



Adaptive resource defense and experience-dependent nestmate recognition in ants

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Ants rigorously defend their nest against foreign individuals to protect their colony's resources from being exploited. The recognition of nestmates and discrimination from non-nestmates is based on mixtures of low-volatile components of cuticular hydrocarbons (CHCs) which are species- and colony-specific. Trophallaxis and allogrooming result in mutual exchange of CHCs and homogenization of CHC profiles among nestmates. However, the CHC profiles of workers within a colony show variation that relate to different tasks they perform. It is generally assumed that encountering workers compare the perceived CHC profile (label) of the opponent with own neural representation for nestmates (template) and mismatches between label and template allow discrimination of nestmates and non-nestmates. Importantly, labels change over time since they are subject to environmental influence, e.g. nest material and diet. Hence, workers need to constantly update their template. In our studies, we address the questions how social context (interactions with nestmates) modulates individual propensity to react aggressively towards non-nestmates, and how systematic modifications of the CHC profiles (added or removed components) impact the recognition process. Our results demonstrate that the nestmate recognition system is suited to mediate an adaptive and flexible resource defense. The variety and chemical similarity of labels that ants can discriminate strongly indicates that rather than a global template for 'nestmates', workers have several templates available to recognize different types of nestmates. We propose that the nestmate recognition system of ants is partitioned, where nestmate-specific labels are learned as entities and different templates, each having its own specificity range are formed.