Abstract

The brain is made up of neurons. Neurons communicate with each other and form a complex, active neuronal network. A small group of neurons use monoamine as their neurotransmitter and modulate the activity of many different neurons, playing critical modulatory roles in the neuronal network. Those monoaminergic neurons have attracted increasing interest in behavior, cognition, and disease studies.

Connectome aims to draw a comprehensive map of all neurons and their connections in the brain. New techniques like electron microscopy (EM) have accelerated the construction of connectomes in various animals. However, building connectomes is a starting point for further understanding the brain. In the EM-based adult *Drosophila* connectome, FlyEM, for example, only a few monoaminergic neurons have been annotated.

In this study, I have made significant strides in understanding the adult *Drosophila* brain. By bridging light-microscopy data with EM data, I have identified 40 serotonergic, 79 dopaminergic, and 139 octopamine/tyramine-producing neurons. This comprehensive identification is a first in the field. Additionally, I have discovered that these monoamine neurons partition the entire brain into different, mostly segregated modulatory blocks, a finding that has never been reported before. Our connectomics analysis has also revealed the superior neuropils and the lateral accessory lobe as communication hubs of these modulatory blocks.

In the combined publication, I and colleagues showed asymmetric presynaptic depletion for the first time in one identified dopaminergic neuron in a *Drosophila* model of Parkinson's disease.