Social contact acts as appetitive reinforcement and supports associative learning in honeybees (Apis mellifera)

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Honeybees' foraging behavior critically depends on individual learning by foragers of floral cues, among which odors play a prominent role. Foragers thus learn to associate floral odors with sugar reinforcement from flower nectar. In the Lab, this process is studied using the Pavlovian conditioning of the proboscis extension response (PER), in which an odor (CS) is associated with sucrose solution (US). This learning has been studied for 50 years and its neural bases are nowadays partially unraveled. Interestingly, olfactory learning about floral resources is not limited to the foraging situation, and honeybee workers can learn chemosensory information directly from successful foragers within the hive. Previous work attributed this learning to a simple classical association between the floral scent adsorbed on the returning foragers' body and a sugar reward given by this forager via trophallaxis. However, nectar transfer is not performed during all dual interactions with returning foragers, suggesting that other mechanisms may be involved in this transmission. Here, we determined whether social cues may be involved in this transmission, i.e. can interaction with another forager represent an appetitive reinforcement for bees? Our recent data supports this hypothesis. We found that simple antennal contact with a fed nestmate, in absence of any sugar stimulation, can induce PER in harnessed worker bees. In addition, bees can learn to associate an odor CS with this antennal contact with a nestmate. After such association, the odor alone triggers the PER. This suggests that simple social contact can act as an appetitive US in honeybees. We currently study the mechanisms implied in this new conditioning focusing on the physical nature of this social US. Our current data suggest the implication of antennal movements produced by the US nestmate.