

Genomic Analysis of Chemical Communication in Honey Bees

**Christina M. Grozinger
Insect Physiology – Genomics
Department of Entomology
North Carolina State University**

Pheromonal communication is often considered to be stereotyped and innate in terms of both the production and response to pheromones. However, production of pheromonal cues and responses to pheromones can be modulated by environmental context, physiological changes and/or the genotype, but the molecular mechanisms underlying these processes are relatively uncharacterized. We are using genomic approaches to characterize the molecular mechanisms and pathways underlying modulation in the production of and response to queen mandibular pheromone (QMP) in honey bees (*Apis mellifera*). QMP is rather unusual pheromone, in that it can cause both short-term changes in behavior and long-term changes in behavior and physiology. QMP also causes profound changes in brain gene expression, in a manner that correlates with its long-term effects on behavior and physiology. Furthermore, the short- and long-term responses QMP can be uncoupled; thus, they appear to operate by different mechanisms. We are now characterizing how physiological and genotypic factors modulate response to QMP. Additionally, we have found that modulation of the mating process in honey bee queens alters the pheromone blend that is produced, and workers are responsive to differences in these blends. These studies suggest that chemical communication between queens and workers is a dialog, with modulation of both production and response. We are now expanding our research to study the effects of pathogens and diseases on chemical communication in honey bees. Finally, we are beginning to address the roots of pheromone-mediated behavior in social insects, by monitoring expression of QMP-regulated genes in other hymenopteran species with different social organizations, to determine if there are common underlying pathways related to queen control.

Dr. Grozinger's presentation is scheduled for:
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