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Author(s)	HABARA, Yoshiaki; ISHIKAWA, Toru; KITAMURA, Naoki
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### Laboratory of Physiology

Professor : Yoshiaki Habara  
Associate Professor : Toru Ishikawa  
Instructor : Naoki Kitamura

#### *Educational activities*

Veterinary Physiology is one of basic courses which undergraduate students learn just when professional courses begin during their early terms before clinical courses start. Teaching staff mentioned above takes responsibilities for lecture and practice of Physiology for undergraduate students in a wide variety of fields such as General Physiology, Cell Physiology, Vascular and Cardiac Physiology, Respiratory Physiology, Endocrinology, Digestion and Absorption, Renal Physiology, Muscle Physiology, Neurophysiology, Brain function, and Environmental Physiology. For postgraduate students, special courses for Comparative Physiology and Neurophysiology will be offered. Our teaching staff carries on lecture and practice from the comparative and evolutionary point of view in order to explain "The Logic of Life" in various animals. Understanding of "The Logic of Life" will surely be helpful for those students who are trying to be not only basic scientists but also veterinary clinicians.

#### *Research activities*

Our current research themes are as follows ; studies on 1) the role of calcium ion in intracellular signaling system in various cells including secretory cells (Habara), 2) the specific mechanisms of energy metabolism in the brain of ruminants (Habara), 3) the effect of photodynamic action on intracellular signaling system in various cells (Habara), 4) the characterization of ionic channels in epithelial cells (Ishikawa), and 5) the cellular mechanisms of function of adrenal chromaffin and dorsal root ganglion cells (Kitamura). The second project is now processing as a domestic collaboration with Dr. Kenichi Yayou

and Dr. Kiyoshi Takeshita of Hokkaido National Agricultural Experiment Station of the Ministry of Agriculture and Fishery (Sapporo) and the third one is on going as a 3-year international joint research with Dr. Zong Jie Cui of Beijing Normal University (Beijing) and Dr. Yoichi Satoh of Iwate Medical College (Morioka) from 1998. For these scientific interests, we adopt fluorescent ratiometry technique, fluorescence imaging system, in vivo whole body animals, patch clamping technique, molecular biological technique, cell culture methods, in addition to ordinary physiological techniques. Those who are also interested in above projects, you are mostly welcome to contact with our laboratory (phone : 81-11-706-5199, Fax : 81-11-706-5202, e-mail : habara@vetmed.hokudai.ac.jp).

#### Selected recent publication list

- 1) Dual effects of chlorobutanol on secretory response and intracellular  $Ca^{2+}$  dynamics in isolated pancreatic acini of the rat. Habara Y. and Kanno T. *Br. J. Pharmacol.* (1993) 109 : 685-692
- 2) Enhancement of cell killing and increase in cytosolic calcium concentration by combined treatments with hyperthermia and TMB-8 in mouse mammary carcinoma FM3A cells. Kondo T., Kano E., Habara Y. and Kanno T. *Cell Calcium* (1993) 14 : 621-629
- 3) Stimulus-secretion coupling and  $Ca^{2+}$  dynamics in pancreatic acinar cell. Habara Y. and Kanno T. *Gen. Pharmacol.* (1994) 25 : 843-850
- 4) Basolateral  $K^+$  efflux is largely independent of maxi- $K^+$  channels in rat submandibular glands during secretion. Ishikawa T., Murakami M. and Seo Y. *Pflugers Archiv. -Euro. J. Physiol.* (1994) 428 : 516-525
- 5) Carbamylcholine- and catecholamine-induced intracellular calcium dynamics of epithelial cells in mouse ileal crypts. Satoh Y., Habara Y., Ono K. and Kanno T. *Gastroenterol.* (1995) 108 : 1345-1356
- 6) A  $Ca^{2+}$ -activated 23pS potassium channel in a

- human submandibular gland duct cell line (HSG). Ishikawa T. and Cook D. I. *Cell. Physiol. Biochem.* (1995) 5: 232–242
- 7) Ratiometric imaging of  $[Ca^{2+}]_i$  dynamics by UV-laser scanning confocal microscopy in indo-1-loaded rat pancreatic acinus. Habara Y., Nakamura R., Sakaguchi K., Satoh Y. and Kanno T. *Biomedical Res.* (1996) 17: 27–34
  - 8) Lipid secretory mechanisms in the mammalian Harderian gland. Satoh, Y., Gesase, A. P., Habara, Y., Ono, K. and Kanno, T. *Microsc. Res. Tech.* (1996) 34: 104–110
  - 9) Perimetric  $[Ca^{2+}]_i$  rise and exocytosis detected by UV-laser scanning confocal microscopy in rat peritoneal mast cells. Habara Y. and Kanno T. *Experimental Physiol.* (1996) 81: 319–328
  - 10) WW domains of NEDD4 bind to the proline-rich PY motifs in the epithelial  $Na^+$  channel deleted in Liddle's syndrome. Staub O., Dho S., Henry P., Correa J., Ishikawa T. McGlade J. and Rotin D. *EMBO J.* (1996) 15: 2371–2380
  - 11) A bicarbonate-and weak acid-permeable chloride conductance controlled by cytosolic  $Ca^{2+}$  and ATP in rat submandibular acinar cells. Ishikawa T. *J. Membr. Biol.* (1996) 153: 147–159
  - 12) A novel aspect of photodynamic action : induction of recurrent spikes in cytosolic calcium concentration. Cui Z. J., Habara Y., Wang D. Y. and Kanno T. *Photochem. Photobiol.* (1997) 65: 382–386
  - 13) cAMP modulation of a  $Ca^{2+}$ -dependent  $K^+$  conductance in rat submandibular acinar cells. Ishikawa T. *Am. J. Physiol.* (1997) 35: G454–G462
  - 14) Calcium channel subtypes in porcine adrenal chromaffin cells. Kitamura N. Ohta T. Ito S. Nakazato Y. *Pflugers Archiv. - Euro. J. Physiol.* (1997) 434: 179–187
  - 15) Muscarinic and nicotinic receptor-mediated  $Ca^{2+}$  dynamics in rat adrenal chromaffin cells during development. Oomori Y., Habara Y. and Kanno T. *Cell Tissue Res.* (1998) *in press*
  - 16) Calcium channel current facilitation in porcine adrenal chromaffin cells. Kitamura N. Ohta T. Ito S. Nakazato Y. *Pflugers Archiv. -Euro. J. Physiol.* (1998) 435: 781–788