

## **Is Dufour's Gland Secretion an Egg-Marking Pheromone or a Queen Signal in Honeybees?**

Victoria Soroker,<sup>1</sup> Tamar Katzav-Gozansky<sup>2</sup> and A. Hefetz<sup>3</sup>

*\*Dept. of Entomology, ARO, The Volcani Center, Bet Dagan 50250, Israel [e-mail: sorokerv@agri.gov.il]; <sup>2</sup>INRA, Unit de Zoologie-Apidologie, Domaine St. Paul 84914, Avignon Cedex 9, France; and <sup>3</sup>Dept. of Zoology, Faculty of Life Sciences, Tel-Aviv University, Tel Aviv 69978, Israel*

Although the queen honeybee is the major reproductive member of the hive, workers can lay eggs, and are responsible for the production of approximately 0.1% of the male brood. Queens are also distinguished from workers by their pheromonal bouquet, exhibiting caste-specific compositions

in at least two exocrine glands. We focused our study on Dufour's gland (DG), which opens into the dorsal vaginal wall and was suggested to be the source of an egg-marking pheromone. In queens, glands are more developed than in workers and are fortified with long chain esters that are absent in queenright (QR) workers. Queenless workers, however, possess the queen-specific esters in their DG secretion. We used both chemical and behavioral approaches to elucidate the function of DG secretion. Chemical analysis revealed the presence of DG esters on the queen-laid eggs, albeit in minute quantities. The behavioral experiments focused first on testing worker policing, *e.g.* the selective elimination of worker-born eggs by the worker nestmates in a QR colony. It was demonstrated that QR workers readily discriminate between queen- and worker-laid eggs, selectively eliminating the latter. However, neither queen's DG secretion nor its synthetic ester constituents prevented egg policing, refuting the hypothesis that the secretion serves as an egg-marking pheromone.

We then tested the hypothesis that the queen DG constitutes a part of the queen signal. Application of queen glandular secretion or the synthetic mixture of its ester constituents on a glass slide or on a worker induced retinue formation around the 'surrogate queen'. It was concluded that DG secretion constitutes part of a complex queen signal that is the basis of the social integrity of the honeybee colony. The presence of these esters on queen-laid eggs further suggests that they may function as a queen fecundity signal, a hypothesis that remains to be tested.