



## **Antagonistic functions of the biogenic amines octopamine and tyramine on honeybee vision**

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The biogenic amines octopamine and tyramine are important neuromodulators in insects and other invertebrates. Both play an important role in phototaxis, learning, memory and sucrose responsiveness in honeybees. Octopamine and tyramine are thought to be involved in the division of labor and might influence the switch from in-hive tasks to foraging. While most aminergic receptors have been characterized, their respective function remains elusive. Yet, biogenic amines and their corresponding receptors most likely influence honeybee behavior. I examined the behavioral functions of tyramine and octopamine in the honeybee. Electroretinography (ERG) experiments were used to analyze the sensory input and phototaxis experiments were used to measure the behavioral output. For the phototaxis experiments, a honeybee treated with octopamine, tyramine or ringer (control) was placed inside a dark arena and different light sources with increasing light intensities were turned on consecutively. The time the honeybee needed to walk towards these light sources was recorded. For the ERG experiments, a honeybee treated with octopamine, tyramine or ringer was placed inside a light-impenetrable Faraday cage and different light intensities were applied onto the honeybee's eye. The photoreceptor response was recorded before and after the application of the substance. The results show that both substances influence the phototactic behavior as well as the ERG. Octopamine increases the walking speed towards different light sources while tyramine decreases it. No effect can be found on the locomotor activity of honeybees during the behavioral test. In the ERG experiment, octopamine increases the maximum ERG response while tyramine decreases it. These results indicate that tyramine and octopamine have antagonistic functions in processing visual information. Tyramine also seems to increase the onset of the receptor response in the ERG experiments.