

“In pursuit of plants, people, and puddles: deciphering the molecular basis of chemical detection in vector mosquitoes”

Vector insects respond to volatile organic compounds (VOCs) when foraging for nectar, bloodmeal hosts, and suitable oviposition sites. While many studies have identified environmentally relevant VOCs emitted by organisms in the environment, little is known about the molecular events of chemical reception that mediate behavior, especially in mosquitoes and other Dipteran (fly) pests. In the present study, we have characterized the expression patterns and functional response profiles of selected chemical receptors from two major gene families, the Odorant Receptors (ORs) and Ionotropic Receptors (IRs). Our investigations have revealed receptors that respond with high selectivity to known host cues, such as carboxylic acids, indoles, terpenes, and green leaf volatiles. Moreover, we have identified functional homologs across diverse species, suggesting evolutionary conservation for common ecological purposes. Our findings establish a baseline for further investigations into the chemical ecologies of vector species and the molecular evolution of insect chemoreceptors more broadly. Conceptually, potent activators of ORs and IRs could be exploited for improved vector surveillance or bait-and-kill technologies.