

## Department of Biological Sciences Seminar Blog

Seminar Date: 2/2/18

Speaker: Dr. Michael Baum, Boston University

Seminar Title: *“The olfactory brain's control of courtship behaviors in female mice.”*

### Smelling Connections

By: Anton Evans

As a concept, most people you encounter can understand and explain what pheromones are. Typically, you hear something like “Some animal looking for a mate is attracted to the smell of an individual from the opposite sex.” Evolutionary theory suggests that individuals that produce the “best” smells are most attractive because they have better genetics. The chemicals in these odorants are referred to as pheromones. However, pheromones encompass a wider spectrum of signaling systems ranging from danger warnings, location and territorial marking, to behavioral triggers that modulate group cohesion. These signals have been found in plants, animals, insects, and even single-celled organisms.

On Friday February 2nd, 2018, Duquesne University had the pleasure to host Dr. Michael Baum of Boston University's Department of Biology for a guest lecture. Dr. Baum is an expert in the field of pheromone research. His lab focuses on the role pheromones play in controlling and stimulating the mechanisms involved with partner selection and courtship behaviors using mice as a model. Specifically, they study the chemical pathways in the mouse brain that trigger lordosis behavior. Also known as presenting, this behavior is characterized by the arching of the female's back to position the body for mating.

In their model, they have identified a pathway within the mouse brain that is involved with regulating this behavior. This pathway consists of the vomeronasal- accessory olfactory bulb, which detects chemical signals through smell, and the medial amygdala of the brain, which receives the generated neural signal. Their most exciting work involves the use of DREADDs (Designer Receptors Exclusively Activated by Designer Drugs). This technology allows them to turn this pathway on and off within an individual through injection of the DREADD ligand, CNO. They can then monitor the animal's behavioral response to different stimuli.

In one of their recent papers, *DREADD-induced silencing of the medial amygdala reduces the preference for male pheromones and the expression of lordosis in estrous female mice*, Baum's lab characterized how the silencing of the medial amygdala pathway decreased the preference of female mice to investigate nonvolatile male urinary odors and that removing the silencing agent would restore this preference. They also showed that silencing of this pathway significantly decreased the lordosis of the female mice when paired with a male, and the removal of the silencing agent restored the lordosis behavior to expected levels for a non-treated individual.

The significance of this study is that they used this DREADD method to provide direct evidence of chemical activation of a brain pathway that directly influences behavior. This will allow them to dig further into the mechanism to potentially identify the specific chemical stimuli and their receptors and determine the role that pheromones such as darcin, a major male urinary protein, play in this system. Overall, Dr. Baum's work forwards our knowledge of how the brain interprets external signals to regulate downstream processes. Hopefully, this type of work will help us understand our own brains and the disorders that affect it.

## References

McCarthy, E. A., Maqsudlu, A., Bass, M., Georghiou, S., Cherry, J. A., & Baum, M. J. (2017). *Dreadd-induced silencing of the medial amygdala reduces the preference for male pheromones and the expression of lordosis in estrous female mice*. European Journal of Neuroscience.

McCarthy, E. A., Naik, A. S., Coyne, A. F., Cherry, J. A., & Baum, M. J. (2017). *Effect of Ovarian Hormones and Mating Experience on the Preference of Female Mice to Investigate Male Urinary Pheromones*. Chemical senses.