

BIOLOGY IV

Section Moderator: Dr. Jennifer Thomas
Room: Beaman Hitch Science Building 208
Time: 8:00 – 9:00 PM

8:00 – 8:15

“The Effects of Testosterone Treatment on Conditioned Responses in *Danio Rerio*”

Jeanna Bardin
Faculty Advisor: Dr. Lori McGrew

Testosterone is an androgen that is known to evoke multiple external effects including development of secondary male characteristics, stimulation of aggressive behavior, and anabolic characteristics. Its internal effects on the central nervous system, however, are not as clear. This study attempts to better understand testosterone's effect on the brain and its impact on memory. Zebrafish, *Danio rerio*, a widely utilized vertebrate model system, were used for this evaluation. Fish were treated with concentrations of testosterone ranging from 2 to 200 µg/ml for 30 minutes prior to testing. Fish were trained using a rapid conditioning learning paradigm. Briefly, the zebrafish were taught to choose the one side of an aquarium by associating punishment with the alternate side. Learning was evaluated based on the percentage of times that fish chose the “correct” side (associated with no punishment). Data suggested no significant difference between control and treated zebrafish. A second measure of learning used a maze in which zebrafish were timed across several trials to assess working memory based on spatial recognition. Non-parametric data analysis showed slight significance. In conclusion, testosterone was observed to have negligible effect on working memory in zebrafish tested using these spatial recognition paradigms, but further work is required. Future studies using color discrimination and mate recognition are planned.

8:15 – 8:30

“Incidence of Methicillin-Resistant *Staphylococcus aureus* in Belmont University Dormitories”

Alaia L. Williams
Faculty Advisor: Dr. Jennifer T. Thomas

Methicillin-resistant *Staphylococcus aureus*, MRSA, is a highly pathogenic, Gram-positive bacterium present in many community settings. Since MRSA is a chief concern for health officials worldwide, I chose to explore its incidence on the Belmont University campus. *S. aureus* isolates were collected from 36 Belmont University dormitory restrooms. Methicillin-resistance was determined through the disk-diffusion method. *S. aureus* colonies were found in varying amounts in each dormitory; the total number discovered was 496. Four of the 6 dormitories examined exhibited MRSA colonies, and 20 methicillin-resistant isolates were collected; approximately four percent

of collected *S. aureus* colonies exhibited resistance. These isolates exhibited zones of inhibition ranging from 6 to 10 millimeters, indicating that degrees of resistance varied. MRSA was more prevalent in male dormitory restrooms in comparison to female and co-ed restrooms, as well as more common in community-style restrooms than in suite-style restrooms. MRSA is relatively widespread in Belmont University dormitory restrooms, and precautionary measures may need to be considered.

8:30 – 8:45

“Water-Use Efficiency in *Lonicera maackii* and *Symphoricarpos orbiculatus* in Response to Increasing Light and CO₂ Levels”

April Tummins

Faculty Advisor: Dr. A. Darlene Panvini

A variety of strategies have been proposed to explain how exotic species out-compete natives. Among these, greater resource use in exotics has been shown in various ecosystems; exotics tend to have higher levels of productivity and water-use efficiency (WUE). Plant physiological parameters, including rates of photosynthesis and transpiration, are affected by environmental factors such as CO₂ and light levels. Therefore WUE is also affected by these environmental factors since WUE is a measure of the relationship between carbon gain and water loss. For example, an increase in WUE is a response that plants have demonstrated in response to rising atmospheric CO₂ concentrations. Changes in atmospheric CO₂ concentrations and light levels are environmental outcomes that often result from disturbance, fragmentation, and urbanization. Disturbance and fragmentation in urban natural areas create habitats that promote invasion of exotic species as evidenced by the higher populations of exotics, both in number of species and density of individuals, in urban than rural areas. To study the relationship between urbanization and the success of exotics, water-use efficiency was compared in an invasive exotic species, *Lonicera maackii*, and a native species, *Symphoricarpos orbiculatus*. Each species was exposed to varying levels of CO₂ and PAR to compare the species' WUE responses using a LI-6400. Compared to the native species, *Lonicera* had an overall greater WUE as both CO₂ concentrations and light levels increased. The data suggest that exotic species respond favorably to the increasing CO₂ and light levels that accompany urbanization

8:45 – 9:00

"Presence of PBP2a Protein in Methicillin-Resistant *Staphylococcus aureus* Isolates Containing the *mecA* Gene"

Mollie A. Schlarman

Faculty Advisor: Dr. Jennifer T. Thomas

Since the emergence of antibiotic treatment in medicine in the 1950's, microbes have exhibited a remarkable ability to protect themselves through development of antibiotic resistance. Recently, the rapid evolution of Methicillin-Resistant *Staphylococcus aureus* (MRSA) has become an issue of urgent importance in healthcare settings. Methicillin resistance in *S. aureus* is conferred through three methods: increased levels of penicillin binding proteins, the production of beta-lactamases, and the presence of the *mecA* gene, which encodes for a unique penicillin binding protein, called PBP2a. Beyond healthcare settings, outbreaks of MRSA in the community have been reported throughout the United States, including a number of outbreaks in Middle Tennessee. Through a PBP2a latex-agglutination test, I have tested MRSA isolates from the Belmont University campus to determine their method of resistance, specifically production of PBP2a. Only two of the 16 isolates tested positive for PBP2a expression, indicating additional mechanisms of resistance for our isolates.