

Abstract

The antennal lobe (AL) of insects, structural and functional analog of the olfactory bulb of mammals, is the first order olfactory center for processing olfactory information. Odor information is represented spatially and temporally on the topographic map of the AL glomeruli, and then transmitted to the higher brain centers. First, to reveal how the topographic map made in the AL is represented in the higher brain centers, I analyzed the projection map of the AL projection neurons (PNs), especially for the pheromone processing PNs. Second, as a first step to reveal the mechanisms of spatio-temporal representation in the AL, I analyzed morphological characteristics of the AL local interneurons (LNs) responsible for inter- and intra- glomerular information processing. For these two studies I developed a new intracellular staining method that enabled me to insert an electrode to a target neuron under visual control. I also found that NO-induced anti-cGMP immunostaining specifically recognized the PNs which respond to the major pheromone component (bombykol). Making use of these methods efficiently, I demonstrated that integration and segregation of pheromone information may occur in the higher brain centers and that variation of AL LNs is clearly present within one species.