Neuroscience
Moderator: Lori McGrew, Ph.D.

April 20, 2017, 4:00-5:15 p.m.
Inman 242

4:00 p.m. - 4:15 p.m.
Examining the Effects of Anandamide Intake on Working Memory in *Danio Rerio*
Sam Zacovic
Faculty Advisor: Lori McGrew, Ph.D.

The endocannabinoid system is active in a wide range of physiological processes such as sleep, hunger, memory, and stress. Anandamide is a naturally occurring psychoactive cannabinoid that neurons release to inhibit the cortisol stress response. Anandamide interacts with CB1 and CB2 receptors, located in the central and peripheral nervous systems. CB1 receptors are present throughout the medial pallium in the amygdala and in the hippocampus. Both of these structures are thought to be involved in associative learning. Using zebrafish as a model organism, because of their extensive endocannabinoid system, the interaction of cannabinoid activation with working memory was examined. The fish executed a T-maze task with reward and punishment reinforcement. Choosing the right arm of the maze initiated a reward while choosing the left arm of the maze would result in punishment. The *Danios* were trained until they could consistently navigate to the right arm of the maze based on the reward or punishment they encountered during training. Once trained, the fish were submerged in anandamide solution to stimulate internal cannabinoid activity. It was hypothesized that a lower dose of anandamide would not have an effect on T-maze performance, but a high dose would exhibit inhibitory effects on their recently learned association.

4:15 p.m. – 4:30 p.m.
Chemotaxis of *Caenorhabditis elegans* with *Bacillus thuringiensis* 4A4 in vegetative and sporulated growth stages
Meghan McGath
Faculty Advisor: Robert Grammer, Ph.D.

A study performed by Angel Brothers at Belmont University looked at the attractant or repellent properties of vegetative *B. thuringiensis* 4A4 and fifth, sixth, and seventh day sporulated *B. thuringiensis* 4A4. The study observed what occurred to the *C. elegans* during the first and seventh hour of chemotaxis for the vegetative state and the first and twenty-fourth hour for the sporulated state. The goal of the current study is to find out what occurs to the *C. elegans* during the first, fourth, and tenth hours of a chemotaxis assay with vegetative *B. thuringiensis* 4A4 and the fourth, tenth, and twenty-fourth hours on the fifth, seventh, and ninth days for *sporulated B.*

thuringiensis 4A4. Results point to the *C. elegans* being attracted to the vegetative *B. thuringiensis* 4A4 and not the control, water. Likewise, that are attracted during the beginning of chemotaxis for the sporulated *B. thuringiensis* 4A4. However, at the twenty fourth hour it was shown that the *C. elegans* began to chemotaxis towards the control, water. Findings indicate that *C. elegans* followed the predicted hypothesis of moving towards the *B. thuringiensis* 4A4.

4:30 p.m. - 4:45 p.m.
Examining the Effects of Dopamine on Working Memory in *Danio Rerio*
Stephane Morin
Faculty Advisor: Lori McGrew, Ph.D.

Literature has suggested that dopamine plays a crucial role in the development of memories and learning via the reinforcement method. Dopamine has been shown to respond to aversive stimuli, meaning dopamine influences aversion learning as well as reinforcement learning (Schmidt, R., G. Morris, E. H. Hagen, R. J. Sullivan, P. Hammerstein, and R. Kempter, 2009). In a study done just early this year it was shown that situations where animals learn to avoid negative stimuli is regulated by dopamine (Dani, John, PhD., 2016). In the present study, this effect was looked into to determine whether or extra dopamine could further increase the natural learning ability of Zebra fish. It was hypothesized that the increase in dopamine in the fish would lead to a greater learned response. To test this, the fish were all trained in the same T-maze under the same conditions. The fish were split into three groups – a control group – a pre dose group - a post group. The maze testing followed a basic reward punishment system. The results looked at after the final testing for each group included whether or not the fish took the right path on the T-maze; the total time spent to complete the maze; and the time each fish spent latent during their time on the T-maze. These figures can help determine whether the fish knew the right choice, and how certain the fish were in that decision (time latent compared to total time).

4:45 p.m. - 5:00 p.m.
Investigating the anti-proliferative effects of the sesquiterpene Beta-Caryophyllene on HCT116 cells
Diana Neculcea
Faculty Advisor: Chris Barton, Ph.D.

Beta-Caryophyllene is a natural bicyclic sesquiterpene widely found in the essential oils of many common herbs and plants. The biologic properties of B-Caryophyllene have experimentally demonstrated anti-proliferative, antioxidant, antimicrobial, and anti-inflammatory effects. In this experiment, we investigated variances in the anti-proliferative effects of B-Caryophyllene on the isogenic human colorectal cancer cell line HCT116 with wild-type p53 (+/+) and HCT116 without p53 (-/-). Both conditions showed a dose-dependent response in cell growth inhibition to treatment with increasing concentrations of B-Caryophyllene. The nontoxic dose of 150uM B-Caryophyllene significantly decreased the mitotic cell count in the p53 (+/+) HCT116 by over 50% in the first 24-hours. The same IC50 value was used with the p53 (-/-) cells for consistency,

however there was only a 10% decrease in the first 24 hours. This discovery advocates that the presence of p53 may play a role in the effectiveness of B-Caryophyllene as an anticancer agent.

5:00 p.m. – 5:15 p.m.
Effects of Acute Stress on Apomorphine-Induced *Danio rerio*
John Longenecker
Faculty Advisor: Lori McGrew, Ph.D.

Zebrafish (*Danio rerio)* are a well-established model for neuroscience research due to similarities in their central nervous system, one such being dopamine receptors. Dopamine is integral to the reward/pleasure system, and has been publicized as one reason for drug dependence. Contrary to this, research is also being done on the use of dopamine therapy during drug withdrawal. The purpose of this study is to determine if Apomorphine, a dopamine agonist, influences anxiety, and its propriety in the drug withdrawal process. The objectives of this study were to observe if inducement affects the duration and latency of time fish spent anxious, as well as the extent to which inducement impacts mobility. A pilot study was done to assess drug tolerance. Results of this study show significant differences in latency ($p=0.02$) and velocity ($p<0.01$) with trending contrasts in cumulative duration. In conclusion, Apomorphine moderately decreased anxiety and significantly impacted velocity.