Pre-neural vs Neural: Neurotransmitter Signaling Development in *Lottia scutum*

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Abstract:

Metazoans use nervous systems to transmit, interpret, and respond to sensory information from across their bodies using neurotransmitters. Neurotransmitters such as the serotonin-precursor 5-hydroxytryptophan convey signals using the synaptic pathways present in neural networks that result in physical reactions. They can also function as molecular messengers outside of the nervous system such as in the human digestive tract. The introduction of molecular messengers has been known to incite changes in cilial behavior within the phylum Mollusca. This change is seen in both adult and neural larval specimens. However, it is known that many in the family Gastropoda have a larval stage that lacks a nervous system yet possess cilia. Whether molecular messengers can impact ciliary behavior in the pre-neural stage of larva is yet unknown. Here we aimed to show that some molecular messengers do cause behavioral changes in both pre-neural and neural larvae of *Lottia scutum*. For example, our in-situ tests revealed an increase in the ciliary swimming behavior in specimens exposed to ATP compared to control specimens in filtered seawater. The resulting increase in the velocity of the organisms' movement was similar for both pre-neural and neural larvae. This suggests that ATP functions similarly in the pre-neural stage to how it does in the neural stage. Our results suggest that in the case of *Lottia scutum*, signaling using molecular messengers does occur in the absence of the nervous system. We anticipate that by studying the function of molecular messengers in pre-neural and neural larvae, we can gain insight into the evolutionary development of neuronal signaling.