Flavour

POSTER PRESENTATION

Open Access

Associative and non-associative learning shapes mixture representation and improves perception of relevant odors

Fernando Locatelli[*], Emiliano Marachlian

Animals live in a world of countless olfactory stimuli that are normally presented forming complex and variable mixtures. To deal with excess of information they should have systems that process the sensory afference and optimize detection of the relevant odors. In case of specialist animals, whose success depends on detection of defined molecules, this optimization is hardwired or solved by specific olfactory receptors. In the present work we asked if detection of relevant odors can be optimized when the category "relevant or irrelevant" is not fixed but depends on the experience of each individual with odors and rewards. Honey bees provide a good model for this study, because their foraging behavior depends on generalist olfactory receptors and because they are able to learn the predictive value of originally neutral odors. Olfactory stimuli to which bees are normally exposed are complex mixtures, in which relevant odors can be masked by the presence of irrelevant ones. The meaning and significance of odors may change and bees have to keep their olfactory sense adjusted to these changes. We performed calcium imaging in projections neurons of the honey bee antennal lobe and measured the neural representation of mixtures and the pure components after associative and non-associative learning. On the basis of patterns obtained for naïve animals we assayed different algorithms that allow accurate prediction of the pattern elicited by the mixture. The prediction algorithms were later applied to animals that have been trained on appetitive conditioning using as conditioned stimulus one of the components of the mixture. We found that the representation of the mixture in trained animals deviates from the mixture predicted for naïve animals. This deviation is in favor of the representation of the rewarded component. The changes in the mixture seem to be consequence of changes in the interactions among components since normally no change was observed in the representation of pure odors. The results are consistent with a model in which plasticity the antennal lobe can redefine the perceptual space according to experience and needs.

Laboratorio de Neurobiología de la Memoria, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires. IFIByNE- CONICET. Argentina