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Identification of volatile compounds emitted by European honey bee larvae (*Apis mellifera*)

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► **To cite this version:**

Alban Maisonnasse, Guy Costagliola, Fanny Choteau, Yves Le Conte. Identification of volatile compounds emitted by European honey bee larvae (*Apis mellifera*). American Bee Research Conference, Jan 2008, Sacramento, United States. 2008. hal-02823973

HAL Id: hal-02823973

<https://hal.inrae.fr/hal-02823973>

Submitted on 6 Jun 2020

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Proceedings of the American Bee Research Conference

The 2008 American Bee Research Conference was held January 8-13 at the DoubleTree Hotel in Sacramento, California. The twenty-second American Bee Research Conference will be held in conjunction with the Apiary Inspectors of America in Gainesville, Florida during February 4-6, 2009. The following are abstracts from the 2008 Conference.

13. Maisonnasse, A.^o, G. Costagliola^P, F. Choteau^P & Y. Le Conte^o - IDENTIFICATION OF VOLATILE COMPOUNDS EMITTED BY EUROPEAN HONEY BEE LARVAE (*APIS MELLIFERA*) - Like many social insects, honey bees have evolved a complex social system in which the brood is completely dependent on nurse bees. To provide optimal care to the larvae, nurses must recognize the various brood instars, their age, sex and needs. Chemical communication seems to be a major factor in this interaction. In 1990, a blend of ten esters that function as a brood pheromone was identified by Le Conte et al. (*Naturwissenschaften* 77: 334-336). Their experiments focused on the recognition of larvae by nurse bees. However, little is known about the recognition of larval needs. One compound of the blend, methyl linoleate, can increase the amount of royal jelly deposited in cells by workers (Le Conte et al., 1995 *J Econ Entomol* 88: 798-804), but we do not know if that compound or others are produced by larvae as a hunger signal.

In this study we focus on volatile compounds that could be produced by larvae as a hunger signal, informing nurses about their needs. We used solid-phase microextraction to sample the volatile compounds emitted by starved larvae. Two candidate molecules (X and Y) were identified. The production of compound X increased during the first 6 h of larval starvation and stabilized at 24 h. Molecule Y production was constant and low during the first 6 h, and increased strongly at 24 h. We hypothesized that the 2 compounds could be hunger signals. Four testable hypotheses related to larval food needs were established (Figure) to determine the biological function of molecules X and Y. Preliminary results indicate that molecule Y can induce increased royal jelly deposition in queen cells during queen rearing. Molecule Y can also significantly delay the age at first foraging in a single cohort colony. Our results suggest that compound Y functions as a hunger signal in honey bee colonies. Additional experiments are ongoing to confirm the biological function of molecule Y and to determine the role of compound X.

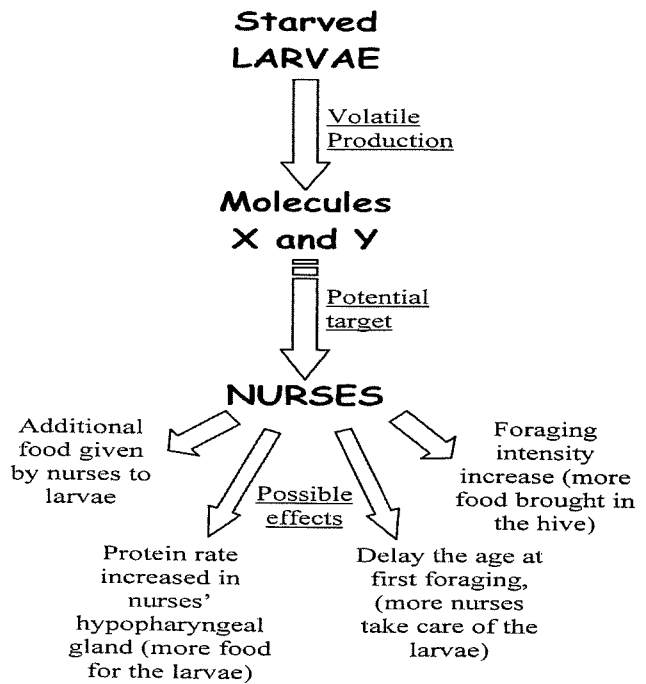


Figure - Four hypotheses we are investigating to determine the roles of 2 potential feeding signals.