Cellular and molecular mechanisms on olfaction of locust (Insecta, Orthoptera: *Locusta migratoria*)

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Evolution of Organisms depends on environmental chemicals. This ancient and efficient receptive ability is still maintained by organisms. Locust, a most important pest insect to crops world wide, is with this ability sense exogenous chemicals evoking important behaviors, such as migration, aggregation, foraging and courtship tightly related with locust plagues. A detailed knowledge of chemoreception in locusts at the molecular level will help understanding the diversity of cellular and molecular mechanisms of organisms, as well as designing novel repellents or attractants for locust control. Here we present our latest results of research on locust chemoreception. We have identified 4 types of chemosensilla, s. trichoid, s. basiconic, s. ceoloconic and s. chaetic on antenna. Their ultrastructure indicates that trichoid and basiconic sensilla are olfactory. Functional studies, using single sensillum recording, indicated that trichoid sensilla may be divided into 7 subtypes, 5 containing 2 neurons each, the other two containing 3. All these 16 neuron cells have been characterized in terms of odorant specificity. Locust odorant binding protein (LmigOBP1) is specifically expressed in the lymph of trichoid and basiconic sensilla, as shown by using immunocytochemical study. Its synthesis starts just before hatching and continues through post-embryo life, indicating that it might play important roles in chemical sensing. LmigOBP1 shows high affinity to 15-17 carbon linear aliphatic compounds. We have also performed docking experiments on a three-dimensional model of the protein. These simulations showed that more than 16 amino acids may be involved in the binding of 1-pentadecanol. Two amino acid residues in particular, N74 at entrance of the binding pocket, and V87 at inner bottom of the pocket might be more important for the binding activity of this protein, as shown by experiments with specific mutants. Here we propose that the region at entrance of the binding pocket plays a very important role in the initial recognition of ligands. Finally, we give some aspects of study in future.