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Honeybee worker larvae perceive queen pheromones in their food

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If honeybee larvae are reared in a queenless colony they develop into rebel workers, with more ovarioles in their ovaries and less developed hypopharyngeal glands. In natural conditions, rebel workers appear after swarming because some larvae complete their feeding in the absence of a queen after the old-queen leaves her colony with the swarm and before new-queen hatches. The drop in relatedness between the old-generation workers and the new-queen's offspring justifies the rebel strategy of workers, which are more prone to attend to their own reproduction than to rearing the new-queen's offspring. How the larvae recognize the lack of a queen in the colony is unknown. We hypothesized that lack of queen pheromones in the larvae's food is what triggers their development into rebel workers. To test that we used two colonies divided into queenright and queenless subunits, each with an experimental frame containing eggs of similar age. When the larvae appeared in these frames, each day we added a drop of distilled water to the food of some larvae, and the others were left untreated. Additionally, only in the orphaned subunits each day we added a drop of water with macerated mandibular glands of egg-laying queens from independent colonies to the food of some larvae. We dissected bees newly emerged from the experimental frames and found that the workers developing in queenright subunits did not differ from those developing in queenless subunits fed with macerated mandibular glands. Only workers emerging in queenless subunits, those whose food had pure water added and those not treated, developed into rebels. They had more ovarioles per ovary, smaller hypopharyngeal glands, and bigger mandibular and Dufour's glands than the workers from all other compared groups. This suggests that the presence of queen pheromones from mandibular glands in larvae's food prevents larvae from becoming rebels.