



## **Individual appetitive associative memory in *Formica fusca* ants is extraordinarily persistent and resistant to extinction**

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An animal's environment is not constant, and new food sources or competitors may appear at any time. Learning is essential to modulate behaviour in a changing environment. Associative learning, and its underlying mechanisms, have been intensively studied in a limited number of insect model species, such as the fruit fly and the honeybee. We present a study on individual appetitive associative learning in a very common European and northern American ant species, *Formica fusca*, using a free-walking protocol, in which ants learn to orientate toward an odorant associated with a sugar reward. We studied acquisition of an odour-reward association and ants' memory performances between one hour and one week after conditioning. For the first time in ants, we also studied extinction, during which the learned odorant is presented repeatedly without any reward to the insect. Results show that *Formica fusca* ants can learn an odorant very quickly (a single trial) and, even though memory performances decrease over time, memory is still persistent three days after conditioning and no extinction is observable after six consecutive extinction tests. More surprisingly, after a single trial, memory persists for three days and more than six extinction tests are needed to see significant extinction of the response. Lastly, we studied whether this form of long-term memory is, as in other models, dependent on protein synthesis using a protein synthesis inhibitor. Our results highlight the importance of investigating behavioural adaptations in non-model species, which might help understanding how learning abilities evolved in different species considering both evolutionary and ecological contexts.