**Bahamian Bush Medicine: A Study based on the Andros Study Abroad Experience**

**Presenter(s):**
Neena Alex, Eunhye Cho and Keeli Johnson

**Abstract:**
In this presentation we will give a background of the traditional Adrosian bush medicine. We will discuss the different tea leaves used, their claimed medicinal value, and results of lab experiments conducted to test its antibacterial efficiency. We will also give accounts of our encounter with Ms. Marshall, the local bush medicine woman and former mid-wife, who has, for decades, adhered to the medical needs of the village Red Bays.

**Faculty Mentor(s):**
Dr. Katey Hughes, Department of Biology
**Classification of Seasonal Bacterial Populations Growing in a Sarracenia Rubra Pitcher**

**Presenter(s):**
Amy Schabel

**Abstract:**
Carnivorous plants are unique plants because they depend on other organisms for nutrients. A Sarracenia rubra pitcher plant is an example of a carnivorous plant; its morphology attracts small insects into their pitchers. Once the insects are in the water within the pitcher enzymes from the plant break down the exoskeleton of the insects. The insects provide nutrients to the plant, especially ones that the plant lacks. Many scientists have thought that bacteria communities within a pitcher also contribute to the breakdown of insects. This research is specifically looking at bacteria communities seasonally over a six month time period within three pitchers of a Sarracenia rubra pitcher plant. It is expected due to environmental factors that bacterial communities within three different pitchers of Sarracenia rubra will differ from one another and change seasonally. This project will be done by sampling 4mL of water samples from three random pitchers on a Sarracenia rubra plant. The water samples will have a ten fold serial dilution and will be plated on LB agar media Petri plates. The Petri plates will be observed for two days. Other factors like temperature, oxygen levels, ammonia levels, and pH levels will be taken on the water samples from within the pitchers as well. This data will try and correlate change of the bacteria communities with one of these factors. Saved water samples might also be used for DNA analysis if time permits. Gram stain test will be performed on bacterial communities found within the pitchers. Identification tests will give us a better idea of the communities living within the pitcher. At the end of the six month time period statistical analysis will be done to determine if the bacteria does change seasonally. The bacteria within the pitchers may be the same within each pitcher and may not change seasonally; or the bacteria within the pitchers may be different from one another and but not change seasonally.

**Faculty Mentor(s):**
Dr. Julie Ballenger, Department of Biology

**Distribution and Relative Abundance of Meso-Predators in the Memorial Forest on the Callaway Preserve, Harris County Georgia: A Second Survey**

**Presenter(s):**
Christina Cox
Abstract:
For a better understanding of animals and their habitats of those that try to avoid contact with humans, researchers have found indirect ways to census them. Many techniques are used for tracking animals such as the bobcat, raccoon, fox, coyote, skunk, opossum, and armadillo, the meso-predators of interest in the present study. One of the most frequently used techniques is the scent station. By setting a scent disc in the center of a pile of sand, the odor that is released from the disc will attract the animals, causing their tracks to be left in the sand. By setting up scent stations in the Memorial Forest of Callaway Gardens located in Harris County, Ga, the types of meso-predators that inhabit that environment, their preferred habitats, and what other meso-predators they coexist with will be determined.

The data show that there was no statistically significant difference among the number of Armadillos, Coyotes, Opossums, Skunks, Bobcats, and the unknowns. On the other hand, Raccoons and Grey Foxes, there was a statistical difference in the number of species found between the two environments. The results of this research will be compared to the results collected by Todd in 2008.

Faculty Mentor(s):
Dr. William S. Birkhead, Department of Biology
Effect of an Artificially Applied Caudal Spot Near the Anal Fin of Fishes as related to Avoidance of Predation

Presenter(s):
Beverly Whitt

Abstract:
The role of the effectiveness of a caudal spot in deterring predation will be investigated. Golden Shiners Notemigonus crysoleucus which naturally lack a caudal spot will be used in this experiment because of their availability and hardiness. Half of these shiners will be injected on both sides of their caudal peduncle with black dye to create a caudal spot. Shiners with and without the caudal spot will be presented pair-wise to Striped Bass and Largemouth bass. Because caudal spots are thought to confuse predators as to which end of the prey is the head because of their similarity to an eye, it is predicted that the bass will prefer the shiners without the caudal spot. The choice of the bass will be assessed as to which shiner it prefers. In addition, implications of the observed behavior of the striped and largemouth bass will be discussed.

Faculty Mentor(s):
Dr. William S. Birkhead, Department of Biology
Effects of Natural Anti-inflammatory Agents on Toll-Like Receptor 2 Expression: Implications for Lyme Neuroborreliosis Response

Presenter(s):
Jennifer Silvers

Abstract:
Lyme Neuroborreliosis (LNB) is a chronic infectious disease of the central nervous system (CNS) caused by a tick-borne spirochete, Borrelia burgdorferi, the same spirochete which causes the more commonly known Lyme disease. Direct effects of the causative infectious agent as well as additional immunity-mediated mechanisms are thought to play a role in the central nervous system (CNS) pathology of LNB. It is a complex disease including a number of different clinical and pathological manifestations, such as meningitis and cranial neuritis, all which involve neuroinflammation and are severe complication of Lyme disease.

Astrocytes are glial cell in the brain which support and nourish neurons. Astrocytes, as well as microglia, express Toll-like receptors which play a major role in the innate immune responses against microbial pathogens. Toll-like receptors (TLR) are a group of proteins which play role in pathogen recognition and the activation of innate immunity. They recognize pathogen-associated molecular patterns (PAMPs), which are conserved molecular structure motifs and play a crucial role in the recognition of microbial components. TLR 2 is the most abundant and has the most expression during LNB.

The cells will be induced with lipidated outer surface protein A (L-OspA), which is a highly basic lipoprotein, produces proinflammatory cytokines and is the major outer surface protein of Borrelia burgdorferi. Infection from Borrelia burgdorferi develops LNB in both the peripheral nervous system and CNS and involves TLRs for mediating the proinflammatory cytokine and chemokines expression.

There are known herbal supplements which have anti-inflammatory properties which may be able suppress LNB induced inflammation. Garlic is promoted as an anti-inflammatory because it inhibits NF-kB activity. Bromelain is derived from the stem of pineapple and is a mixture of proteolytic enzymes, and has been known to significantly reduced TNF-α, a cytokine involved in systemic inflammation. Grape seed extract is commercially advertized as an anti-inflammatory and contain proanthocyanidins which inhibit the formation of cytokines such as TNF-α and IL-1β. These proposed extracts may be useful in reducing inflammation from L-OspA, therefore limiting expression of TLR2.

Faculty Mentor(s):
Dr. Katey Hughes, Department of Biology

Identifying Complex Taxonomic Groups of Native and Cultivated Rhododendrons Using DNA Barcoding
Abstract:
Taxonomically Complex Groups of flowering plants such as Rhododendrons contain numerous species including eight subgenera and over 2000 individual species. Therefore, identifying those using DNA barcodes is of interest, especially in native and cultivated plants that are grown together with similar morphology. DNA barcoding is a method used to monitor biodiversity or identify individuals using short genetic markers in the mitochondrial genome. DNA Barcoding is most successful in animals using the CO1 gene region of the mitochondrial genome because mitochondrial evolutionary rates are faster than those of plants. For plant species, I used the rbcL gene region of the plastid genome because they proved to distinguish among various plant species (Fazekas et al 2008). The diversity and complexity of these plants will test the effectiveness of my barcode. I collected 50 plant specimens of native and cultivated Rhododendrons, extracted DNA and performed PCR on each sample. Next, I used the Geneious program to align sequences and produced a cladogram showing taxonomic relationships among species. I expected greater diversity among subgenera or distinctiveness between eлепidotes and lepidotes or between deciduous and evergreen species.

Faculty Mentor(s):
Dr. Kevin S. Burgess, Department of Biology
Invertebrate Communities In Calcareous Algae

Presenter(s):
Meg Rynearson

Abstract:
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Faculty Mentor(s):
Dr. William S. Birkhead, Department of Biology
The Effect of Distance on the Frequency of Cross-Fertilization between C-Fern Gametophytes

Presenter(s):
Robin Moore

Abstract:
Two sexes exist in the gametophyte phase of the C-Fern life cycle: males and hermaphrodites. Male gametophytes produce sperm, while hermaphrodites produce both sperm and eggs. Hermaphrodites are able to fertilize themselves, but they can also be fertilized by males or other hermaphrodites. Sex determination in C-Fern gametophytes is not a result of genetic differences between individual gametophytes, but rather a result of environmental conditions. A hermaphrodite releases a hormone called antheridiogen that influences neighboring gametophytes to develop as males. In the absence of antheridiogen, developing gametophytes develop as hermaphrodites. It is not fully understood how hermaphrodites benefit from the presence of males within a population, but males likely increase the frequency of cross-fertilization, thereby reducing the negative effects of inbreeding and possibly increasing the overall fitness of the population.

My research will determine the ability of males to fertilize hermaphrodites from various distances, allowing a comparison between the distance at which antheridiogen can induce male development and the distance from which males can fertilize hermaphrodites.

Faculty Mentor(s):
Dr. Brian Schwartz, Department of Biology