“Generating genetic tools in ants to study social behavior and neural development”

Abstract: Social insects, including ants, exhibit cooperative social behavior with an extensive dependency on communication. The perception of cuticular hydrocarbons (CHCs) as pheromones is mediated by odorant receptor neurons (ORNs). ORNs express specific odorant receptors (ORs) encoded by a dramatically expanded Or gene family in ants. The biological features in a few ant species, such as Harpegnathos saltator, allow CRISPR-Cas9 gene targeting to generate a germline mutation. This facilitates the genetic analysis of the orco gene that encodes the obligate co-receptor whose mutation should significantly impact ant olfaction. Our results show that Orco exhibits a conserved role in the perception of general odorants but also a role in social behavior, plasticity and reproductive physiology in ants. Surprisingly, and in contrast to other insects, the loss of OR functionality also dramatically reduces the development of ant ORNs and antennal lobe glomeruli. Taken together, the ant genetics will provide inroads towards understanding the function of genes in regulating developmental plasticity, reproduction, longevity, and complex social behavior.

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