sea Level:** 78 feet	

Discussion:

The Mountain Maple (*Acer spicatum*) has leaves that are 3-5 lobed and 2-10 inches long. It has dark bark and its twigs are velvety-hairy. Most are less than 20 feet tall. The Norway Maple (*Acer platanoides*) has 5-7 lobed leaves and relatively long-pointed teeth often with hair like tips. Leaves are 4-8 inches long and it grows up to 40-70 feet tall. The Eastern White Pine (*Pinus strobus*) is a tree that has thin needles with parallel branches. The Sugar Maple (*Acer saccharum*) has a gray-brown bark

with mostly five lobed leaves that have firm edges that are sharply toothed. Leaves are 2-10 inches long and it grows up to 40-60 feet. The Japanese Red Maple (*Acer palmatum*) can be a single-stemmed small tree or multi-stemmed shrub. The deeply lobed leaves are red or reddish-purple especially in spring and fall, its leaves usually turn green in the summer. This is a seed grown tree that grows up to 15 to 25 feet tall. The White Oak (*Quercus alba*) is a tree that has leaves with 7-11 lobes that are even and hairless. It has a light gray bark and its leaves are 3-9 inches long. It grows up to 60-80 feet tall. The Austrian Pine (*Pinus nigra*) has needles that are dark green, stiff, and 3-6 inches long. This tree grows up to 50-100 feet tall. The Yellow Birch (*Betula alleghaniensis*) has a bark that is shiny yellow to silver-gray with narrow horizontal lines and peels in small thin curls. Leaves are short-pointed and are 1-5 inches long. It grows to a height of 70-80 feet tall. The American Mountain Ash (*Sorbus americana*) is a shrub or small tree that has compound leaves, they are narrow, toothed, and long-pointed leaflets. Its leaves are 6-9 inches long and this tree grows to 40 feet tall. The Atlantic White Cedar (*Chamaecyparis thyoides*) is a tree that has leaves that are about 1/16-1/8 inches long. It grows to 40-60 feet tall. Foliage sprays are somewhat flattened. The Red Cedar (*Juniperus virginiana*) has sharp three-sided, needlelike leaves that are 1/16-1/4 inches long. These trees grow to a height of 40-50 feet tall and like dry sites. The Bald Cypress (*Taxodium distichum*) has needles that are 1/4 -7/8 inches long and are mostly flat and green on both sides, but sometimes three-sided. They grow up to 80-120 feet tall. The Pignut Hickory (*Carya glabra*) is a tall tree with leaves of five hairless leaflets. Its leaves are 6-12 inches long and the tree can grow to 80-90 feet tall. The White Birch (*Betula papyrifera*) has white peeling bark that readily separates into layers as the tree matures and is marked by narrow horizontal streaks. This tree has leaf blades that are 1-4 inches long and can grow up to 70-80 feet tall. The Red Maple (*Acer rubrum*) has smooth gray bark with leaves that are 3-5 lobed and 2-8 inches in length. It grows to 20-40 feet tall. It also has shallow V leaf sinuses. The Black Ash (*Fraxinus-nigra*) is a tree that has leaves that are 12-16 inches long and it grows up to 40-80 feet tall. The leaflets are always toothed and its twigs are round, hairless, and dull.

In the Town of Islip, the Austrian Pine was also identified by Townes et al. (2013). The Red Cedar was also identified twice and the Yellow Birch once by Navarro et al. (2013). The White Oak was also identified twice and the Red Cedar and Sugar Maple once by DeAnda et al. (2013). The Bald Cypress was also identified by Lewis et al. (2013). The Red Cedar was also identified by Deorag et al. (2012).

In the Town of Babylon, The Red Maple and White Birch were also identified by Perks et al. (2013). The Norway Maple was also identified by Deorag et al. (2012). The Red Maple was also identified by LeGodais et al. (2012). The Norway Maple, Japanese Maple, and Red Maple were also identified by Grosso et al. (2013). This research shows that Maples are dominant in the Town of Babylon, while Islip has more of a variety of tree species.

Conclusion:

Forty tree species in the Town of Babylon and the Town of Islip were identified using a dichotomous key. The Austrian Pine, Red Cedar, White Oak and Bald Cypress were all common tree species identified in the town of Islip. In the town of Babylon, Red Maple and Norway Maple were found. A White Birch tree was also found. The Japanese Red Maple, Eastern White Pine, and Sugar Maple trees were all found in the both the town of Islip and Babylon. Maple trees were more numerous in the Town of Babylon. In Islip, a large variety of tree species were found. Maple trees may be dominant in the Town of Babylon but may not be so in the neighboring Town of Islip.

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A Comparison of the Characteristics of Trees in the Northern and Central Regions of Long Island

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Abstract:

Forty different tree samples from Brentwood (Central Long Island) and Kings Park (Northern Long Island) were collected. By using a dichotomous key, which is used to classify tree species; all of the tree samples were identified. In Brentwood, there were a total of 9 species found which were the Bottlebrush Buckeye (*Aesculus*), the Bigleaf maple (*Acer macrophyllum*), the Striped Maple (*Acer pensylvanicum*), the Winged Eunonymus (*Euonymus alatus*), the Mapleleaf Virburnum (*Virburnum acerfolium*), the Norway Spruce (*Picea abies*), the Deciduous Holly (*Ilex decidua*), the Saucer Magnolia (*Chinese magnolia*), and the Northern White Cedar (*Thuja occidentalis*). In Kings Park, there were a total of 12 species found which were the Bigleaf Maple (*Acer macrophyllum*), the Virginia Creeper (*Parthenocissus quinquefolia*), the Striped Maple (*Acer pensylvanicum*), the Northern Catalpa (*Catalpa speciosa*), the Sourwood (*Oxydendrum*), the Sweet Cherry (*Prunus avium*), the Shagbark Hickory (*Carya ovata*), the Bottlebrush Buckeye (*Aesculus parviflora*), the Katsura Tree (*Cercidiphyllum*), the Deciduous Holly (*Ilex decidua*), the Devils Club (*Oplopanax horridus*), and the Norway Spruce (*Picea abies*). There were a total of 21 species found in both locations. We classified 5 tree species in common leaving 16 separate species between Kings Park and Brentwood.

Introduction:

In New York State there are 18 million acres of trees which covers 62% of New York State (Leopold 2003). Due to extreme climate changes on Long Island, there are many different tree species that have evolved in the Northern and Central parts. Kings Park, New York is located on the Northern Region of Long Island. The Kings Park Nature Reserve is about 19.5 miles from the Long Island Sound. Brentwood, New York is located in the Central Region of Long Island, New York. Brentwood, New York is not surrounded by any major body of water. According to the Soil Survey of the Long Island Area, New York, the temperature in the Central Region of Long Island tends to be warmer than the Northern Region of Long Island (Bonsteel 1903). The North shore of Long Island tends to have rockier, solid soil than the South shore of the Island which tends to be sandier.

Method:

The longitude and latitudes were collected from four different locations using google.com. They are listed in table 1. A branch around the size of a forearm was collected from each tree that was identified. This was repeated at all four locations. Each tree sample had identifiable qualities, such as buds or leaves. A magnifying glass was used to see these characteristics of the tree branches. To help classify the trees, a dichotomous key from virginiatech.edu was used (Refer to tables 2 and 3).These qualities were needed to find out the name of each tree. By using the website Oregonstate.edu/trees/name_common.html the scientific name and physical traits were found.

Results:

The trees identified from Central Long Island were: The Bottle Brush Buckeye (*Aesculus*), the Bigleaf Maple (*Acer macrophyllum*), the Striped Maple (*Acer pensylvanicum*), the Norway Spruce (*Picea abies*), the Winged Euonymus (*Euonymus alatus*), the Mapleleaf Virbirnum (*Virburnum acerfolium*), the Norway Spruce (*Picea abies*), the Deciduous Holly (*Ilex decidua*), the Saucer

Magnolia (*Chinese magnolia*), and the Northern White Cedar (*Thuja occidentalis*). The trees from Northern Long Island were: The Bigleaf Maple (*Acer macrophyllum*), the Virginia Creeper (*Parthenocissus quinquefolia*), the Striped Maple (*Acer pensylvanicum*), the Northern Catalpa (*Catalpa speciosa*), the Sourwood (*Oxydendrum*), the Sweet Cherry (*Prunus avium*), the Shagbark Hickory (*Carya ovata*), the Bottlebrush Buckeye (*Aesclulus parviflora*), the Katsura tree (*Cercidiphylum*), the Deciduous Holly (*Ilex decidua*),the Devils Club (*Oplopanax horridus*), and the Norway Spruce (*Picea abies*). The Kings Park property had 20 tree samples and 12 tree species. The Brentwood had 22 tree samples and 9 tree species. There were 5 tree species in common: the Bottle Brush Buckeye (*Aesculus*), the Bigleaf Maple (*Acer macrophyllum*), the Striped Maple (*Acer pensylvanicum*), the Norway spruce (*Picea abies*), and the Deciduous Holly (*Ilex decidua*). A total of 16 separate tree species that were not in common: the Winged Euonymus (*Euonymus alatus*), the Virginia Creeper (*Parthenocissus quinquefolia*), the Northern Catalpa (*Catalpa speciosa*), the Sourwood (*Oxydendrum*), the Sweet Cherry (*Prunus avium*), the Shagbark Hickory (*Carya ovata*), the Katsura tree (*Cercidiphylum*), and the Devils Club (*Oplopanax horridus*).

Table 1: Locations on Long Island

	Property 1	**Property 2**	**Property 3**	**Property 4**
Latitude and Longitude	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West	Latitude: 40 degrees 46’ 15.96” North Longitude: -73 degrees 13’ 15.96” West	Latitude: 40 degrees 46’ 56.0172” North Longitude: -73 degrees 13’ 15.7728” West	Latitude: 40 degrees 46’ 54.2424” North Longitude: -73 degrees 13’ 17.8320 West
Town	Kings Park	Brentwood	Brentwood	Brentwood
Region	Northern LI	Central LI	Central LI	Central LI
Lot Size	500x1000	75x100	75x100	75x100
Tree Count	20	11	6	5

(The last three properties are the same size because they’re from the same community that has been divided equally. Property one had trees from a nature reserve.)

Table 2: Tree Species from Brentwood Location

Common Name	**Scientific Name**	**Physical Traits**	**Location (longitude and latitude)**
Bottle Brush Buckeye	*Aesculus*	The leaves have a long leaf stem, while the flowers vary from white to pink.	Latitude: 40 degrees 46’ 15.96” North Longitude: -73 degrees 13’ 15. 96” West
Bigleaf Maple (2 samples)	*Acer macrophyllum*	The leaves range from 6 to 12 inches in diameter. Tree grows to about 49–66 ft. tall.	Latitude: 40 degrees 46’ 15.96” North Longitude: -73 degrees 13’ 15. 96” West Latitude: 40 degrees 46’ 56.0172” North Longitude: -73 degrees 13’ 15. 7728”

			West
Striped Maple (3 samples)	*Acer pensylvanicum*	Its leaf's contain three lobes and can range from 5 to 8 inches long. The tree grows to about 5-10 ft tall.	Latitude: 40 degrees 46' 15.96" North Longitude: -73 degrees 13' 15. 96" West Latitude: 40 degrees 46' 56.0172" North Longitude: -73 degrees 13' 15. 7728" West Latitude: 40 degrees 46' 54.2424" North Longitude: -73 degrees 13' 17.8320" West
Winged Euonymus	*Euonymus alatus*	Its leaves are dark green, that later turn to a reddish purple in autumn and it grows to about 8 ft tall	Latitude: 40 degrees 46' 15.96" North Longitude: -73 degrees 13' 15. 96" West
Mapleleaf Viburnum (3 samples)	*Viburnum acerifolium*	A small Shrub that grows to about 3 to 6 feet tall. The leaves can change from a dark green to a reddish-purple color in the fall.	Latitude: 40 degrees 46' 15.96" North Longitude: -73 degrees 13' 15. 96" West Latitude: 40 degrees 46' 56.0172" North Longitude: -73 degrees 13' 15. 7728" West Latitude: 40 degrees 46' 54.2424" North Longitude: -73 degrees 13' 17.8320" West
Norway Spruce (2 samples)	*Picea abies*	Can grow to 115 to 180 feet tall with needle like leafs.	Latitude: 40 degrees 46' 15.96" North Longitude: -73 degrees 13' 15. 96" West Latitude: 40 degrees 46' 56.0172" North Longitude: -73 degrees 13' 15. 7728" West
Deciduous Holly	*Ilex decidua*	Grows to the average	Latitude: 40 degrees

		height of 82 feet	46’ 15.96” North Longitude: -73 degrees 13’ 15. 96” West
Saucer Magnolia	*Chinese magnolia*	Smaller tree, usually 20 ft tall. Has pink flowers and buds. Has a bunch of lower branches	Latitude: 40 degrees 46’ 15.96” North Longitude: -73 degrees 13’ 15. 96” West
Northern White Cedar(8 samples)	*Thuja occidentalis*	Medium sized tree, Shaped like an arrowhead. Often has several main trunks.	Latitude: 40 degrees 46’ 15.96” North Longitude: -73 degrees 13’ 15. 96” West Latitude: 40 degrees 46’ 56.0172” North Longitude: -73 degrees 13’ 15. 7728” West Latitude: 40 degrees 46’ 54.2424” North Longitude: -73 degrees 13’ 17.8320” West

(These trees were taken from properties in Brentwood. These properties were all located on the same street. Since they were taken from the same residential area, there were many similar trees and properties.)

Table 3: Tree Species from a Nature Reserve in Kings Park, Long Island

Common Name	**Scientific Name**	**Physical Traits**	**Location(Longitude and Latitude, Lot Size)**
Bigleaf Maple	*Acer macrophyllum*	157 feet tall. Leaves are 15-30 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Virgnia Creeper (2 samples)	*Parthenocissus quinquefolia*	66-98 feet tall. Climbs smooth surfaces using small forked tendrils about 5mm in size. The leaves range from 3-20 centimeters across.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Striped Maple	*Acer pensylvanicum*	5-10 meters tall and the trunk up to 20 centimeters in diameter. The leaves	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West

		are 8-15 centimeters long.	Lot size: 500x1000
Northern Catalpa	*Catalpa speciosa*	15-30 meters tall and 12 meters wide. The trunk is up to 1 meter in diameter. The leaves are heart shaped and 20-30 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Sourwood (8 samples)	*Oxydenrum*	10-20 meters tall. The trunk is up to 50 centimeters in diameter. The leaves are 8-20 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Sweet Cherry	*Prunus avium*	50-100 feet tall. The trunk is up to 5 feet in diameter. The leaves are 7-14 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Shagbark Hickory	*Carya ovata*	89 feet tall. The leaves are 30-60 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Bottlebrush Buckeye	*Aesculus parviflora*	3-5 meters tall. The leaves are 12-22 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Katsura Tree	*Cercidiphyllum*	148 feet tall. The leaves are 3-8 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Deciduous Holly	*Ilex decidua*	7-15 feet tall. The leabes are 2.5-7.5 centimeters long.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Devils Club	*Oplopanax horridus*	3 feet 3 inches-4 feet 11 inches tall. The leaves are 20-40 centimeters across.	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees 13’ 56” West Lot size: 500x1000
Norway Spruce	*Picea abies*	115-180 feet tall. The leaves are needle like and 12-24 millimeters	Latitude: 40 degrees 54’ 06” North Longitude: 73 degrees

		long.	13’ 56” West Lot size: 500x1000

Discussion:

Altenburg and Hempel (2013) also compared trees from Northern and Central Long Island. Of the 13 specimens they indentified there weren’t any species that were found in this study. Altenburg and Hempel also had taken species from the Kings Park area and found different species from the samples that were identified in this study. Navarro et al. (2013) had taken species from the Brentwood area. Out of the 22 trees that were identified there were no common species found in both Brentwood locations. The Sourwood species in both studies were identified in their Brentwood location and our Kings Park location.

Conclusion:

Our evidence shows that the Bottle Brush Buckeye (*Aesculus*), the Bigleaf Maple (*Acer macrophyllum*), the Striped Maple(*Acer pensylvanicum*), the Norway Spruce(*Picea abies*), and the Deciduous Holly (*Ilex decidua*) are common trees in the Northern and Central parts of Long Island. The Kings Park location was part of a Nature Preserve and the Brentwood location was a residential area. These results also show that tree species are common between the Nature Preserve and residential properties in this area.

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Characterization of Soil Bacteria from the Nature Preserve at Suffolk County Community College, Grant Campus

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Keywords: Soil, Bacteria, Bacilli, Colony morphology

Abstract

The purpose of this study was to determine if there is a major difference between the bacterial populations found in two different areas of the Nature Preserve located on the Suffolk County Community College, Grant Campus. Serial dilution and gram staining were done to analyze the colony morphology and cell morphology of the bacteria in the samples. It was observed that the sample collected from a dry location had yellow pinpoint colonies while the other sample which was obtained from a moist location did not have these colonies. Most of the bacteria examined, in both samples, were gram positive bacilli.

Introduction

Bacteria are part of our ecosystem, without which life as we know it may not exist (Stevenson, 1986). There is an abundance of bacteria found in the soil, most of which are located in the top 10 centimeters of the soil where organic matter is present. It is the diversity of bacteria found within the soil, which allows them to perform versatile tasks, and allow the earth to support life (Stevenson, 1986). Often they form symbiotic relationships with plants, allowing them to better take up nutrients and have a greater tolerance to stress (Davitt *et al.*, 2011). In addition, they play a role in nitrogen cycling, carbon cycling and soil formation, in addition to contributing to genetic diversity on earth.

In nitrogen cycling, the bacteria reduce the nitrogen gas in the atmosphere into ammonium by using the enzyme nitrogenase (Balley *et al.*, 2001). Many bacteria, such as *Bascillus subtillis*, also serve to decompose the organic matter in the soil into inorganic compounds through the process of mineralization (Willey *et al*., 2010).

The Nature Preserve at Michael J. Grant Campus of Suffolk County Community College is home to diverse vegetation including Pines, Maples, Oaks, and Ferns. Along with the various plants that thrive in this environment are the microorganisms that exist in moist and dry soil habitats. The two soil samples were collected from this Nature Preserve for this experiment.

The purpose of this study was to determine the colony morphology and the cell morphology of the soil bacteria from two locations of the Nature Preserve in an attempt to learn if there are any major differences in the bacterial populations of these soil samples.

Methods and Materials

The two soil samples, one from a moist, year –around shaded region which is the outdoor classroom in the Nature Preserve and another from a dry well exposed to sunlight region (Latitude 40^{o} 48’ 2.29322” N, Longitude 73^{o} 16’ 38.22636’’ W) which is close to the entrance to the Nature Preserve, were collected in October of 2013. Each was labeled sample one and two, respectively. Sample one was wet and clumpy whereas sample two, the dry soil, was extremely brittle and powdery.

The samples were then diluted up to 1:10,000 by performing serial dilution (Harley, 2008). The dilutions of each sample were then inoculated onto Trypic Soy Agar (TSA) and MacConkey agar

plates. After 24 hours of incubation at 30^{o} C, colonies were examined and gram staining was performed on the bacteria from the isolated colonies on the plates.

Results

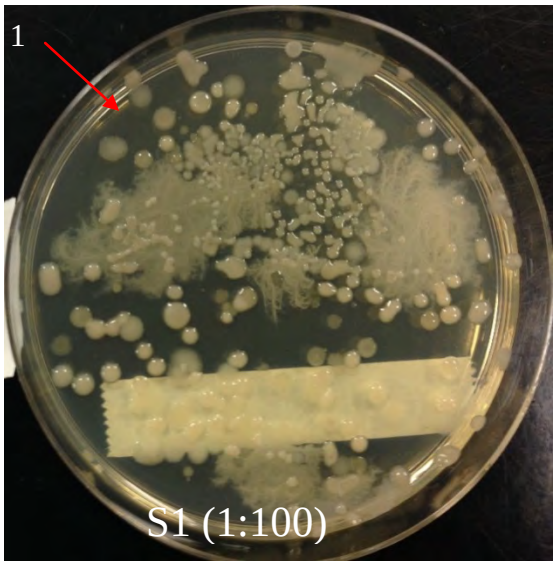

Figure 1: Sample 1, Colony 1 (1:100).

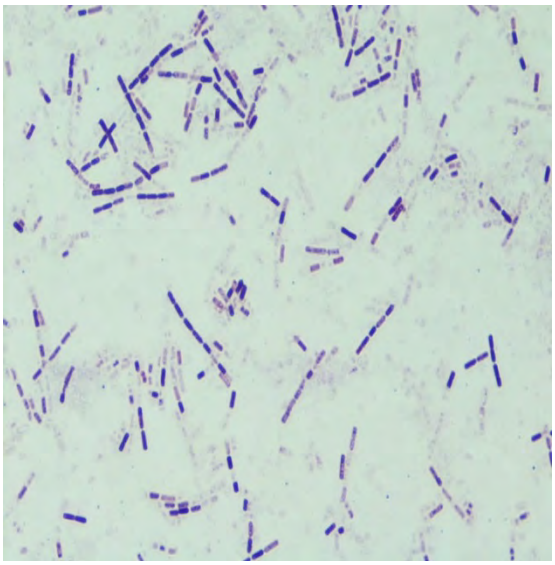

Figure 1a: Sample 1, Colony 1 Gram Staining (1000X).

Figure 2: Sample 1, Colony 2 (1:1,000).

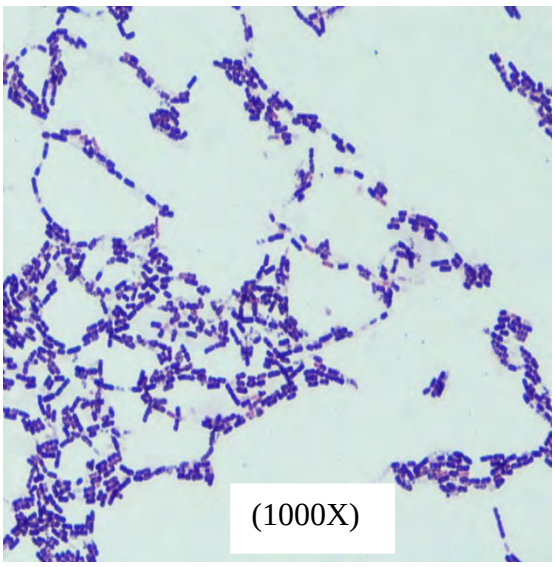

Figure 2a: Sample 1, Colony 2 Gram Staining.

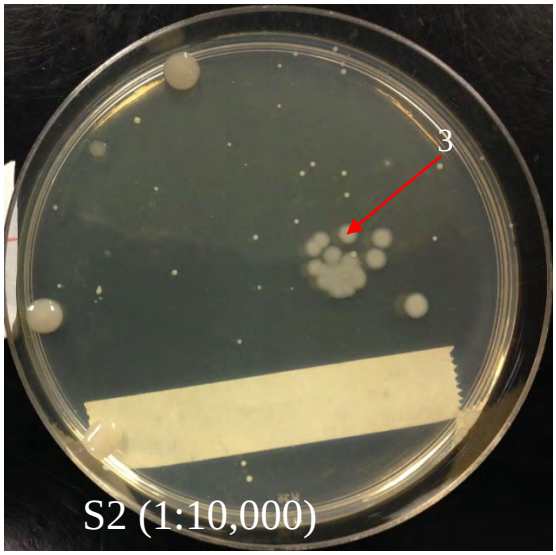

Figure 3: Sample 2, Colony 3 (1:10,000).

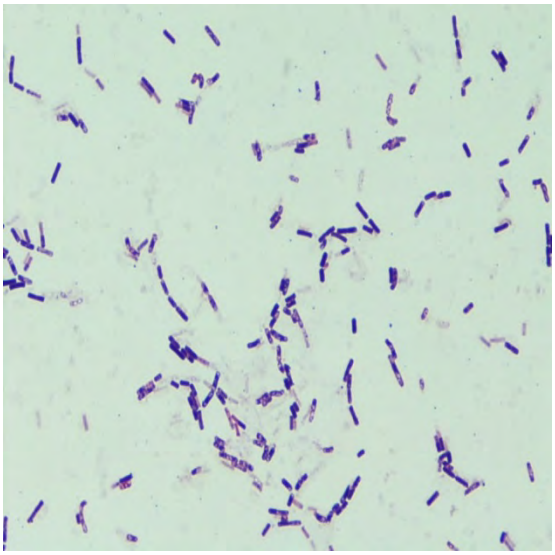

Figure 3a: Sample 2, Colony 3 Gram Staining (1000X).

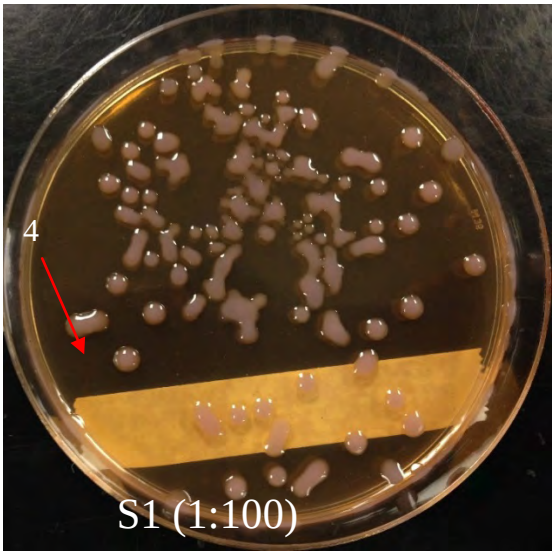

Figure 4: Sample 1 Colony 4 (1:100).

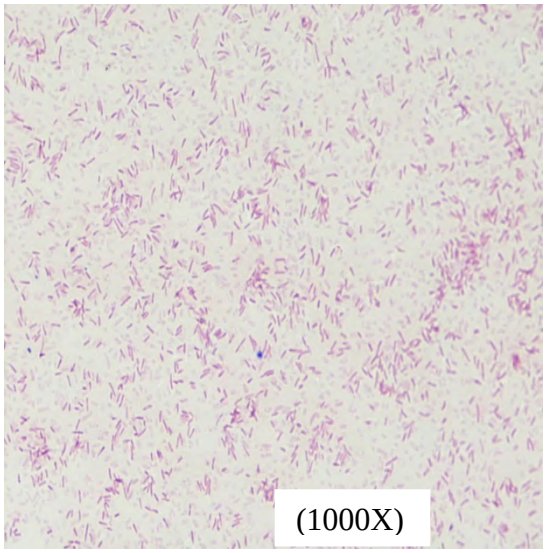

Figure 4a: Sample 1, Colony 4 Gram Staining.

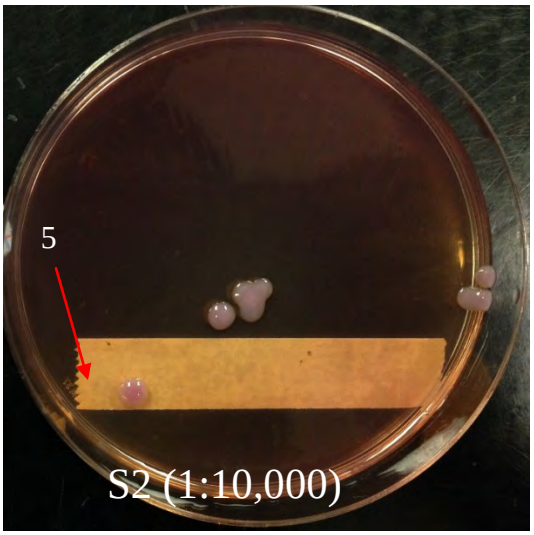

Figure 5: Sample 2, Colony 5 (1:10,000).

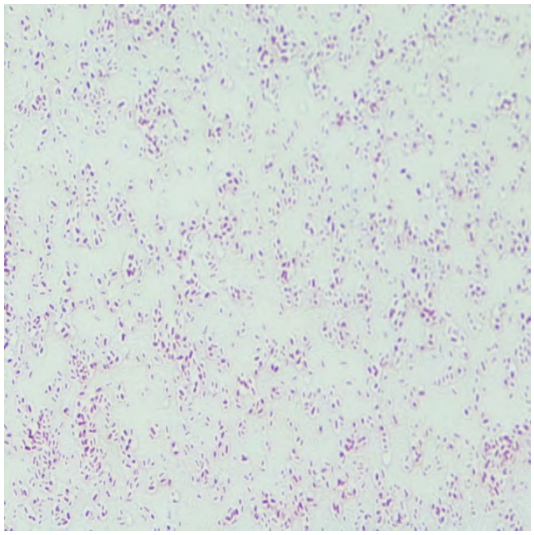

Figure 5a: Sample 2, Colony 5 (1:10,000) Gram Staining (1000X).

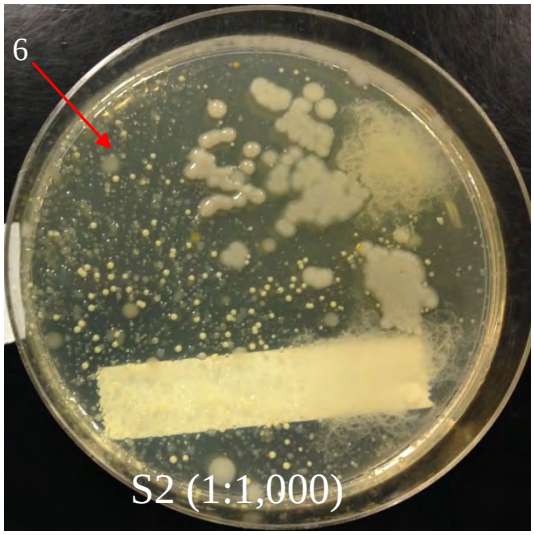

Figure 6: Sample 2, Colony 6 (1:1,000).

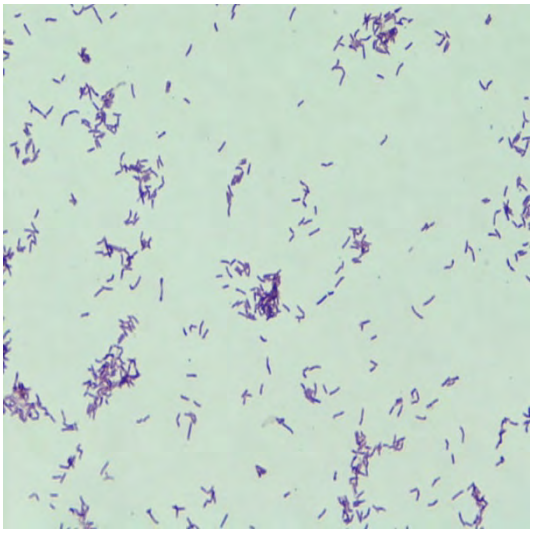

Figure 6a: Sample 2, Colony 6 (1:1,000) Gram Staining (1000X).

The first colony (Figure 1) was from sample one diluted to 1:100, which was circular and dry with a dull surface. This colony had gram positive, rod shaped cells, but the rods were very short and very thin (Figure 1a). Many streptobacilli and diplobacilli were seen. The second colony (Figure 2) was obtained from sample one, diluted to 1:1000. This colony was filamentous, dry, white with the veined surface. The gram staining of the cells in this colony showed gram positive rods, which were fat and short. Many streptobacilli were observed (Figure 2a). The third colony (Figure 3) was obtained from sample two, diluted to 1:10,000. This colony was circular, whitish and dry with a dull surface. The gram staining of the cells in this colony revealed gram positive rods, but they were very thin and short (Figure 3a). Mostly diplobacilli and single cells were seen. The fourth colony (Figure 4) was collected

from sample 1, diluted to 1:100 and this bacteria grew on MacConkey agar. The colony was circular and mucoid. The cells from this colony were gram negative rods and existed as single cells (Figure 4a). The faint circle around the cells suggested that this bacterium was capsulated. The fifth colony (Figure 5) was collected from sample 2, diluted to 1:10,000 and this also grew on MacConkey agar plate. The colony was circular, pinkish, shiny and mucoid. The cells from this colony were gram negative and appeared to be capsulated (Figure 5a). No specific arrangement of the cells was observed. The last colony (Figure 6) was collected from sample 2, diluted to 1:1000. This colony was pinpoint, shiny, moist and yellow. The cells in this colony were gram positive rods which were long and thin (Figure 6a). The cells did not have any specific arrangement and they existed as single cells.

Discussion

Results obtained in this study suggest that the moisture content of the soil influences the diversity of the bacterial population. This is consistent with the studies conducted by other investigators. For example, Waldrop and Firestone (2006) have shown that there is a Difference in bacterial communities found in the soil from shaded areas with higher water content and the soil from open areas with the lower water content. Singh and Kashyap (2007) have found that low moisture content in the soil reduced the size of the bacterial population which was highest during the rainy season and lowest during the summer season. In addition low water availability in the soil can inhibit the growth of certain bacteria and thus change the bacterial composition of the soil (Stark and Firestone, 1995). The absence of some groups of bacteria in the soil can facilitate the growth of certain other species bacteria (Lin *et al.*, 2010). This would explain the presence of bacteria forming the yellow colonies only in the soil collected from the dry location.

Conclusion

The bacterial populations in the two samples were different to a certain extent.Yellow, pinpoint colonies were found only in sample two which was obtained from a dry, sunny location. Both of the samples had mostly gram positive bacilli and no cocci were observed. Mucoid colonies with possibly capsulated, gram negative bacilli were common to both samples. Different growth media can be used to isolate other species of bacteria that might not have grown on TSA and MacConkey agar. Various biochemical tests such as nitarte redutcion, hydrogen sulfide production can be done to furthur characterize the species of bacteria that were observed. Endospore staining and capsule staining would help in gathering more information about the bacterial populations in the samples. Protein gel electrophoresis can be done on the bacterial cells to examine the differences in the protein composition.

Acknowledgements:

We thank Debbie Kaufmann and Barbara Young for providing the materials for the study. Our thanks to MaryPat Takacs for her instructions on the literature search..

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Natural and Artificial Sweeteners contribute to an increase in inflammation in Macrophages

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Key words: Inflammation, artificial sweeteners, sugar substitutes, chemotaxis, nitric oxide

Abstract: Sugar and Artificial Sweeteners (AS) constitute a large part of the American diet and can be found in numerous food products and beverages at exceedingly high levels (Ng et al., 2012; Gardner et al., 2012). Prior research has shown that overconsumption of sweeteners can lead to illnesses such as diabetes (Gardner et al., 2012; Hu et al., 2010), heart disease (Gardner et al., 2012; Cohen et al., 2012), and obesity (Hu et al., 2010; Feijo et al., 2013). A major underlying factor of these health issues is increased chronic inflammation caused by sweeteners (Shoelson et al., 2007). We conducted assays to determine three indicators of inflammation: increased chemotaxis by white blood cells (Coelho et al., 2006), excess nitric oxide (NO) production, and cell death via apoptosis (Secco et al., 2004). We determined the level of inflammation triggered by three artificial sweeteners (aspartame, saccharin, and sucralose) and five natural sweeteners (sucrose, fructose, corn syrup, erythritol, and dextrose) using a macrophage cell line (LADMAC) by measuring the occurrence and magnitude of the three conditions above. We hypothesized that excess sweeteners would cause increased inflammation. Our results demonstrated that the majority of sweeteners did result in an increase in inflammation; however erythritol (Truvia) demonstrated low levels of inflammation. Intake of both sugars and artificial sweeteners should be kept at a minimum to maintain optimum health and reduce the risk of inflammation and its resulting diseases. Our results contribute to the global momentum aimed at changing policy to regulate or reduce the consumption of sweetened beverages and food at the local, state, and national level.

Introduction:

Artificial sweeteners are sugar substitutes that have become more prevalent in the foods that are consumed today. These sugar substitutes are derivatives of a common sugar molecule, through a series of alterations and combinations of chlorine, oxygen, and hydrogen atoms (Selim, 2005). Artificial sweeteners can be found in diet sodas, sugar-free candy, yogurt, and other food products. Examples of artificial sweeteners include sucralose, (Splenda), saccharin, (Sweet'N Low), and aspartame (Equal). Within the past 30 years, our dietary intake of these sugar alternatives have soared (Tandel, 2011). This is most likely due to the claim that these chemicals have less calories, and are therefore diet friendly (Park A. 2013). Whether or not artificial sweeteners are truly beneficial remains an area of intense debate and study. Research has shown that there can be severe health consequences due to high

consumption of these sweeteners. Most notably, several studies have linked sweeteners to increased inflammation which is a persistent symptom of many diseases that plague Americans. Attempting to find a potential cure involves a thorough understanding of inflammation.

One of the most significant responses in the human body is inflammation. Inflammation is a response to cellular injury characterized by increased blood flow to the area, elevated cellular metabolism, vasodilation, release of soluble mediators, extravasation of fluids, and cellular influx (Ferrero-Miliani et. al., 2007). When tissues in the body become injured or infected by foreign pathogens, the inflammatory response is initiated as a natural response for the body to heal damaged tissues. During the inflammatory response chemoattractant factors such as TNF-α, PAF, and C5a along with chemokines are released to generate the migration of white blood cells to the inflamed area (Secco et. al., 2004). White blood cells, such as neutrophils and macrophages, accumulate at the infected or damaged tissue area and engulf harmful pathogens or damaged cells by phagocytosis until the damaged tissue is healed. If the accumulation of white blood cells persists after the damage tissue has become healed, this will lead to chronic inflammation (Walker et al., 2013).

Chronic inflammation is harmful and may lead to disease. In diabetes for instance, subjects have overactive immune responses which leads to an increased release of inflammatory chemicals such as TNF-α (Rizvi, 2006). Several studies have shown that increased inflammation is linked to tumorigenesis. Similar to inflammation's role in diabetes, an increased release of TNF-α occurs which causes a continuous migration of cells leading to the development of tumors (Aggarwal et. al. 2006).

Many studies link natural and artificial sweeteners to inflammation. In 2001, Kim *et al* found that Zebrafish fed aspartame and saccharin had higher incidences of inflammation in the liver and in the brain (Kim et al., 2001). This experiment also looked at the effect of a high calorie diet (HCD) on inflammation with sweeteners. They found greater inflammation in the HCD group with both sweeteners used. In addition to the connection between AS and inflammation, the researchers also noted swimming defects in the group that was fed aspartame which implies that there could also be other toxic effects.

A 2008 study done by Glushakova *et al* revealed that fructose caused an increase in the levels of inflammation in human vascular cells. The research noted that even low to moderate dosages of fructose stimulated the expression of intercellular adhesion molecule-1 (ICAM-1). The results of this study are quite noteworthy because they used fructose levels that mimicked concentrations that could be consumed in the human diet.

In 2010, Oliver *et al* showed that obese children had higher blood glucose levels and inflammatory markers such as neutrophils and interleukin 6 (IL-6) in comparison to children with normal weight. Another study done in 2010 by Bryland *et al* examined the effects of high levels of glucose in infusion fluids given to patients. The results claimed that glucose degradation products (GDPs) lead to an increase in the amount of carboxymethyllysine (CML), an indicator of advanced glycation end products (AGEs). This study shows that glucose like other AS can increase inflammation through the harmful metabolic products such as GDPs and AGEs (Bryland *et al*., 2010).

In 2012, a study was done by Cannizzo *et al* which showed that mice fed a high fructose diet had increased inflammatory markers such as vascular cell-adhesion molecule-1 (VCAM-1) and matrix

metalloprotease 9 (MMP-9), as well as induced insulin resistance. This in turn led to increased atherosclerotic plaque formation. With heart disease being one of the deadliest diseases in the country, this study shows that there is a relationship between artificial sweeteners and inflammation that underlies these medical conditions.

Many of these studies reveal that sweeteners can contribute to inflammation in various diseases such as obesity, heart disease, cancer, and diabetes. In regards to obesity, some scientists have claimed that artificial sweeteners can lead to an increase in weight gain because the lack of calories in them may trigger the brain to tell the body it needs more food, leading to overconsumption (Paddock et al., 2008). In addition, some research has shown that the enlarged adipocytes of obese individuals have increased levels of macrophages and by extension, inflammation (Shoelson *et al*., 2007). Heart disease is the leading cause of death in the United States, and studies have begun to link AS related inflammation to an increase in atherosclerosis (Libby et al., 2002). Cancer has also taken the lives of many Americans, and again, research has shown that inflammation can aid in tumorigenesis (Aggarwal et al., 2006). Diabetes is also one of the most prevalent diseases in the country, and inflammation due to AS plays a significant role. Scientists have shown that chronic inflammation can perpetuate insulin resistance which makes coping with this illness very difficult (Rizvi, et al., 2006).

With the increased evidence that natural and artificial sweeteners contribute to disease we hypothesized that cells exposed to natural and artificial sweeteners will show an increase in inflammation. In this study we used a macrophage cell line with monocyte morphology, or LADMAC cells, (ATCC- CRL 2420) to test this hypothesis. LADMAC cells are derived from the bone marrow of mice, and carry out functions similar to larger white blood cells (neutrophils) such as phagocytosis and response to injury. We elected to test four natural sweeteners: table sugar, corn syrup, sucrose, fructose; and four artificial sweeteners: Sucralose, saccharin (Sweet'N Low), Aspartame (Equal), and erythritol (Truvia). To test the effects of these sweeteners on inflammation, we used three assays to identify the presence and magnitude of the inflammatory response: the chemotaxis assay, Greiss reaction assay, and apoptotic assay. The purpose of the chemotaxis assay was to determine if LADMAC cells would migrate towards chemotactic factors released from LADMAC cells exposed to sweeteners during the recruitment phase of inflammation. The amount of migration and therefore inflammation was determined by this assay. The purpose of the Greiss reaction assay was to determine the levels of nitric oxide (NO) released by the LADMAC cells under high levels of sweeteners. NO cannot be measured directly since it quickly gets oxidized to nitrite or nitrate. Nitrite and nitrate are less transient and can be chemically modified to indirectly indicate how much NO is present as a proxy. The apoptotic assay determines if there are high levels of inflammation, which may trigger apoptosis, a programmed cell death (Hartl et al., 2011).

Our study focused specifically on how sweeteners can increase inflammation. Artificial sweeteners are not rare, and are in most of the products consumed in modern society. Many people are unaware of how prominent sweeteners are in their diet, as they are found in many canned, frozen, and diet foods. Ingesting too much of these sweeteners can be detrimental to health. This study may open new ideas to the prevention of inflammation. Studying the effects of artificial sweeteners on inflammation could be a key in preventing diseases such as cancer, diabetes and possibly other inflammatory related diseases. It can contribute to the current dialogue that could contribute to changes

in public health policy. The rise of childhood obesity in the United States is a growing problem; the amount of sweeteners consumed needs to be re-evaluated (Oliver *et al.*, 2010).

Materials and Methods:

Preparation of Natural and Artificial Sweeteners

Four natural sweeteners, dextrose, corn syrup, sucrose, fructose, and four artificial sweeteners, Sucralose, Saccharin (SweetN' Low), Aspartame (Equal), and Truvia, were prepared solution at a final concentration of 10µg/ml in phosphate buffer saline (PBS).

LADMAC cell culture

LADMAC cells were cultured in Dulbecco's Modified Eagle's Medium (DMEM) (Invitrogen, Carlsbad, CA) with 10% Fetal Bovine Serum (FBS) (Atlas Biologicals, Fort Colins, CO), 100x Glutamax-L-glutamine (Invitrogen), Penicillin-Streptomyosin (P/S) (Invitrogen), and Non-Essential amino acids (MEM NEAA) (Invitrogen). Concentration of the cells was maintained at a density of $1x10^5$ -$1x10^6$ cells/ml, and incubated at 37°C with 5% CO_2. Media was changed every 2-3 days. Cells were passaged 2-3 times prior to experiments.

Chemotaxis assay

LADMAC cells were incubated 4 milliliters of serum free media at a concentration of 1.6 x10^^{6} cells/ml. Fructose, sucralose, sugar, saccharine, aspartame, and corn syrup were added at a final concentration of (100µg/ml). The positive control contained FBS while the negative control contained no chemoattractant. The cells were incubated in each additive for 24 hours. Each experiment was done in triplicate. If the sweeteners were causing an inflammatory response, chemoattractants were released from the cells. After the 24 hour incubation time the protocol for the Colorimetric Chemotaxis Cell Migration Assay (Millipore, Bilerca, MA. USA) was followed. Absorbance was measured at 490nm after a final incubation period of 4hrs at 37°C.

Greiss reaction Assay

The Greiss reaction system assay (Promega, Madison, WI) was used to test the amount of NO produced by LAD-MAC cells in response to either sucrose, saccharin, sucralose, aspartame, fructose, dextrose, Truvia or corn syrup. To prepare for the Greiss reaction assay, cells were plated into new flasks at a density of $2.1x10^5$ per ml in each flask with each sweetener. Next, 4ml of serum free media was added to each flask. To initiate inflammation, 500 µg/ml LPS (Lipopolysaccharide) was added to each flask. After incubating for 24 hours, the cells from each flask were spun at 3,000 rpm in the centrifuge. The media was saved to use for the Greiss reaction assay. A nitrite standard curve was used to compare the concentration of NO released by each sample of cells in each sugar tested. To prepare the nitrite standard curve, 1ml of a 100µm nitrite solution was prepared by diluting 0.1M nitrite standard and distributed on a 96 well plate. (Figure 1). Sulfanilamide and NED (N-1-naphylethylenediamine dihydrochloride) were used to create a chemical reaction that allows for the measurement of NO, following the Promega Greiss Reaction Assay System protocol exactly. Absorbance was read at 490mn.

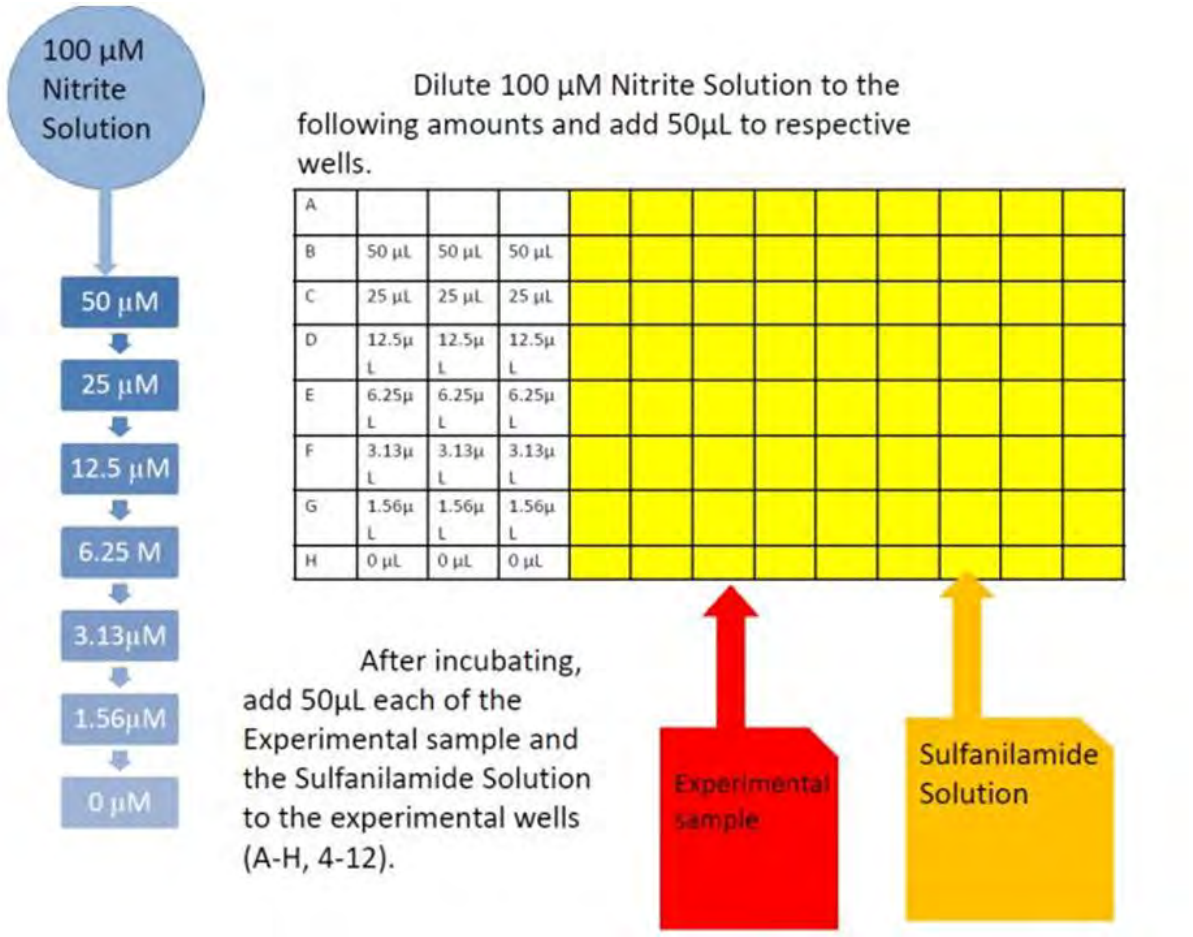

Figure 1: 6 well plate set up for the Greiss reaction assay

Starting from Column A: row 1-3, a 6 serial twofold dilution in triplicates was performed down the plate to generate a decrease in the concentration of nitric oxide The sugars were added as follows: Column A, row 4-6 was table sugar; column B, row 4-6 was sucralose; column C, row 4-6 was saccharine; column D, row 4-6 was aspartame; column E, row 4-6 was corn syrup; column F, row 4-6 was fructose; column G, 4-6 was Truvia; column H, 4-6 was the control; column A, 7-9 was staurosporin; column B, 7-9 was dextrose; column C, 7-9 was sucrose (50µl of each sample was added). In column A-H, row 1-3, the nitrite standard curve was established.

Apoptosis

The apoptosis assay was implemented to identify if inflammation and cell death was caused by sweetener exposure at 100µg/ml of sucrose, saccharin, sucralose, aspartame, fructose, dextrose, Truvia and corn syrup was placed in separate flasks containing a concentration of $2.1x10^5$ LADMAC cells per/ml, and 500 µg/ml LPS. Staurosporin, a known apoptotic agent was used as a positive control. Two incubation time points, one after 24 hours and one after 6 days were used to ascertain inflammation. After each time point, DNA was extracted from the LADMAC cells following the protocol for DNA extraction using spin column exactly (Qiagen, Valencia, CA). The DNA was then visualized on a 1% agarose gel by gel electrophoresis.

Results:

Chemotaxis Assay

Based on all previous literature creating a link between inflammation and sweeteners we attempted to identify whether LADMAC cells incubated in natural and artificial sweeteners produced enough chemoattractants to elicit a chemoattractive response. Our colorimetric chemotaxis assay results were measured at an absorption measurement of 490nm. Higher absorption measurements indicated greater chemoattractive responses, and demonstrated higher levels of inflammation caused by a sweetener. The absorption rate of the samples plus the positive and negative controls was subtracted from the blank without FBS. That number was then normalized to the negative control, and finally that number was subtracted by one. The values for each experiment (Figure 2) include corn syrup at 0.092682922, Sucralose -0.034146337, fructose - 0.107317079, sucrose- 0.185365859, aspartame - 0.229268299, and saccharin - 0.297560982. Our positive control was 0.419512202 and our negative control was 4.87805E-09. Saccharin shows the highest inflammatory response while sucralose and corn syrup show a slight repulsive effect. Truvia and dextrose were not tested.

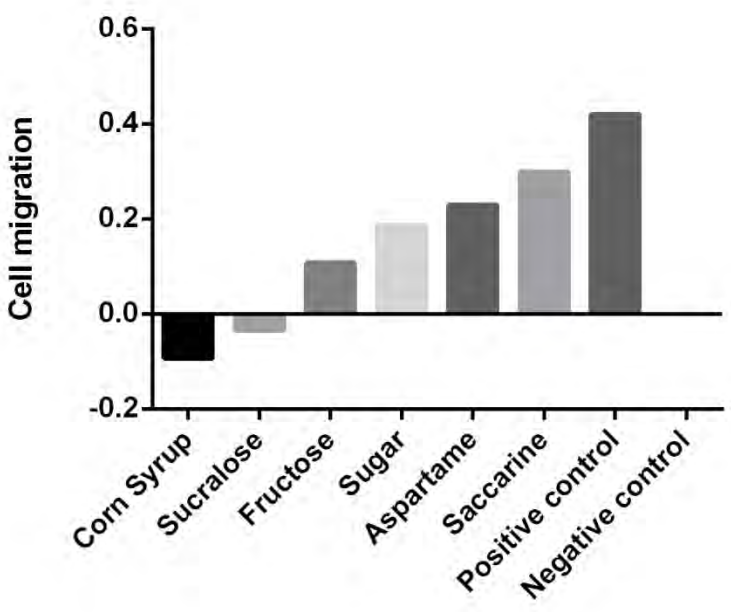

Figure 2: Chemotaxis assay. Absorption rates read at (490nm) for sweeteners tested in the Chemotaxis Assay as normalized to the negative control. Saccharine shows the highest level of inflammation and corn syrup shows the least.

Greiss reaction assay

Nitric oxide production has been used as an indicator of inflammation. We incubated LADMAC cells in sweeteners and measured the levels of nitric oxide produced where higher levels of NO production should represent sweeteners responsible for creating higher levels of inflammation. In our results of the Greiss reaction assay, the nitrite standard curve decreases as each serial dilution was made down the 96-well plate (Figure 3). The linear regression line of the nitrite standard curve indicates that as nitrite concentration increases, so does absorbance. Each sugar produced a certain amount of nitrite concentration and absorbance in the Greiss reaction assay. Sucrose had the highest absorbance, and

therefore production of NO at 0.152 and Truvia had the lowest absorbance at 0.140. The absorbance for the rest of the sweeteners is as follows: sucralose 0.147, saccharin 0.141, aspartame 0.146, corn syrup, 0.146, fructose 0.142, dextrose 0.145, and sucrose 0.143. The control had an absorbance of 0.149. Saccharin, Truvia and aspartame produced a lower amount of nitrite and absorption than the nitrite standard curve. The nitrite concentration released by each sugar is proportional to the absorbance. The total average nitrite concentration is 20µM. The order of sweeteners that produced the highest amount of nitrite to the lowest amount is the same as the order described with the absorbance.

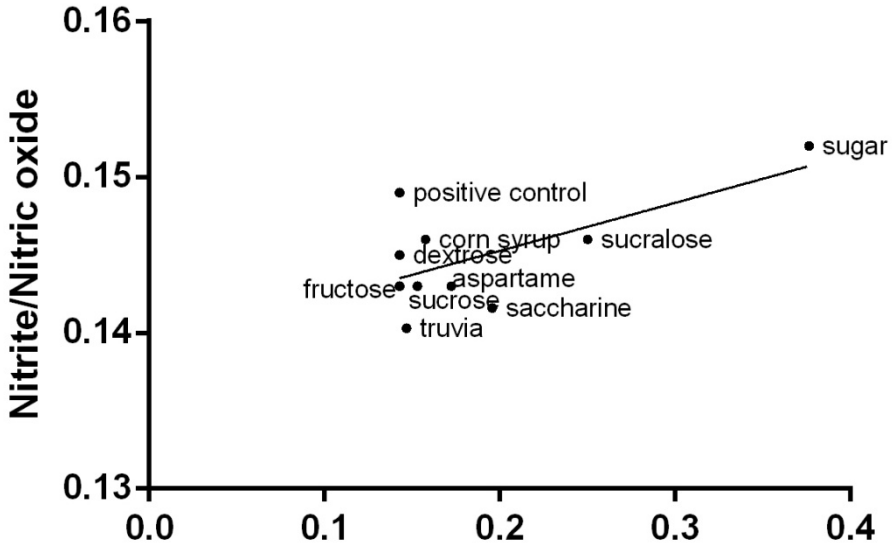

Figure 3: Nitric Oxide production by LADMAC cells exposed to sweeteners. This figure depicts the linear regression of nitric standard curve and NO production for each sweetener as measured at 490nm. Values to the left of the zero indicate negative absorbance values and therefore the ones that influence inflammation the least. Each sweetener varied in the amount of absorbance when compared to each other. Sugar has the highest absorbance (0.152nm) and Truvia has the lowest absorbance (0.140nm). The order of absorbance from least to greatest is as following: Truvia, saccharine, fructose, sucrose, staurosporin, dextrose, aspartame, corn syrup, sucralose, (control) and sugar. The average absorption of every sugar is 0.150nm.

Apoptosis

LADMAC cells incubated in sweeteners were tested for apoptosis by observation of the presence or absence of apoptotic DNA fragmentation. LADMAC cells incubated in dextrose, sucrose, saccharine, sucralose, aspartame, fructose, sugar and corn syrup for 24 hours, (Figure 4) demonstrated DNA fragmentation. Cells incubated in Truvia produces no signs of DNA fragmentation, and it can be surmised that this sweeteners produced the least inflammation. The second batch of LADMAC cells were incubated in sweeteners for 6 days. Here, Truvia and aspartame show very little DNA fragmentation and consequently the least apoptosis (Figure 5). Dextrose, saccharin, sucralose, fructose, sugar, and corn syrup show DNA fragmentation characteristic with apoptosis.

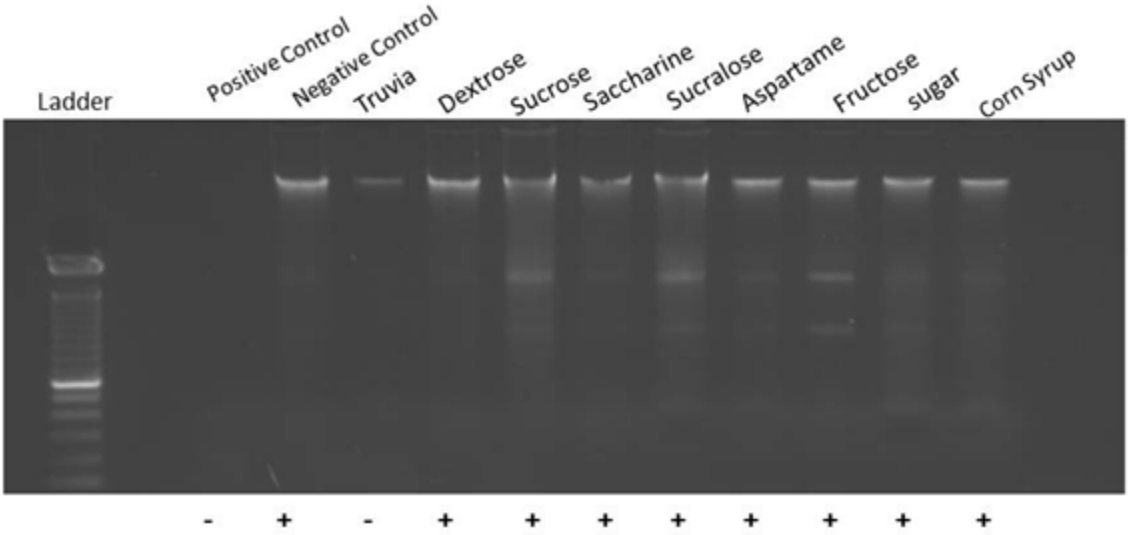

Figure 4: Apoptosis assay after 24 hours. Gel electrophoresis demonstrating characteristic apoptotic DNA ladder for dextrose, sucrose, saccharine, sucralose, aspartame, fructose, sugar, and corn syrup.

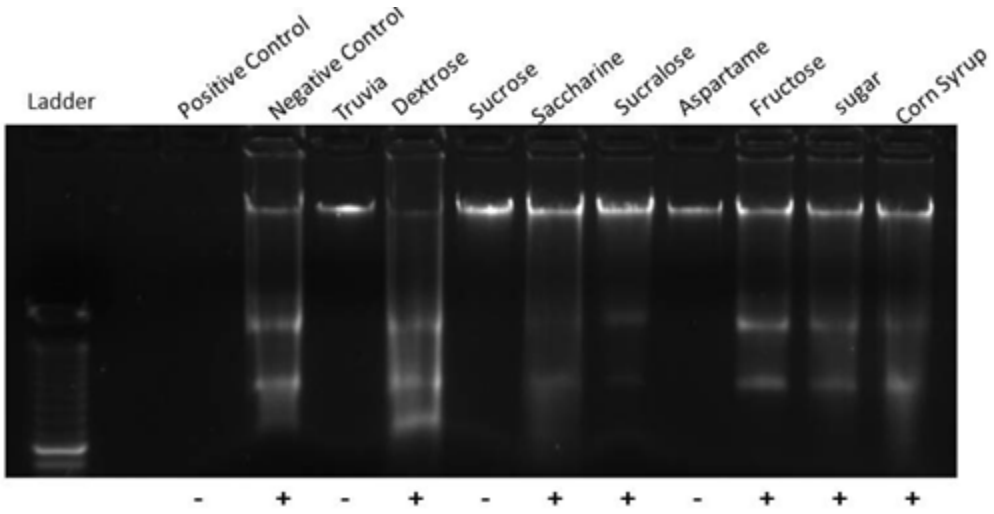

Figure 5: Apoptosis assay after 6 days. The characteristic apoptotic DNA ladder is present for dextrose, saccharine, sucralose, fructose, sugar and corn syrup.

Correlation across experimental assays

Since the chemotaxis assay, Greiss reaction assay, and the apoptosis assay produced varying results a Venn diagram was used to see the connection linking the positive inflammatory results between each experiment for each sugar (Figure 6). From the three different assays preformed, we are able to deduce which sweeteners induced inflammation between different assays. Sucralose, corn syrup, and dextrose showed positive results for inflammation from the Greiss Reaction and apoptosis assays. Aspartame and sugar showed positive results for inflammation for both the chemotaxis and the Greiss reaction assays. Fructose and saccharine produced positive inflammatory responses in both the apoptosis and

Greiss reaction assays. No sweetener showed inflammation across all three assays. Truvia tested negative for inflammation for both the Greiss reaction and apoptosis assay in both the 24 hour and 6 day exposure. Truvia was not tested using the chemotaxis assay.

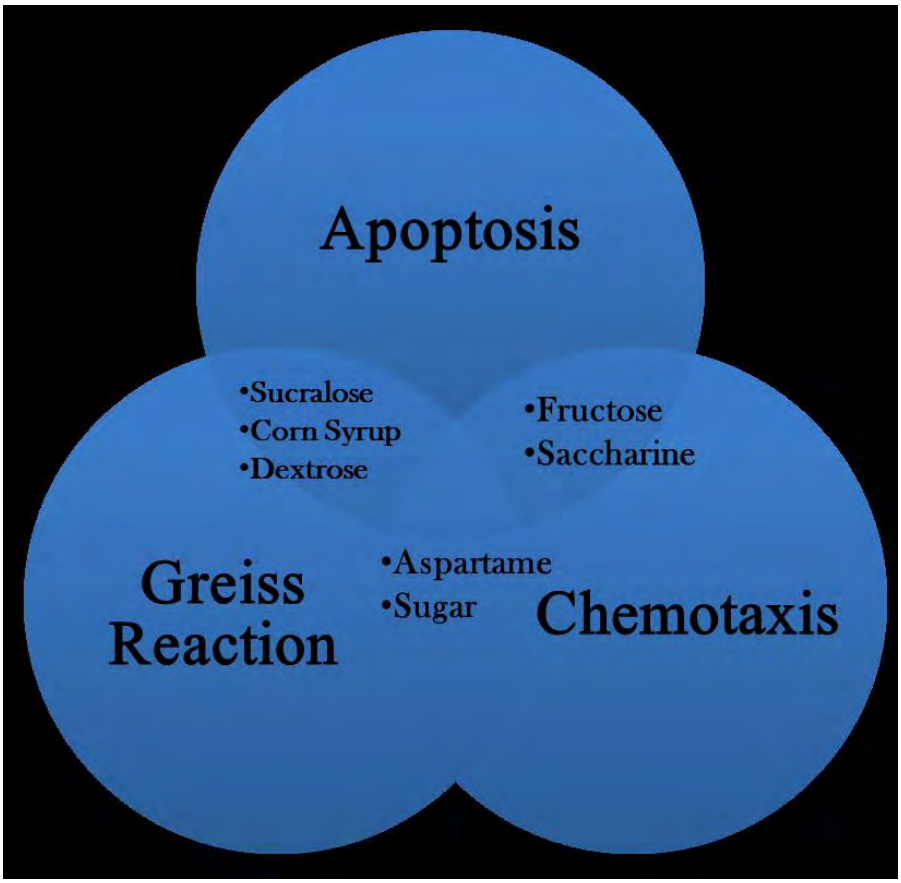

Figure 6: Venn diagram demonstrating positive results for inflammations by three assays across all sweeteners tested.

Aspartame induced inflammation in both the chemotaxis and Greiss reaction assays. Corn syrup induced inflammation in both the Greiss reaction and apoptosis, assays as did dextrose. Fructose in both the apoptosis and chemotaxis assays, as did Saccharin. Sucralose was positive for inflammation in the Greiss reaction and apoptosis assays. And finally sugar was positive in the chemotaxis and Greiss reaction assays. Truvia showed negative results meaning it did not show inflammation in both the Greiss reaction and apoptosis assay but was not test in chemotaxis.

Discussion:

Our study demonstrates that artificial sweeteners influenced inflammation in LADMAC cells through the chemotaxis assay, Greiss reaction assay, and apoptosis assay. In the chemotaxis assay, the healthy LADMAC cells tested responded to the chemoattractants released by the LADMAC cells that were incubated in each sweetener except for corn syrup and sucralose which showed a slight anti-

inflammatory effect. In this assay LADMAC cells in the upper chamber of each experimental well migrated to the bottom of the chamber where the cells incubated in the sweeteners were placed. This shows that the cells at the bottom of each well experienced inflammation caused by fructose, sugar, aspartame and saccharin by releasing chemoattractants. Only 6 of the 9 sweeteners were tested in the chemotaxis assay due to the amount of wells available and time constraints.

The presence of NO was confirmed through the Greiss reaction assay despite the relatively low resulting concentrations. These low concentrations could have occurred for several reasons. It is possible that the concentration of sweeteners used (10µg/ml) was too low. Another reason might bet. It might be interesting to see what the results are if the cells were incubated for more than 24 hours in the presence of the sweeteners.

In the apoptosis assay, LADMAC cells in certain sweeteners experienced apoptosis when tested after 24 hours and 6 days demonstrating that inflammation had occurred. All of the sweeteners tested influenced inflammation on the LADMAC cells after 24 hours except Truvia. After 6 days, only dextrose, saccharin, sucralose, fructose, sugar and corn syrup induced apoptosis. It is possible that sucrose, sucralose, and aspartame did not generate apoptosis after 6 days due to a high apoptotic rate between days 1-5.

In further studies it would be imperative to test the same sweeteners over all three assays. One final modification would be to test Truvia in the chemotaxis assay, since Truvia showed the least amount of inflammation in both the Greiss assay and apoptotic assay. It may be significant to test Truvia in the chemotaxis assay to provide more proof that Truvia is a beneficial sweetener.

Conclusion:

The results from all three of the experiments indicate that AS and non-AS can contribute to increased inflammation. This conclusion was reached based on the evidence obtained from each of the reactions. However, we cannot say by what means the sweeteners caused the inflammation. Our study contributes to ongoing literature about the dangers of added sweeteners which are so prevalent in food and drinks. One major finding from this study includes the negative inflammatory results for Truvia across two inflammatory assays. Truvia is the basis for many zero calorie drinks and foods. Further studies should be done on Truvia to further validate its use as a healthy artificial sweetener. Recent studies have shown that Truvia has health benefits. One study shows that Truvia protects endothelial cells (Boesten et. al, 2013). Another study shows that Truvia does not cause tooth decay (Patton et. al, 2011). One significant result that may be beneficial from our experiment is the low effect Truvia had on inflammation. Our studies showed Truvia to be linked to influencing low amounts of inflammation on LADMAC cells. Our study suggests that Truvia is a healthy artificial sweetener, and further links between Truvia and health may be discovered in the future.

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[1]Authors declare no conflict of interests.

A Comparison of Tree Species on the North and South Shores of Long Island from the Towns of Smithtown, East Northport, and Copiague New York

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Abstract:

Forty-seven tree samples were collected from residential areas of both the North and South Shores of Suffolk County in Long Island, New York. The samples obtained from all trees were inspected for terminal buds, leaf scars, vein scars, and pith size and color. In order to identify these tree samples two dichotomous keys were used. There were thirty-four tree samples from the North Shore. Of the samples, twenty-two were Eastern White Oak (*Quercus alba*) and twelve were Scarlet Oak (*Quercus coccinea*). There were thirteen samples from the South Shore. Single tree samples found on the South Shore include, American Larch (*Larix laricina*), Silver Maple (*Acer saccharinum*), Flowering Dogwood (*Cornus florida*), Red Maple (*Acer rubrum*), Beech (*Fagus grandifoli*a), White Oak (*Quercus alba*), Weeping Willow (*Salix babylonica*). Two Red Cedar (*Juniperus virginiana*), two Northern Red Oak (*Quercus rubra*), and two Black Spruce (*Picea mariana*), were also found on the South Shore. The White Oak *(Quercus alba)* is commonly found on both the North and South Shores of Long Island, New York. This study shows that although the North and South Shores have one common tree species there are also many differences in residential tree species.

Introduction:

Long Island is a part of New York which is located in the North East United States. The island is approximately 118 miles in length and has a vast amount of trees of a variety of species. Trees are a very important part of the environment. They clean the air by removing carbon dioxide and releasing oxygen to enable humans and animals to breathe.

Tree samples were collected to investigate tree species found in the towns East Northport, Smithtown and Copiague. All towns were in Suffolk County which is located in the East of Long Island. According to the *US Geological Survey* (*USGS*), East Northport has a longitude of -73.31598 and latitude of 40.85736. Smithtown has a longitude of -73.209497 and latitude of 40.85292 and Copiague has a longitude of -73.395062 and latitude of 40.680994. East Northport and Smithtown are located on the North Shore of Long Island and Copiague is located on the South Shore. Both the North and South Shore maintain a similar climate and seasonal change, however their geographies differ. The North Shore is rockier and has many hills, whereas the South Shore is flat and sandy (Taney, 1961).

A variety of dichotomous keys were used to identify the species of each tree sample. Dichotomous keys are used to identify organisms by leading the user through a series of choices, until they come to a final result. According to data gathered by the United States Department of Agriculture, all trees identified in this study are native to Long Island with the exception of the Weeping Willow (*Salix babylonica*). The Weeping Willow is seen by the USDA Forest Service as invasive to the state of New York.

Methods:

Forty-seven samples of trees were collected from various residential areas on the North and South Shores of Long Island. Refer to Figure 1 for the placement of the locations.

After gathering the tree samples, they were examined and identified. Each sample was approximately eighteen inches in length and contained either leaves or no leaves. The samples were identified by dichotomous keys such as *Tree Finder: A Manual for Identifying Trees by Their Leaves* and *Peterson Field Guides: Eastern Trees* (Watts, 1991). The tree samples were identified by both common name and scientific name. In addition, the plot size of each property was recorded along with the longitude and latitude of each property using the *US Geological Survey* (*www.usgs.gov).* The findings from each location were compared and similarities and differences were noted.

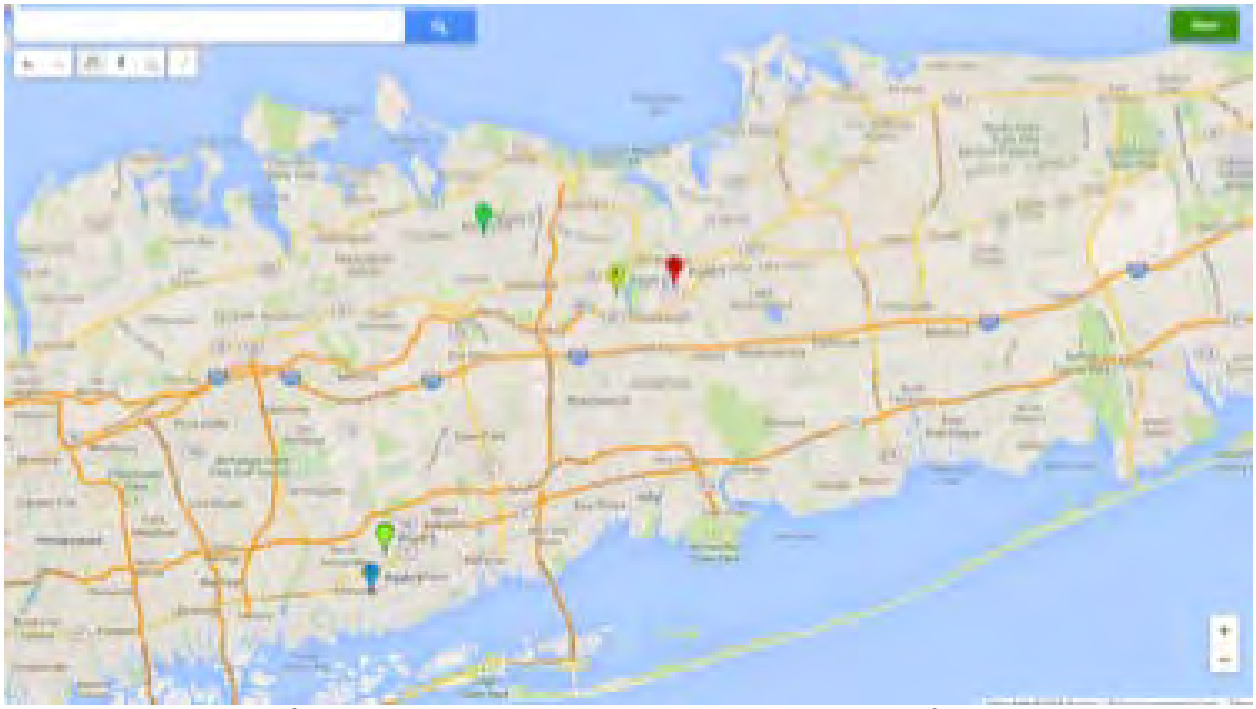

Figure 1- Locations of Residential Areas (Reproduced with permission from Google Inc)

Results:

During this study multiple tree species were identified. The following species were identified on the North Shore (Smithtown and East Northport); Scarlet Oak *(Quercus coccinea),* White Oak *(Quercus alba).* On the South Shore (Copiague) the following species were identified; Red Cedar *(Juniperus vrginiana),* Northern Oak *(Quercus rubra),* Black Spruce *(Picea mariana),* Weeping Willow (*Salix babylonica*), Silver Maple *(Acer saccharinum),* Flowering Dogwood *(Cornus florida),* Red Maple *(Acer rubrum),* Beech *(Fagus)* and White Oak *(Quercus alba).* The White Oak *(Quercus alba)* was the only tree sample found on both the North and South Shore. These results can be seen in Table 1 as well as a breakdown of results by property size, location, and number of each species found.

KEY	
<u>UNDERLINED SPECIES</u>	**COMMON ON BOTH SHORES**

Table 1: Tree Species Found on Properties in Smithtown, East Northport, and Copiague

Property Address / Lot Size	Latitude / Longitude	Trees Found on Site
NORTH SHORE		
11 Creek Rd. Smithtown, NY 1187 Lot Size: 1.25 acres	Lat: 40.835704 Long: -73.233362	7 - Scarlet Oak (*Quercus coccinea*) 9 - Eastern White Oak (*Quercus alba*)
212 4th St. East Northport, NY Lot Size: 0.1387 acres	Lat: 40.866219 Long: -73.326516	5 - Scarlet Oak (*Quercus coccinea*) 1 - Eastern White Oak (*Quercus alba*)
26 Sterling Ln. Smithtown, NY 11787 Lot Size: 0.38 acres	Lat: 40.838259 Long: -73.192338	12 - Eastern White Oak (*Quercus alba*)
SOUTH SHORE		
429 43rd St. Copiague, NY 11726 Lot Size: 0.1148 acres	Lat: 40.697954 Long: -73.395895	2 - Red Cedar (*Juniperus virginiana*) 2 - Northern Red Oak (*Quercus rubra*) 2 - Black Spruce (*Picea mariana*) 1 - Weeping Willow (*Salix babylonica*)
278 Lake Dr. Copiague, NY 11726 Lot Size: 0.229 acres	Lat: 40.676899 Long: -73.405878	1 - American Larch (*Larix laricina*) 1 - Silver Maple (*Acer saccharinum*) 1 - Flowering Dogwood (*Cornus florida*) 1 - Red Maple (*Acer rubrum*) 1 - Beech (*Fagus grandifolia*) 1 - Eastern White Oak (*Quercus alba*)

Discussion:

The results of this experiment confirmed with a small sample of forty-seven trees that a very wide variety of trees grow all over Long Island. In one previous study by Glynn et al. (2013) Red Cedar (*Juniperus virginiana*), White Oak (*Quercus alba*), Flowering Dogwood (*Cornus florida*), and the invasive species Weeping Willow (*Salix babylonica*) were also found.

There were many similarities and differences found between shores, as well. For the South Shore, there was a lot of concurrence between groups. Townes et al. (2013) found the Weeping Willow (*Salix babylonica*), Red Maple (*Acer subrum*) and Silver Maple (Acer *saccharinum*). De Anda

and Donnelly (2013) found the Red Maple (*Acer rubrum*), Red Cedar (*Juniperus virginiana*), White Oak (*Quercus alba*) and Flowering Dogwood (*Cornus floridia*) and Perks et al. (2013) found the Flowering Dogwood (*Cornus floridia*) and Red Maple (*Acer rubrum*). These trees were also found in this study.

However, there were fewer similarities for tree species in the North Shore. While Altenburg and Hempel (2013) and Liao et al. (2013) also found White Oak (*Quercus alba*) trees on some properties, no other groups reported finding Scarlet Oaks (*Quercus coccinea*) on the North Shore. Additionally, previous studies found a wider variety of tree species in the North Shore. For example, Altenburg and Hempstead (2013) found species such as the Atlantic White Cedar (*Chamaecyparis thyoides)* and Honey Locus (*Gieditisia triacanthos)* and Bonavia et al. (2013) found species such as the American Larch (*Larix laricina)* and Siberian elm (*Ulmus pulmia*). In comparison, the author's group only found two different species of trees in the North shore; the White Oak and Scarlet Oak.

A similar study by Marino et al. (2012) which compared tree species on the north and south shores of Long Island yielded interesting results. This study revealed the following species on the north shore: Japanese Maple (*Acer palmatum*), Arbor Vitae (*Thuja occidentalis*), Silver Maple (*Acer saccharinum*), Flowering Dogwood (*Cornus florida*), Common Pear (Pyrus communis), Pin Cherry (*Prunus pensylvanica*), Black Ash (*Fraximus nigra*), and a Tulip Tree (*Lirodendron tulipifera*). On the south shore, the investigators of this study found the following: Silver Maple (*Acer saccharinum*), Chokecherry (*Prunus virginiana*), and White Oak (*Quercus alba*) (Marino et al. 2012). These results were interesting in comparison for two reasons. First, the species found in the previous study that are similar to the current study were found in opposite locations. Those found on the north shore are also found on the south shore and visa versa. This demonstrates that these trees are not only found on either shore, but are widespread across the island. Secondly, this study reveals that there are many more species of trees on Long Island than can be identified with just forty samples.

Conclusion:

Eleven tree species were discovered among forty-seven samples of trees from both the north shores and south shores of Long Island, more specifically the towns of East Northport, Smithtown, and Copiague. Similarities and differences were seen between the north and south shores. According to the study, the most common tree appeared to be the Eastern White Oak (*Quercus alba*) which could be found on both the north and south shore. There were a wide variety of trees that were located on the south shore that were not found on the north shore. From this study we can also conclude that there are species of trees on Long Island that are invasive or in other words do not necessarily belong here and could be potentially harmful to the environment. The invasive tree found in this study was the Weeping Willow (*Salix babylonica*). In comparing this study to previous studies of its type it becomes obvious that Long Island is home to many different species of trees.

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Diversity of Maple Trees on Residential Properties of Long Island

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Keywords: Maple Tree, Long Island, Huntington, Brentwood, Deer Park, Tree Species

Abstract

Tree species were identified on six different residential properties in Long Island, New York to determine whether there is an abundance of a specific clade of trees. Branches and leaves were examined by using a dichotomous key in order to identify the tree species. It was discovered that a tree belonging to the Maple Family (*Aceraceae*) grew on each property. These findings support that there is an abundance of Maple trees on Long Island including the Sugar Maple (*Acer saccharum*), Silver Maple (*Acer saccharinum*), and Sycamore Maple (*Acer pseudoplatanus*).

Introduction

The Maple family (*Aceraceae*) contains deciduous trees and shrubs. They have opposite leaves, palmately lobed simple leaves or pinnately compound leaves (Fred & Duncan, 2005). In addition, they have four to six colored sepals but most often five sepals, four to six but mostly five petals, and four to twelve but mostly eight stamens. Maple trees also grow flowers that are small and form in clusters; they are composed of an ovary superior, one pistil, two stigmas, and two to three fused carpels. Maple (*Aceraceae*) trees are often planted as an ornamental due to its fast growth, fine foliage and fall colors (Fred & Duncan, 2005).

Long Island sits at 40.80 N, 73.30 W (link to google maps) and its average annual temperature is thirty-one degrees Fahrenheit. Winter temperatures average negative three degrees Fahrenheit while summer temperatures average eighty-five degrees Fahrenheit. In addition, Long Island's topology graphical features include rocky north shore beaches and scattered small mountainous terrain due to glaciers melting during the ice ages. The highest elevation of Long Island is in Melville resting at 400 ft. above sea level.

Samples were taken from Bay Shore, Huntington, Deer Park, and Brentwood. Students used samples of dominant clades from four different parts of Long Island, however they were different species. A dichotomous key was used to identify organisms based on a series of choices between alternative characters. This tool described twenty-four species of trees; nine of which were identified from the Maple (*Aceraceae*) family. Therefore, the most dominant clade found on residential properties in Long Island was the Maple (*Aceraceae*).

Methods

Six students brought in a total of 24 branches with leaves from their place of residence to be identified. A dichotomous key was used to identify each sample. The first keys used were " Tree Finder" by May Theilgaard Watts (1991). This helped identify the species, the size, and density of the tree. Also, this helped identify the location of the species of the tree. Another tool used to confirm the species of trees was the "Peterson Field Guides Eastern Trees" by George A. Petrides and Janet Wehr (1988).

To start off the identification process, students identified whether the sample contained pine leaves or leaflets. All trees were identified to have leaflets. Next to be identified was if the tree leaflets

were opposite or alternate to each other. With this information, the separation of trees was noticeable.

The next task conducted was to identify if the leaflet samples were palmate or pinnate, and simple or compound. Palmately compound leaflets radiate from one point while pinnately compound leaflets have a central stalk. Then, whether the leaves had lobes was decided.

The samples were taken from the towns of Brentwood (latitude 40.7780 longitude 73.2248), Deer Park (latitude 40.7811, longitude 73.2467), Copiague (latitude 40.7607, longitude 73.2890) and Huntington (latitude 40.8723, longitude 73.4086). The latitudes and longitudes were identified using Google maps. The findings were then recorded and compared to other findings from other researches.

Results

Table 1: Identification of Latitude, Longitude and Tree Species

Town	Latitude	Longitude	Common Name	Species Name
Huntington	40.8723	73.4086	• Silver Maple • Sugar Maple	• *Acer sacharunum* • *Acer saccharum*
Brentwood	40.7983	73.2649	• Sugar Maple • Flowering Dogwood • Sycamore Maple	• *Acer saccharum* • *Cornus florida* • *Acer pseudoplatanus*
Brentwood	40.778	73.2248	• English Oak • Flowering Dogwood • Sugar Maple • Saucer Magnolia	• *Quercus robur* • *Cornus rlorida* • *Acer saccharum* • *Magnolia soulangiana*
Deer Park	40.7811	73.2467	• Green Ash • Stripe Maple • Linden American	• *Fraxinus pennsylvanica* • *Acer pensylvanicum* • *Tilia americana*
Huntington	40.8723	73.4086	• Sugar Maple • Colorado Spruce	• *Acer saccharum* • *Picea pungens*
Brentwood	40.7899	73.2223	• English Oak • Sycamore Maple	• *Quercus robur* • *Acer pseudoplatanus*

As shown in table one above, this research indicates that the following species found in Huntington are: the Silver Maple *(Acers sacharunum),* Sugar Maple *(Acer saccharum)* and English Oak **(***Quercus robur***).** The species found in Brentwood are: Sugar Maple (*Acer Saccharum),* Flowering Dogwood *(Cornus florida),* Sycamore Maple *(Acer pseudoplatanus),* English Oak *(Quercus robur),* Green Ash (*Fraxinus pennsylvanica*), and Saucer Mangolia (*Magnolia soulangiana*). Lastly, the species found in Deer Park are: Green Ash *(Fraxinus Pennsylvanica*), Stripe Maple (*Acer pensylvanicum*), and Linden American (*Tilia americana*).

Each property grew a different type of species belonging to the Maple Family (*Aceraceae).*

However, the most popular tree is the Sugar maple *(Acer Saccharum)*; it was found on four different residential properties within Brentwood and Huntington. The Sycamore maple (*Acer pseudoplatanus)* was found on two properties of Brentwood, the Stripe maple (*Acer pensylvanicum)* was found on one property in Deer Park and the Silver Maple (*Acer aacharunum*) was also found on one property in Huntington.

Discussion

Maple trees, such as the Sugar maple, are growing in abundance on Long Island. In one study, tree species were compared in the residential properties of Commack, Plainview, and East Islip (Bernero *et al.* 2004), their data indicates a reoccurrence of Maple trees on their residential properties; the Red Maple (*Acer rubrum*) and the Silver Maple (*Acer saccharinum*) were commonly found.

In comparison, another study indicates that the Oak (*Quercus)* is a common tree species grown on the North and South shore of Long Island (Ambrogio *et al.* 2013). Compared to the rest of the trees in their data, Oak is grown more frequently on residential properties in the South shore. Their discovery suggests that the Oak (*Quercus*) grows in abundance on Long Island as well as the Maple tree (*Aceraceae*).

Conclusion

The tree family *Aceraceae* was found to grow through out Long Island. An abundance of Sugar Maples (*Acer saccharum*) as well as Silver Maples (*Acer saccharinum*) and Sycamore Maples (*Acer pseudo-platanus*) were found. The Maple (*Aceraceae*) is a dominant clade on Long Island since it is the only family, which was found on 100% of the properties.

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Addendum

2014 NE Regional **Sigma Xi** Conference Saturday, April 26, **2014**

Abstracts

1. Increasing Degradation of the Huntington's Disease protein mHtt Q51 with the Proteasome Activator Blm10 purified from Saccharomyces cerevisiae

Brandon Mogrovejo, Marion Schmidt, Yanhua Yao, and Ciyu Yang
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Huntington's disease (HD) is a neurodegenerative disorder which causes cognitive decline affecting one out of every 10,000 Americans. HD is caused by harmful mHtt proteins expressed by the mutant Huntingtin gene (mHTT). Proteasomes are the central cytoplasmic and nuclear proteolytic systems and are implicated in Htt degradation. The proteasome has a modular structure consisting of a proteolytic core (CP) that is regulated by activators. We found that loss of the conserved Blm10/PA200 activators causes increased mHtt aggregation in yeast and mammalian cells. Here we seek to investigate the impact of Blm10 on the degradation of mHtt with 51 glutamines (mHttQ51) in vitro and hypothesize that Blm10 might increase proteasome-mediated mHttQ51 degradation. To test this we isolated Blm10-CP (BP) complexes from yeast. A degradation assay was performed with tagged HttQ51in the presence of BP, CP, or H2O. mHtt degradation was analyzed via electrophoresis and immunoblotting. We found that the CP degrades mHtt without ATP and ubiquitin. Additionally, Blm10 significantly accelerated the degradation. Our data suggest that PA200 might impact the aggregation of mHtt in mammals.
Acknowledgments: This work was supported by NIH grant NIGMS-084228, as well as funding from SURP

Category: Cell and Molecular Biology

2. Screening the Saccharomyces cerevisiae genomic library for genes involved in copper induced cell death

. Weiwu Li, Nidhi Gadura.
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The broad goal of our study is to understand the mechanism(s) by which copper alloy surfaces kill microorganisms. It has been known that copper kills microorganisms but the mechanism of cell death is still not clear. Previous results from our lab indicate that copper surface mediated cell death of bacteria and yeast correlates with increased levels of lipid peroxidation. Saccharomyces cerevisiae FLEXgene ORF collection in the BY011 expression vector was acquired from the Harvard Institute of Proteomics (HIP). All clones were fully sequence-verified after cloning into the vector pBY011. There are a total of 5533 clones in the collection. We are currently screening this overexpression library for survivors on lethal doses of copper. Our results indicate that in a 96 well format, cell death occurs in wild type Saccharomyces cerevisiae strain BY4741 at 30mM CuSO4 concentration between 40-50 min. Screen results will be discussed. The genes discovered in this screen will reveal the cellular pathways involved in copper induced cell death.
Acknowledgements: This project was funded by PSC – CUNY and Copper Development Association grant to Dr. Gadura. Funding for Weiwu Li is provided by QCC NSF – STEP grant.

Category: Ecology, Evolution and Environmental science

3. Validation Of The Existing Fish Labeling By Using Sds-Page Protein Profiling

Eun Jung Shin and Dr. Nidhi Gadura
Department of Biological Sciences and Geology, Queensborough Community College, Bayside, NY 11364

The characteristics of all living organisms have changed as a result of evolution, which makes the individuals different in the same species. To validate the existing labeling of food, specifically fish labeling, proteins were extracted from fish's muscles and lined up based on their sizes in Kilo Dalton by using SDS-PAGE protein electrophoresis. Since the actin myosin is crucial for the muscle contraction in every organism, it was used as proxy for protein profiling. Due to complex protein structure, detergent sodium dodecyl sulfate (SDS) was used to denature the proteins and coat the proteins with negative charges. Once the proteins were separated on a gel, the gel was stained with coomassie blue and all the bands smaller than 50kDa were counted after washing step. Cladogram was constructed based on the number of bands on the gel they have in common. The more bands they have in common, the more recent species they are in the evolution. The closer the species on the cladogram, the most genes they have in common and they are more closely related. Our data indicates about 30% of the fish were improperly labeled which is pretty close to the recent published reports of mislabeled fishes in NYC.

Category: Ecology, Evolution and Environmental science

4. Identifying Genetically Modified Organisms among Typical Produces

Melody To and Nidhi Gadura
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Plant engineering has led to the production of genetically modified (GM) foods. Some selective advantages that plant genetics can develop for GM plants are insecticidal resistance, herbicidal resistance, viral resistance, and fungal resistance. Genes that have been cloned and expressed in GM plants have enhanced the quality of crops, increased yields of harvests and added to the nutritional value of produces in order to fulfill commercial needs as well as provide better food to the population. Plasmids can be used to introduce new genetic information to plants such as antibiotic resistance. Agrobacterium tumefaciens possesses a bacterial plasmid; a tumor inducing (Ti) plasmid approximately 200kbp that can be used to introduce new genes but first must be disarmed of its virulence. A section of the Ti plasmid, T-DNA, can be integrated into the plant genome as a binary vector by being transformed and cloned into a small plasmid with sequences from viral vectors. The three viral vectors often used to incorporate genes of interest are the Cauliflower mosaic virus (CaMV), nopaline synthase (NOS) terminator, and the plant chloroplast genes. In this study, primers specific to these viral vectors typically found in GMOs were used to investigate if produces such as banana, corn, peas, kale, plum, carrot, and lemon were genetically modified or not. Basic techniques of gene analysis were utilized by extracting the DNA of these produces, performing a polymerase chain reaction (PCR) to amplify genetically modified DNA in vitro, and identify the GMOs with an agarose gel electrophoresis.

Category: Ecology, Evolution and Environmental science

5. HMGB1 as a Target of Curcumin in the Inhibition of Microglial Response to LPS

Sherise Martin and Elaine Quezada
LaGuardia Community College

Alzheimer Disease (AD) is the most common neurodegenerative disorder. Accumulation of Aβ-containing amyloid plaques is neuropathological hallmark of Alzheimer's disease (AD) but inflammatory process triggered by Aβ deposition and microglial activation is significantly related to the pathogenesis of AD. Studies on brain tissues of the patients with AD show the elevated levels of pro-inflammatory cytokines such as IL-1β, and IL-6. Several research studies have shown the therapeutic potential of curcumin in neurodegenerative diseases including AD through its antioxidant, anti-inflammatory and anti- Aβ protein aggregation effects. In addition, curcumin can down-regulate the inflammatory cytokines. However, the effect of curcumin on microglial functions and its underlying mechanism is not elucidated yet. We previously demonstrated inhibition of a High Mobility Group Box 1(HMGB1) in LPS- stimulated microglial BV2 cells improves the phagocytosis ability in BV2 cells. Therefore, we hypothesized that curcumin can improve microglial functions by inhibiting HMGB1. In this study we examined whether curcumin has any effect on the expression of HMGB1 and consequently the migration and phagocytotic ability of BV2 microglial cells. The levels of HMGB1 expression, migration and phagocytosis function evaluated by western blot, in vitro wound healing assay and phagocytosis assay respectively. Herein, we demonstrate pre-treatment with 5μM curcumin suppresses LPS-induced HMGB1 overexpression in a dose-dependent manner in BV2 cells via inhibiting the Toll like receptor 4(TLR4). Moreover, pre-treatment with curcumin not only improved the LPS-induced phagocytic impairment in BV2 cells significantly, but also decreased the migration of activated BV2 cells. These results suggest that curcumin could be an effective agent for preventing AD and its mechanism may in part be a consequence of the reduction HMGB1 and TLR4 expression.

Category: Cell and Molecular Biology

6. Elucidating the protective effect of Phenylmercaptoacetamide (PMA) to As (V) toxicity in Caenorhabdites elegans.

Madeeha Rahat and Maurice Chandon
SUNY College at Old Westbury

Bioremediation methods of arsenate decontamination of soils include the use of specialized plants, hyperaccumulators, that extract arsenate out of the soil by using low molecular weight thiols. Phenylmercaptoacetamide (PMA) was synthesized in our laboratory as a functional model to determine the structural features related to the coordination and redox chemistry of arsenate detoxification. The goals of this study were to determine the nature of the interaction between As (V) and PMA and the chemical mechanism of its chemoprotection to the worm, C. elegans. Synchronized worms, the wild type (N2) and mutant (VC337) were pre-treated with PMA for thirty minutes, and then washed before arsenate exposure. The tested hypothesis is that in the pretreated worms PMA would diffuse into the worm where it would enhance the reduction of As(V) to As(III) and its subsequent sequestration in an intracellular compartment. Control worms were pre-treated with distilled water. After pre-treatment, the nematodes were exposed to arsenate concentrations of 100 mg/L, 50 mg/L, and 10mg/L and incubated for 24 hours. PMA pretreated worms showed a significantly lower mortality (40 to 60% lower) than those exposed to As(V) alone. The mortality of PMA pretreated worms alone was not significantly different from the controls. The reactivity of arsenate and PMA was also studied in vitro by 1H and 13C NMR and electrochemical analyses. These experiments suggest that the reduction of arsenate by PMA in vitro is a non-spontaneous process. These results indicate that PMA outside of the worm is

limited at best to a chaperoning interaction with arsenate. These experiments provide some mechanistic insights also for the actions of PMA in vivo.

Category: Ecology, Evolution and Environmental science

7. Establishing the origin Lepidochelys olivacea females nesting in Campamento La Gloria, Jalisco, Mexico

Meghan Bresson and Theodora Pinou
Western Connecticut State University

The olive ridley turtle, Lepidochelys olivacea, was nearly extinct just a few decades ago due to human activity resulting in relatively low levels of genetic diversity for the species. The results of this study tests if a nesting beach of the Mexican Pacific significantly contributes to the genetic diversity of the species. Identifying such a genetically rich beach implores its conservation priority status because it significantly contributes to the genetic diversity of the species. The study also discusses the genetics in post-nesting migration behavior in L. olivacea by comparing satellite migration patterns to population structuring. The study adds to our understanding of breeding behaviors and breeding population sizes as well as the relationship between lineage and post-nesting migration patterns.

Category: Ecology, Evolution and Environmental science

8. A Functional Complex With N-Cadherins In Vitro

Dhara Shah, Alyson Abraham, and Casey Spiteri
SUNY College at Old Westbury

During gastrulation, a mass of cells is organized into distinct germ layers through invagination of the epithelial sheet, which establishes the structural and differentiation sites for the developing embryo. The cadherin family of cell-cell adhesion molecules is one of the most important adhesion groups that instructs proper tissue development during blastula formation, gastrulation and neural tube formation. In the frog, Xenopus laevis, C-cadherin is the only cadherin expressed in early development, so cadherin mediated cell sorting relies solely on the regulation of existing C-cadherin. Protocadherins, the largest subgroup of the cadherin family, have been identified as both positive and negative regulators of cell adhesion. Paraxial protocadherin (PAPC), expressed in the paraxial mesoderm, down-regulates C-cadherin activity, assisting in paraxial mesoderm separation. Axial protocadherin (AXPC), expressed specifically in the axial mesoderm, plays a crucial role is separation of the mesoderm, specifically in notochord morphogenesis. The loss of AXPC causes an altered phenotype defined by the loss of a clear notochord/somite boundary. It is known that loss of AXPC results in reduced mesodermal gene expression, however, it must be doing so through a secondary molecule. Since mesoderm is initiated as a common population, separation into axial and paraxial tissue is likely directed, in part, by the differential expression of AXPC in the axial mesoderm. Previous findings indicate that the classical cadherin N-cadherin is expressed at low levels in the dorsal mesoderm during early gastrulation. This expression pattern is similar, spatiotemporally, to that of AXPC, which provides the interesting potential that these two molecules form a functional complex. We tested this hypothesis by co-expressing AXPC and N-cadherin in HEK293 cells and performing co-immunoprecipitations. While the results of these interactions were negative, further testing is required using a more biologically relevant system, such as the Xenopus embryo.

Category: Cell and Molecular Biology

9. The Effect of Heroin Self-Administration on Perineuronal Nets using an Animal Conflict Model of Abstinence and Relapse

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Neuropsychology Doctoral Subprogram, The Graduate Center, CUNY

Perineuronal Nets (PNNs) are specialized extracellular matrix structures of the brain that are found around specific neurons. PNNs play a role in structural and developmental plasticity, it remains unknown how they are affected by drugs of addiction. In the US, drug use has a very profound impact medically, economically, and socially. We used a conflict model which mimicked human drug seeking behaviors. Abstinence of heroin seeking was achieved by placing an electric barrier between the animal and drug access and increasing the shock intensities. Relapse was induced by non-contingent presentations of a drug cue. We conducted an analysis on PNN density using Wisteria Floribunda Agglutinin, We found that there was a strong negative correlation between PNN density and heroin infusion volumes during the drug acquisition phase. These findings suggest that PNNs are affected by heroin self-administration and may play a role in regulating plasticity within the brains of drug abusers.

Category: Cell and Molecular Biology

10. The Effect of Cluster Shape on Cluster Scaling Relations

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In cluster cosmology, galaxy clusters are generally assumed to be spherical. However, both observations and simulations have shown that clusters are generally better described as triaxial. This deviation from the spherical model can lead to scatter and bias in the measurement of cluster mass and gas observables. In this paper, we assess the impact that assuming spherical symmetry has on the Mass-YSZ scaling relation. In particular, for a suite of about 70 simulated clusters, we assessed the differences in plots of total mass vs. YSZ using two different models to calculate the total mass and YSZ: in the first case, we calculated mass and YSZ within a spherical volume with radius of r500. In the second case, we calculated both values within a triaxial ellipsoid of equal volume, with the shape determined by the distribution of total mass. We found that using the triaxial model rather than the spherical model decreased the scatter from 8.2% to 6.5%. In addition, we separated the clusters into quartile bins according to their minor-major axis ratio (top 25%, middle 50%, bottom 25%), renormalized the scaling relation for each individual bin and calculated the scatter for each individual bin. We found (using a triaxial model) that the most spherical clusters had the least scatter, at 3.6%, and that the intermediate- and low-minor-major axis ratio bins had scatters of 5.4% and 6.0%, respectively. Finally, we found that the three bins were normalized differently, and that this different normalization contributed to the scatter in the total set of clusters.

Category: Ecology, Evolution and Environmental science

11. Predicting Geographic Distribution of Water Plants in South American Rivers with GIS
Mallory PappDr. Neeta Connally, and Dr. Thomas Philbrick
Western Connecticut State University
This study focused on assessing how current ecological factors influence the geographic distribution of species in the aquatic angiosperm family Podostemaceae (riverweeds) in South America. Plants in this family only grow attached tenaciously to rocks in the turbulent currents of river-rapids and waterfalls. Though some species are geographically widespread in South America, others occur in only a single river. As rivers are the most heavily impacted of tropical aquatic habitats, it is important to be able to determine the extent of species geographic ranges. The ability to predict species distributions would be invaluable for clarifying conservation priorities. Geographic Information System technology (GIS) was used to assess the distribution of representative species relative to ecological factors (i.e., temperature, precipitation, elevation, soils, geology, and vegetation). Analyses were based on the documented locations of about 1800 collections. The goal was to develop a statistical model to predict the geographic distribution of species. Results indicate that the current distributions of species are not closely linked to variations in the ecological factors examined; current ecology is not a good predictor of geographic range. The next step is to investigate how factors other than current environmental conditions influence the geographic distribution of species. The geological history of South American rivers is of particular relevance, as factors such as the rise of mountains has had a major influence on the development of river-systems and thus would directly influence the evolution of river biota.

Category: Ecology, Evolution and Environmental science

12. Indoor Air Quality Determination by Particulate Matter Measurements
Stevee Delvaille and Rodenellie Pluviose
SUNY College at Old Westbury
This study aims to determine indoor air quality by measurements of particulate matter concentrations using a monitor (DYLOS Corp. DC 1100), a Laser particle counter with two size ranges - small (corresponding to bacteria and mold) and large (corresponding to pollen). These sizes roughly correlate to particle pollution size used by the Environmental Protection Agency (EPA), namely those considered primary or ‘fine particles’ having diameters of 2.5 and 10 microns (μm). The data were collected and analyzed in terms of the manufacturer’s ranges for air quality, and a conversion of these values to the concentrations used by the EPA standards. Results show that 86% of the time (25/29 weeks of data collection) the readings were in the ‘poor’ category of air quality, based on the manufacturer’s ranges; however, a conversion to the EPA standards for both the annual and 24-hour exposures were within the allowed concentration values. The technique makes possible inexpensive significant contributions to the literature on occupational exposure and to quantitative risk assessment of health-related issues since there are currently no indoor air quality standards in the United States, despite extensive findings linking prolonged exposure to indoor pollution and various severe illnesses.

Category: Ecology, Evolution and Environmental science

13. pH-Triggered Porphyrin Release from Silica-Liposomes in Acidic Tumor Environment.
Eric Doucet
SUNY College at Old Westbury
The minimization of non-specific drug release is challenging but important for in vivo applications in cancer treatment. The goal of this project is to develop pH-triggered silica-liposome carriers for cancer

photodynamic therapy. Silica-attached Meso-Tetra(N-methyl-3-pyridyl)porphyrin tetra chloride] (TMPyP) are encapsulated into liposomes composed of 1,2-dioleoyl-sn-glycero-3-phospho chloride (DOPC) by reverse phase evaporation method. Under our experimental conditions, porphyrin sensitizers can only be released from silica-liposomes at acidic tumor pH (5-7) but not at normal physiological pH (~ 7.4). The release percentages of TMPyP vary from 30% at pH 7 to 90% at pH 3. Silica-TMPyP-liposomes are characterized by particle size analysis, singlet oxygen production and in vitro tests. With, the right production of singlet oxygen at the purposed pH levels controlled drug release methods for cancer treatments can be better tested.

Category: Cell and Molecular Biology

14. Hexim-1 Protein Expression Modulates Epithelial Mesenchymal Transition (EMT) During Prostate Cancer: A Novel Mechanism of Metastasis

Susan Ramirez
SUNY College at Old Westbury

Cancer cells gain the ability to migrate and metastasize through specialized pathways and mechanisms. Recent studies indicate that Hexim-1 may play an important role in prostate cancer progression. Epithelial-mesenchymal transition has been identified as a key process by which cancer metastasis occurs. Several cellular and molecular pathways have been identified in EMT including the TGF-Beta pathway, which has been linked to Hexim-1 protein expression levels in prostate cancer models. The aim of our research was to study the effects of reduced Hexim-1 expression in progression of prostate cancer in vivo using the transgenic adenocarcinoma of the mouse prostate (TRAMP) model and two TRAMP derived cell lines, a wild type and a Hexim-1 heterozygous (HT) TRAMP cell line that expresses a reduction in Hexim-1 protein. An in vitro model of cell migration the wound healing assay was used. Our studies demonstrate that HT TRAMP cell line displays greater cell movement and changes in expression of EMT markers such as N-Cadherin, E-Cadherin, Vimentin, and Actin after wound healing. This work establishes a novel in vitro model to study the role of Hexim-1 during EMT in cancer progression.

Category: Cell and Molecular Biology

15. Optimization Of Biofuel Production In Chlamydomonas reinhardtii By Introduction Of A Synthetic Fatb2 Gene

Joseph Saccente, Natasha Tsay, J. Robert Coleman, and Kerry Lutz
Farmingdale State College

Fossil fuels are made from decomposed plants and animals that have been buried in the ground for millions of years. Since they are a limited resource, alternative fuel sources need to be developed. Biofuels are most commonly derived from plant biomass (bioethanol) or from plant oils (biodiesel). Plants and algae accumulate mostly C16-C18 fatty acid chains but short chain fatty acids (C8:0 and C10:0) are most desirable for biodiesel production due to their increased volatility, which can combust more readily. Use of crop plants for biofuel production has several drawbacks, such as a shortage in arable land needed for their planting and the increase in crop prices due to the higher demand. Chlamydomonas reinhardtii is a single celled alga that has a short generation time, grows in fresh water and does not take up arable land for growth. The FatB2 gene from Cuphea hookeriana produces a protein that increases the presence of eight and ten carbon fatty acyl molecules. We describe here introduction of a codon-optimized FatB2 gene into the chloroplasts of Chlamydomonas. The FatB2

gene was cloned into a plastid transformation vector that targets insertion between the psbA and rrn5 genes. The DNA was bombarded into the cells and transformants were identified by selection for spectinomycin resistance, conferred by the aadA gene, encoded in the transformation vector. Plastid transformants were confirmed by PCR and Southern blotting. Gas chromatography will be used to determine the fatty acid chain lengths present in the transformants. Expression of the FatB2 gene in Chlamydomonas is expected to increase the levels of short chain fatty acids, but is probably only one of multiple steps that will be needed to make large amounts of triacylglycerols needed for large-scale production of biofuels.

Category: Ecology, Evolution and Environmental science

16. The Effects of Chronic Caffeine Ingestion on Microglia Activation

Rabia Sohail, Robert Steger, Arifa Kamal, Sarah Lutchman, Liliana Intrabartolo, and Joshua Brumberg
City University of New York, Queens College

Producing effects such as increased attention and reduced fatigue, it's no wonder caffeine is the most widely used psychoactive drug. This routine quick-fix may raise implications for behavior, metabolism, and brain health. Acting as an antagonist to A1 and A2a adenosine receptors, caffeine exhibits spontaneous neuronal firing. Microglia, phagocytes of the CNS, express A1 and A2a receptors. The role of chronic caffeine ingestion on microglial activation was tested on three groups of CD-1 mice; control, low dose, and high dose. Following 30 days of unrestricted drinking mice were sacrificed, perfused, and the brains were sliced and stained with Iba-1 using the ABC method. NeuroExplorer and Neurolucida softwares were used for morphological and density measurements in the primary somatosensory cortex, primary motor cortex, and the striatum. To increase validity, manual counts were conducted on Stereo Investigator. Results indicate decreased microglia density, shortened processes, decreased branching, and decreased process nodes, exhibited only in the caffeine groups. The focus of the study is the mechanistic transition of microglial phenotype from surveillant state to pro-inflammatory state. Characteristics of these states are expressed in the cell body size and ramifications as concluded in the results showing activation. Future studies may include; increasing duration of drinking behavior, manipulating caffeine doses, measurements in more brain areas. In recent literature, microglia is shown to play a role in neurodegenerative diseases. Observing microglial activation patterns in healthy brain models allows for deeper understanding of its behavior in pathological conditions.

Category: Cell and Molecular Biology

17. 6-Thioguanine: A Potential Endogenous Oxidant via Excitation-Oxidation-Reduction Cycles

Edan Bashkin
Department of Chemistry, SUNY College at Old Westbury

6-thioguanine is cytotoxic to cells because of its incorporation into DNA and its ability to produce reactive oxygen species under UVA light irradiation. The mechanism of 6-thioguanine/UVA-induced biological damage has not been fully understood. This project aims to investigate quantitatively 6-thioguanine/UVA-induced production of superoxide radicals, a precursor of hydroxyl radicals, via absorption spectroscopy, steady-state photolysis and NBT (Nitro Blue Tetrazolium) method for superoxide detection. Our results show that upon UVA irradiation, ~ 3 times more superoxide radicals are produced in the presence of than in the absence of reduced glutathione (GSH). The restoration of

oxidized 6-TG to its original, photoactive state is observed by absorption spectroscopy in the presence of GSH, which in turn indicates 6-TG disulfides as a key intermediate in this redox cycles. These findings provide guidance not only to the development of rational chemo-preventive strategies but also to a better understanding of thiol-regulation in a biological system.

Category: Cell and Molecular Biology

18. A Spatial Analysis of Environmental Factors Related to American Black Bear (Ursus americanus) Sightings in Connecticut

Melissa DiNino
Western Connecticut State University

Extirpated from Connecticut until about 1980, the American black bear population has recovered to approximately 500-1000 bears. With this increase, there have been over 2,700 sightings in less than a year. Geographic Information System technology (GIS) was used to identify environmental variables affecting the spatial range of this species. Analyses were based on a record of black bear activity from April 11, 2012 to February 18, 2013 as reported to the Connecticut Department of Energy and Environmental Protection Wildlife Division. Results showed black bear sightings were related to high average town elevation. Other town-level variables that were evaluated included percent of forest coverage, population density, and total road length, as studied in previous research. These results may be useful for addressing American black bear management issues in Connecticut.

Category: Ecology, Evolution and Environmental science

19. Research on the Antibacterial Activity of Garlic and Honey. Patricio E. Bueno, Mary T. Ortiz, Loretta Brancaccio-Taras. Kingsborough Community College, Brooklyn, New York, USA

Garlic and honey are available. Studies are testing their antibacterial properties. This study focuses on the ability of garlic and honey, alone and in combination, to kill potential respiratory pathogens. Aqueous garlic extract (GE), garlic supplement pills (GP), honey (H), aqueous garlic extract combined with honey (GE+H) and garlic pills combined with honey (GP+H) were tested for antibacterial activity against 4 bacteria, 2 Gram-positives (S*taphylococcus aureus, Enterococcus faecalis),* and 2 Gram-negatives (*Klebsiella pneumoniae, Pseudomonas aeruginosa).* The hypothesis was garlic, honey and their combination will be as effective as commonly prescribed antibiotics to treat potential respiratory pathogens. Antibiotics tested were bacitracin, erythromycin, gentamycin, penicillin and tetracycline. The procedure was an agar diffusion assay using tryptic soy agar plates inoculated with the bacteria. Disks containing GE, H, GE+H, GP, GP+H and the antibiotics were placed on the surface of the inoculated plates and incubated 24h@37^{o}C. Zones of inhibition were measured, and sizes were compared using the Mann-Whitney U test. Based on the analysis, H, GE, GP, GE+H, GP+H were not as effective as the antibiotics ($p \leq 0.05$, 2-tailed test) tested against *P. aeruginosa, K. pneumoniae,* and *E. faecalis.* Honey combinations (GE+H, GP+H) were less effective than GE or GP alone. For *S. aureus,* GE (28.00$\pm$0.7mm) ($x\pm$SEM) was more effective than bacitracin (14.25$\pm$0.7mm), erythromycin (22.81$\pm$0.39mm), tetracycline (24.06 $\pm$0.30mm), and gentamycin (21.40 $\pm$0.41mm). The only antibiotic that was more effective ($p \leq 0.001$, 2-tailed test) than GE was penicillin (32.40$\pm$0.60mm). Based on the results the hypothesis is only accepted for GE against *S. aureus*. Further studies may confirm garlic extract could possibly be used to inhibit growth of potential respiratory pathogens. Supported by grants 2R25GM0600309 Bridge Program (NIGMS), 0537121091 NYSED CSTEP.

Category: Ecology, Evolution and Environmental science

20. The Potential impact of Super Storm Sandy: Egg Density of the Atlantic Horseshoe Crabs *(Limulus polyphemus)* on Plumb Beach (Brooklyn NY)

Cassand ra Mezalon, Christina P. Colon, Ph.D.
Department of Biological Sciences, Kingsborough Community College

Atlantic Horseshoe Crabs (*Limulus polyphemus*) one of Earth's oldest living species, date back five hundred million years. Every year, from April to June, the horseshoe crabs come ashore at the night high tide during the new and full moon to lay and fertilize many thousands of eggs in the sand. Throughout the investigation, a team of researchers went to Plumb Beach (Brooklyn NY) a pivotal Limulus breeding beach and collected egg samples from 3 parts of the Eastern section of Plumb Beach to see whether Hurricane Sandy had a negative impact on egg density. It was hypothesized that the storm would have no long term impact on breeding success but could reduce egg densities in the short term. Egg data collected in 2013 were indeed much lower than numbers collected in the 2012 breeding season. Numerous studies of other storms such as hurricane Dennis, Floyd, and Irene, reveal long term negative impacts that led to declines in spawning and survival of marine invertebrates as well as breeding birds. Although the reason is unknown for the decline of the horseshoe crab eggs in 2013, Hurricane Sandy may have been a contribution factor along with other climate or environmental changes on the beach. To better understand factors that lead to the declining of the egg density, and to test for long term impacts, further studies and continued monitoring need to be conducted. I would like to thank, Dr. Mark Botton and Dr. Yumiko Iwasaki, Kang Lee, Richard Ramsundar of Fordham University, New York City Audubon, NY Sea Grant, NYC Parks, NY State DEC, National Park Services and the Army Corps of Engineers. This work was supported by grant 2R25GM0600309 of the Bridge Program of NIGMS under the supervision of Dr. Edward Catapane, and grant 0537121091 of the CSTEP Program of NYSED.

Category: Ecology, Evolution and Environmental science

21. The Impact of Beach Renourishment on the Atlantic Horseshoe Crab (*Limulus polyphemus*) Spawning Activity on Plumb Beach, Brooklyn NY

Vanessa Maria, Christina P. Colon, Ph.D.
Department of Biological Sciences, Kingsborough Community College

This study investigates initial outcomes of beach replenishment on horseshoe crabs, to better understand its impact on egg survivorship. It was hypothesized that despite a beach replenishment project on the Western portion of Plumb Beach, Brooklyn NY in fall 2012, the Atlantic horseshoe crab's (*Limulus polyphemus*) egg density will show no significant increase compared to the numbers in 2012 prior to the beach renourishment. It was further hypothesized that in 2013 horseshoe crabs will continue to prefer to use the existing natural beach (Eastern area) for spawning activities and will show a preference for this area over the restored area. The beach renourishment project that took effect in the Fall of 2012 shortly before Hurricane Sandy, may negatively impact horseshoe crab spawning. Horseshoe crabs, a species that dates back to 500 million years may have specific spawning habitat requirements that a large scale beach renourishment project may disrupt. The observed 50% decrease in eggs on the Western area in 2013 compared to 2012, and the lower numbers on the Western end compared to the Eastern end in 2013 support both hypotheses. These data suggest that perhaps beach

renourishment is not the right approach when trying to protect or increase habitat suitability. However, this may also suggest that horseshoe crabs need time to adapt to the renourished environment, or perhaps that the sand itself needs to settle and become integrated into the existing biota. Gratitude is extended to Dr. Mark Botton and Dr. Yumiko Iwasaki, Kang Lee, Richard Ramsundar of Fordham University, New York City Audubon, NY Seagrant, NYC Parks, NY State DEC, National Park Services and the Army Corps of Engineers. This work was supported by grant 2R25GM0600309 of the Bridge Program of NIGMS under the supervision of Dr. Edward Catapane, and grant 0537121091 of the CSTEP Program of NYSED.

Category: Ecology, Evolution and Environmental science

22. Newly Discovered Eastern Oysters (*Crassostrea virginica*) in Jamaica Bay, NY Were Not Found to be Positive for Dermo (*Perkinsus marinus*).

*Philip Cussimano, Craig Hinkley, Gary Sarinsky. Kingsborough Community College, Brooklyn, NY. USA.

Attempts are underway to re-establish the Eastern Oyster (*Crassostrea virginica*) in Jamaica Bay, New York. It is thought that one of the reasons for their decline in the 1920's was as a result of the pathogenic parasitic protozoan Dermo (*Perkinsus marinus*). There have been no known natural oyster beds observed in the Bay until this year when divers found small clusters of oysters in several locations. Our lab recently tested one and two year old oysters that had been grown from spats in Jamaica Bay in Taylor Floats under controlled conditions. A number of them tested positive for Dermo. The purpose of this study was to determine if any of the newly found oysters were infected with Dermo. We hypothesize that Dermo will be observed in the new oysters. Gill and mantle DNA was extracted from the new oysters using a DNeasy Blood and Tissue Kit. The DNA from 10 oysters and a positive Dermo DNA sample were subjected to PCR with a Dermo specific primer set. None of the oysters were positive for Dermo but we demonstrated that we could amplify Dermo under the conditions used with the positive control. Since no Dermo was amplified from the oysters tested we further verified that DNA was extracted by amplifying the oyster mitochondrial CO1 gene using Folmer primer, and the correct size(702 bp) was confirmed by gel electrophoresis. The 10 samples were submitted to Elim Biopharmaceuticals for sequencing and the results were subjected to a NCBI Blast Search which further confirmed that the CO1 DNA was from *Crassostrea virginica.* Contrary to our hypothesis, this experiment showed that the oysters tested were not infected with Dermo.
This work was supported by grant 0537121091 of the CSTEP Program of NYSDOE.

Category: Ecology, Evolution and Environmental science

23. Newly-Found Eastern Oysters (*Crassostrea virginica*) in Jamaica Bay, NY, Test Positive for MSX (*Haplosporidium nelsoni).* **Reniece Buchanan, Craig Hinkley, Gary Sarinsky. Kingsborough Community College, Brooklyn, NY. USA.*

The Eastern Oyster (*Crassostrea virginica*) is an ecologically and economically important organism. This species was abundantly found in Jamaica Bay, NY until the early 1920's when it is believed that pollution, over harvesting and pathogenic protozoan diseases caused their demise. Since then, no known oyster beds have been observed in Jamaica Bay, until these past two years when small clusters of oysters were detected. One of the suspected pathogenic diseases thought to have infected the oysters is MSX (*Haplosporidium nelsoni*). The mode of transmission of MSX to oysters is not known.

However, it results in a gradual disruption of the digestive tubule epithelia. Our lab recently found that some oysters grown from spats in Jamaica Bay in Taylor Floats under controlled conditions tested positive for MSX. This study attempts to determine whether any of the new oysters found in Jamaica Bay have MSX. We hypothesize that since the environmental conditions are similar to other bodies of water along the Eastern Coast where MSX is presently found to exist, that MSX will be observed in some of the newly-found oysters as well. Gill and mantle DNA was extracted from the new oysters using a DNeasy Blood and Tissue Kit. The DNA from 10 oysters and a positive MSX DNA sample were subjected to PCR with a MSX specific primer set. Two of the10 oysters were positive for MSX. We demonstrated that we could amplify MSX under the conditions used with the positive control. We further verified that DNA was extracted in all the samples by amplifying the oyster mitochondrial CO1 gene using Folmer primer, and the correct size (702 bp) was confirmed by gel electrophoresis. The 10 samples were submitted to Elim Biopharmaceuticals for sequencing and the results were subjected to a NCBI Blast Search which further confirmed that the two positive samples were MSX and the CO1 DNA were from *Crassostrea virginica*. This experiment showed that some of the oysters tested were infected with MSX and thus supported the hypothesis.
This work was supported by grant 2R25GM0600309 of the Bridge Program of NIGMS and grant 0537121091 of the CSTEP Program of NYSED.

Category: Ecology, Evolution and Environmental science

24. Analysis of the Genetic Structure of Eastern Mud Snail Populations from Fort Wadsworth and Plumb Beach in New York. *Goldy Landau, Gary Sarinsky, Craig Hinkley. Kingsborough Community College, Brooklyn, NY. USA

The eastern mudsnail, *Ilyanassa obsoleta*, is native to estuaries along the North America coast. However, it is an invasive species on the west coast where it has taken over habitats of native shellfish including *Cerithidea californica*. In order to control the distribution of mudsnails, we need to understand the genetic structure of their populations. This will help determine whether we need to manage local populations separately or can treat them as one large population. Since *Ilyanassa obsoleta* populations are abundant in many NY bays, including Fort Wadsworth (FW) and Plumb Beach (PB), we examined the genetic structure of mudsnails from these locations to determine if they are from the same or different populations. Our hypothesis was that mudsnails from FW and PB are from the same population. To test our hypothesis, we PCR-amplified a 700 bp region of the cytochrome-c-oxidase I gene using DNA isolated from mudsnails collected at FW and PB. We verified the length of the PCR-amplified DNA by agarose gel electrophoresis and the DNA was sequenced by Elim Biopharmaceuticals. A BLAST search was performed to ensure our DNA is from *Ilyanassa obsoleta*. Estimates of average evolutionary divergence over sequence pairs within groups (d) for mudsnails from FW was d=0.01046 (S.E.=0.00179) and from PB was d=0.01023 (S.E.=0.00112). Using a two-tailed t-test with alpha=0.05, we were unable to reject the null hypothesis that average diversity between the two groups was the same, p-value=0.9407. Phylogenetic tree analysis using the neighbor-joining method showed that DNA sequences from FW and PB were not grouped into separate clades. In conclusion, these data suggest that the mudsnails from FW and PB do not represent two populations; therefore, we accept our hypothesis that they are from the same population. This project was supported by grant 0537121091 of the CSTEP Program of NYS Department of Education.

Category: Ecology, Evolution and Environmental science

25. *The Danger Zone:* Plumb Beach's Condition, and Its Effect on Juvenile Atlantic Horseshoe Crab (*Limulus polyphemus*) Population

Anthony Mora, Christina P. Colon, Ph.D.
Department of Biological Sciences, Kingsborough Community College

Plumb Beach in Brooklyn, New York is an important spawning ground for Atlantic horseshoe crabs. Over the past three years researchers counted and measured adults and juveniles in order to monitor their numbers. Few crabs were found on the Western end of Plumb Beach due to its eroded and inhospitable state, while adults and juveniles were more abundant on the sandier and healthier Eastern end. It was hypothesized that due to Superstorm Sandy, fewer juvenile horseshoe crabs would be found on the Eastern side compared to 2012. It was also hypothesized that due to the storm and a beach renourishment project, there would also be no juvenile horseshoe crabs on the Western end. We observed that older juvenile horseshoe crabs tend to be more abundant early in the summer; as the season progressed smaller crabs were more common, indicating a disappearance of the older crabs, perhaps due to predation. There was an overall decline in the total count of juveniles found on the Eastern end from 2011 to 2013, but an increase in the number of hatchlings on the Western end. This increase could be due to the beach renourishment project carried out in October, 2012 on the Western end of the beach, which had previously been severely degraded. However, other factors could be at play such as natural inter-annual variation, therefore further research is warranted. Gratitude is extended to Dr. Mark Botton and Dr. Yumiko Iwasaki, Kang Lee, Richard Ramsundar of Fordham University, New York City Audubon, NY Sea Grant, NYC Parks, NY State DEC, National Park Services and the Army Corps of Engineers. This work was supported by grant 2R25GM0600309 of the Bridge Program of NIGMS under the supervision of Dr. Edward Catapane, and grant 0537121091 of the CSTEP Program of NYSED.

Category: Ecology, Evolution and Environmental science

26. Evidence That Eastern Oysters Have Spread Into Jamaica Bay, New York. *Isaac Mazile, Gary Sarinsky, Craig Hinkley. Kingsborough Community College, Brooklyn, NY. USA

The eastern oyster, *Crassostrea virginica*, is indigenous to North America. Once abundant in many bays, their numbers have declined due to pollution and destruction of their habitats. In Jamaica Bay (JB) in New York, there are no known natural oyster beds. In 2001, a group of oysters was introduced into JB and shown to both survive and reproduce. Recently, five new oysters were found in various regions of JB and we wanted to know whether they were offspring of those introduced in 2001 or from another source. My hypothesis was that the new oysters were offspring of the 2001 oysters. This hypothesis was tested by first extracting DNA from the tissues of the new oysters. A 700 bp region of the cytochrome c oxidase I (COI) gene was then amplified using the polymerase chain reaction (PCR) and agarose gel electrophoresis was used to verify the correct size of the PCR products. The amplified DNA was sequenced and a BLAST search confirmed the sequences were from the *Crassostrea virginica* COI gene. The COI genes from 69% of oysters in the 2001 study contain a polymorphism that distinguishes them from oysters of other regions. Alignment of sequences from the new oysters and the 2001 study oysters showed that one of the new oyster sequences contained this distinguishing polymorphism. This suggests the oyster is offspring of the 2001 oysters. Although the other new oysters do not contain this polymorphism, it is still possible they are offspring of the 2001 oysters since 31% of the 2001 oysters did not contain the polymorphism either. In conclusion, my hypothesis that the

new oysters were offspring of the 2001 oysters was partially supported. This work was supported by grant 2R25GM0600309 of the Bridge Program of NIGMS and grant 0537121091 of the CSTEP Program of NYSED.

Category: Ecology, Evolution and Environmental science