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Title: The role of pesticides on honey bee health and hive maintenance with an emphasis on the neonicotinoid, imidacloprid  
 Johnson\_umaryland\_0373D\_10323.pdf (2.37 MB)

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Abstract: Imidacloprid (IMI), a neonicotinoid insecticide, arrived on the world market in 1991 and has been under study ever since for its potential negative impacts on the non-target species *Apis mellifera* (honey bees). This neurotoxin, a mimic of nicotine, binds to nicotinic acetylcholine receptors and disrupts nerve transmission, thereby killing target insects. Two studies described here attempt to quantitate IMI's presence in surface water and to track its movement through the vascular system of the red maple (*Acer rubrum*) to determine to what levels honey bees are exposed through water, pollen, and nectar. Of the 108 water samples collected, 9 samples ranged from 7-131ppb (LD50=280ppb), and 14 samples were at the limit of detection by ELISA assay. The red maple study revealed ranges of IMI in plant tissue of 0-53,300 ppb in leaves, 0-5440 ppb flowers, 0-32 ppb pollen, and 0 ppb in nectar, supporting evidence of predominantly xylem transport. Differences in IMI movement by soil and trunk injections and in male and female trees were apparent. Since sub lethal doses have been implicated in foraging disruption, reproductive changes, and memory loss, a hive study was undertaken to determine if developmental or behavioral effects were seen at levels of 5, 20, and 100ppb when hives were exposed to a dosed commercial pollen product. Following adult emergence, longevity and behavior were monitored under normal observational hive conditions. Only two behaviors were noteworthy for aberrance; guarding at the entranceway (almost significant) and a dose dependent presence of dosed bees attending larval filled cells (significant). Since honey bees undergo a task related development, larval cell location implies an arrestment in early adult development. Hives are collection sites for chemicals in the environment which can partition into lipophilic wax, aqueous honey, or proteinaceous pollen. A synergy study was undertaken to study the effects of IMI, fluvalinate (a beekeeper applied acaricide), and chlorothalonil (fungicide) on honey bees when the pesticides were applied separately or in combination to observation hives. Incidence of drift, the movement of bees from their home hive into a foreign hive, was most severe in hives treated with all three pesticides.

Subject Keywords: honey bees  
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