



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Stephanie Lin	Project Number S2011
Project Title Mechanism by which Methoprene Accelerates Behavioral Development in Honey Bees, <i>Apis mellifera</i>	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In worker honey bees (<i>Apis mellifera</i>), juvenile hormone III (JH) is responsible for regulating the division of labor within a colony. JH titers increase with age, and the rate of this increase paces the transition from a bee's nursing to foraging functions. Methoprene, a JH analog, is used to accelerate this behavioral development and induce precocious foraging. My objective was to determine whether methoprene acts by influencing a bee's endogenous JH secretions or by serving as an agonist in place of JH.</p> <p>Methods/Materials To determine methoprene's mechanism, I studied the JH titers of methoprene-treated bees from the preforaging to early foraging stages. Newly emerged bees were treated with methoprene (experimental group) or acetone (control group) and released back into their colonies. 8 bees from each group were collected every 3-4 days and sampled for their haemolymph. I then ran Radioimmunoassays to measure the JH concentration in their haemolymph and analyzed the results. Behavioral observations were also made to ensure the effectiveness of methoprene in accelerating foraging behavior.</p> <p>Results Two separate trials indicated that as the bees matured, there was no statistically significant difference between the JH titers of methoprene-treated and untreated bees (ANOVA, $P > .3$). Behavioral observations confirmed that methoprene did accelerate the onset of foraging in treated bees (t-test, $P < .0009$).</p> <p>Conclusions/Discussion This experimental data demonstrated that the precocious foraging was not a result of artificially increased JH titers, indicating that methoprene accelerates behavioral development without affecting endogenous JH. This is most consistent with the hypothesis that methoprene acts as an agonist to activate the same metabolic pathways as JH. This pesticide-related apiculture research is especially critical today because of the "Colony Collapse Disorder" phenomenon that is so heavily damaging to the agriculture industry. The information also offers a better overall understanding of the mechanisms of JH in bee development.</p>	
Summary Statement An investigation into how methoprene, a juvenile hormone analog, works to accelerate a worker bee's transition between nursing and foraging.	
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