Multimodal properties of photoresponsive neurons in *Onchidium*

Takako Nishi[1], and Kyoko Shimotsu[2]

[1]Laboratory of Physiology, Institute of Natural Sciences, Senshu University, Japan, [2]Department of Neurology, Kagoshima University Graduate School of Medical and Dental Sciences, Japan.

The intrinsically photoresponsive neurons in the abdominal ganglion of mollusk *Onchidium,* named Ip-1 and Ip-2 respond to light with slow hyperpolarizaiton. In the present study, it has shown that ASW with 5% Carbon dioxide (CO_2) evoked depolarization in Ip-2/1. The pH of ASW containing 5% CO_2 dropped from 7.8 to 6.0. Depolarization induced by CO_2 in Ip-2/1 could be caused by acidification (H^+) derived from H_2CO_3, or CO_2 gas itself. Adding H^+ to ASW induced the depolarization in Ip-2/1, under condition in which membrane potentials were depolarized 5-10mV from their resting membrane potentials. On the contrary, ASW containing 5% CO_2 induced depolarization in Ip-2/1 in the wide range of membrane potentials. Furthermore, the effects of CO_2 depend on pH of ASW. These results suggest that the depolarization induced by adding CO_2 are produced by H^+ and CO_2 gas synergistically. Amphibian mollusk *Onchidium* open a pneumostome for aero-breathe. In the previous studies, it has shown that Ip-2/1 activities contribute the pneumostome opening. 5% CO_2 in the air enlarged the pneumostome's opening extremely. The activities of pneumostome could be controlled by multimodal neuron, photoresponsive, H^+ and CO_2-sensing neurons, Ip-2/1.