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Computational inferences on neurotransmission in chemotaxis learning in *Caenorhabditis elegans*

Michiyo Suzuki[1], Tetsuya Sakashita[1], Yasuhiko Kobayashi[1], Toshio Tsuji[2]

[1] Japan Atomic Energy Agency, Japan
[2] Hiroshima University, Japan

Presenter: Michiyo Suzuki

Caenorhabditis elegans typically approaches NaCl, as a soluble chemoattractant. Behavioral plasticity is observed in this organism after it experiences a particular combination of multiple stimuli; for example, *C. elegans* modifies its movement response to NaCl from attraction to avoidance following exposure to NaCl in the absence of food for several hours. The behavioral plasticity in response to NaCl, termed 'salt chemotaxis learning', can be explained, at the neuronal network level, as the changes over time of both the response-characteristics of each neuron and the degree of synapse transmission (neurotransmission). Although the involvement of some neurons in learning has been determined from molecular experiments, even using physiologic and/or advanced imaging techniques, it is not possible to measure neurotransmission in whole synapse connections and gap junctions in *C. elegans* at the same time. For this reason, whether the change of neurotransmission corresponding to the behavioral changes extends to the whole nervous system or only to a limited part of the nervous system is not known.

Therefore, to understand the behavioral changes induced by learning at the neuronal network level, we propose an approach in which the neuronal network is modeled based on the actual neuronal connections, and the changes of neurotransmission corresponding to learning are estimated. Our results revealed that neurotransmission on multiple synapse connections differed prior to and after chemotaxis learning. This partially corresponded to the experimental findings of previous studies. In addition, our results suggested the involvement in chemotaxis learning of some synapse connections between interneurons, whose roles for learning have never been known. We will discuss the possibility of our computational approach to provide novel information that cannot be obtained using conventional experimental techniques.