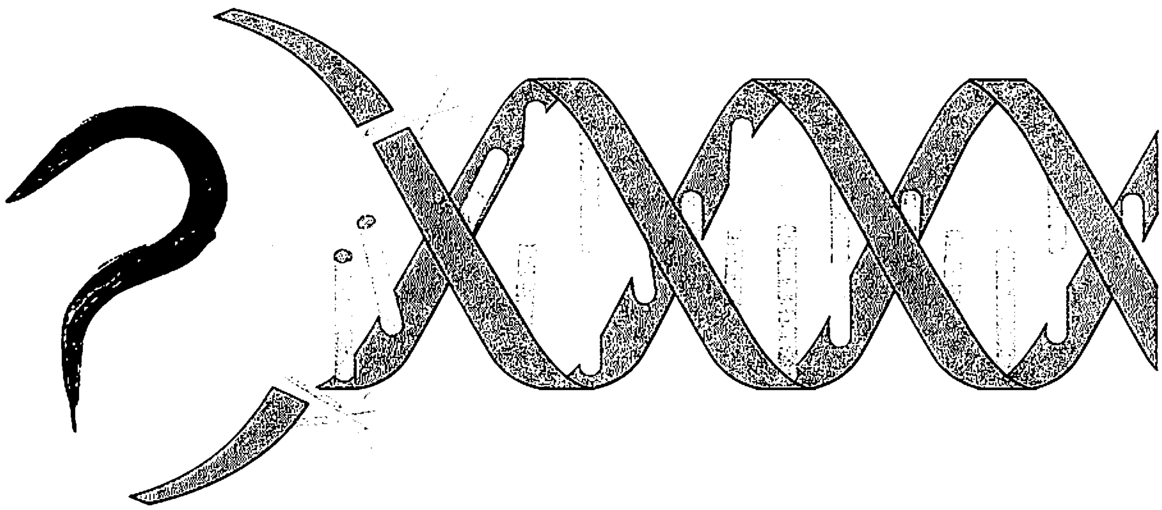
The 2nd

East Asia *C. elegans* Meeting 2006



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East Asia *C.elegans* Meeting 2006

November 15-18, 2006

Hoam Convention Center

Seoul National University, Seoul, KOREA

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Computer simulation of chemotactic neuronal networks in *C. elegans*: Does food-NaCl associative learning lead to changes in the networks?

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Under normal conditions, *C. elegans* produces motion in response to chemical stimuli, e.g., moving toward attractive chemicals and avoiding the noxious ones (chemotaxis). Additionally, *C. elegans* shows associative learning ability: despite the fact that NaCl is typically a soluble attractant to this nematode, after exposure to NaCl in the absence of food, the chemotaxis toward NaCl changes such that it avoids NaCl [Saeki, S. *et al.* 2001]. However, this behavior is not observed in the case of benzaldehyde (a volatile attractant) [Eric, L. *et al.* 2004], although neuronal networks of chemotaxis toward NaCl and benzaldehyde show a partial overlap. We focused on the change in chemotaxis toward NaCl caused by the food-NaCl associative learning and conducted a computer simulation to understand this change at the neuronal network level.

Soluble and volatile chemicals are perceived by different sensory neurons. However, since several interneurons connect with multiple sensory neurons, neuronal networks of chemotaxis toward NaCl and benzaldehyde show a partial overlap. Therefore, the change in chemotaxis caused by the food-NaCl associative learning is hypothesized to be induced mainly in some parts of the neuronal networks.

In this study, to identify these parts of the neuronal networks in which the change is induced, we modeled the chemotactic neuronal networks based on connections of actual *C. elegans* [White, J.G. *et al.* 1986]. The computer simulation of the responses of this model before and after food-NaCl associative learning revealed that this model can be used to replicate the actual responses toward some kinds of chemicals. The preliminary results showed that the signal transduction around the AIY interneuron after the food-NaCl associative learning greatly differed from that before the food-NaCl associative learning. This result is in agreement with the experimental findings of a previous study [Ishihara, T. *et al.* 2002], which suggested that AIY is an important neuron for food-NaCl associative learning. Based on this, we discuss the partial change in the neuronal networks caused by associative learning.