Exploring Ethanol Tolerance in Honey Bees

Trstenjak, Noah (School: UTRGV Mathematics and Science Academy)

Alcohol addiction is a significant societal problem negatively impacting millions of people. Understanding the underlying mechanisms of addiction will aid efforts to provide care and a cure to those suffering from alcohol addiction. The honey bee, Apis mellifera, has proven useful as a simple invertebrate model for alcohol-related studies. Bees were used to study the role alcohol dehydrogenase (ADH) plays in a metabolic process that could be responsible for the development of ethanol tolerance. Bees were given a dose of 2.5% or 5% ethanol followed by a second dose of 5% ethanol to produce tolerance. After the second dose, hemolymph (insect blood) was extracted from the bee. A spectrophotometric assay then measured the amount of ethanol in the hemolymph. The resulting concentrations were compared and contrasted with the concentrations of ethanol in the hemolymph of subjects which had received only one dose of ethanol, and had therefore not produced tolerance. The results suggest that an initial dose of ethanol does not result in an increase in ADH activity. This suggests changes in ADH do not underlie ethanol tolerance. After the initial results were analyzed, a time-course for the breakdown of ethanol in honey bees was conducted to evaluate the ethanol concentrations in hemolymph collected at different time points post second dose.

Awards Won: