

Molecular Basis of TRPA-Dependent Sensory Modulation in Triatomines

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ABSTRACT

Chagas disease is amongst the ten most important vector-borne human diseases, affecting millions of people across the Americas. Its etiological agent, the protozoan parasite *Trypanosoma cruzi*, is hosted and transmitted endemically by triatomine insect vectors (Hemiptera: Reduviidae), including notably of the genera *Rhodnius* and *Triatoma*. These specialized haematophagous vectors seek human hosts relying on diverse sensory stimuli including heat and chemical cues^{1,2,3}.

TRPAs, Transient Receptor Potential Ankyrin channels, are a diverse insect gene family of cation-gated thermosensitive sensory receptors (e.g. Painless, Pyrexia, TRPA1, TRPA5), which are also typically activated by chemical ligands. While the number and types of TRPAs vary across insect Orders, their physiological properties also reflect the diversity of insect sensory adaptations. However, despite the strong thermal and chemical reliance of triatomines for host seeking⁴, little is known about the molecular properties of triatomine TRPAs^{4,5}. Recently, we showed that the TRPA5 subfamily, absent in dipteran genomes, has diversified in other Orders including Hemiptera. Specifically, we showed that TRPA5B, a channel broadly expressed in sensory organs in *Rhodnius prolixus*^{5,6}, exhibits high thermosensitivity when expressed *in vitro*⁵, suggesting a role in heat sensing.

Here, we establish stable TRP-FlpIn293 cell lines to characterize the activation profiles of TRPA1, Pain and TRPA5 channels and their isoforms from *R. prolixus* and *Triatoma infestans*. Using pharmacological fluorescent calcium assays, we examine the channel responses to a panel of natural ligands, including candidate repellent compounds recently identified in behavioral assays. Overall, our findings offer new insights into the thermochemical sensitivity of triatomine TRPA channels, and broadens our understanding of the molecular mechanisms underlying triatomine sensory biology.

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