A Computational Approach for the Prediction of Relevant Olfactory Receptors in Insects

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Abstract : Insects are extremely successful organisms. A sophisticated olfactory system is in part responsible for their survival and reproduction. The detection of volatile organic compounds can positively or negatively affect many behaviors in insects. Compounds such as carbon dioxide (CO_2), ammonium, indol, and lactic acid are essential for many species of mosquitoes like Anopheles gambiae in order to locate vertebrate hosts. For instance, in A. gambiae, the olfactory receptor AgOR2 is strongly activated by indol, which accounts for almost 30% of human sweat. On the other hand, in some insects of agricultural importance, the detection and identification of pheromone receptors (PRs) in lepidopteran species has become a promising field for integrated pest management. For example, with the disruption of the pheromone receptor, BmOR1, mediated by transcription activator-like effector nucleases (TALENs), the sensitivity to bombykol was completely removed affecting the pheromone-source searching behavior in male moths. Then, the detection and identification of olfactory receptors in the genomes of insects is fundamental to improve our understanding of the ecological interactions, and to provide alternatives in the integrated pests and vectors management. Hence, the objective of this study is to propose a bioinformatic workflow to enhance the detection and identification of potential olfactory receptors in genomes of relevant insects. Applying Hidden Markov models (Hmms) and different computational tools, potential candidates for pheromone receptors in Tuta absoluta were obtained, as well as potential carbon dioxide receptors in Rhodnius prolixus, the main vector of Chagas disease. This study showed the validity of a bioinformatic workflow with a potential to improve the identification of certain olfactory receptors in different orders of insects.

Keywords : bioinformatic workflow, insects, olfactory receptors, protein prediction

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