
BIOGRAPHICAL SKETCH

NAME: Takafumi Kawai

POSITION TITLE: Assistant Professor, Department of Physiology, Osaka University, Japan

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
University of Tokyo, Tokyo, Japan	B.S.	04/2002	03/2006	Biology
University of Tokyo, Tokyo, Japan	Ph.D.	04/2006	03/2011	Biology
University of Tokyo, Tokyo, Japan	Post-doc	04/2011	03/2012	Biology
Osaka University, Osaka, Japan	Post-doc	04/2012	10/2014	Biology

A. Personal Statement

I am interested in the significance of “electrical signals” which is mediated by membrane potentials in living organisms. In particular, I am studying the novel biological aspects of voltage-gated ion channels and novel voltage-sensitive molecules. I am doing the research targeting the brain, sperm and other cell types.

B. Positions, Scientific Appointments and Honors

Positions

2010-2012 Japan Society for the Promotion of Science (JSPS) Research Fellowship, The University of Tokyo, Japan

2012-2014 Japan Society for the Promotion of Science (JSPS) Research Fellowship, Osaka university, Japan

2014-present Assistant Professor, Graduate School of Medicine, Osaka University, Japan

2020-present Faculty Lecturer, Graduate School of Medicine, Osaka University, Japan

2021-2022 Visiting Research Scholar, Department of Biochemistry, Duke University, USA

Honors

2014 The best poster award for the 91st Annual Meeting of the Physiological Society of Japan

2021 The 11st Hiroshi and Aya Irisawa Memorial Promotion Award for Young Physiologists.

2022 Narishige Zoological Science Award 2022

Bibliography (main 50 papers):

Original Papers

1. **Kawai T**, Abe H, Wakabayashi K, Oka Y. Calcium oscillations in the olfactory nonsensory cells of the goldfish, *Carassius auratus*. **Biochim Biophys Acta**. 1790(12):1681-1688 (2009)
2. **Kawai T**, Abe H, Akazome Y, Oka Y. Neuromodulatory effect of GnRH on the synaptic transmission of the olfactory bulbar neural circuit in goldfish, *Carassius auratus*. **J Neurophysiol**. 104(6):3540-3550 (2010)
3. **Kawai T**, Abe H, Oka Y Dopaminergic neuromodulation of synaptic transmission between the mitral and granule cells in the teleost olfactory bulb. **J Neurophysiol**. 107(5):1313-1324 (2012)
4. **Kawai T**, Abe H, Oka Y Burst generation mediated by cholinergic input in terminal nerve-gonadotrophin releasing hormone neurones of the goldfish. **J Physiol**. 591(22):5509-5523 (2013)

5. Mutua J, Jinno Y, Sakata S, Okochi Y, Ueno S, Tsutsui H, **Kawai T**, Iwao Y, Okamura Y Functional diversity of voltage-sensing phosphatases in two urodele amphibians. **Physiological Reports**. 2(7) no. e12061 (2014)
6. **Kawai T**, Yoshimura A, Oka Y Neurones in the preoptic area of the male goldfish are activated by a sex pheromone 17 α ,20 β -dihydroxy-4-pregnen-3-one. **J Neuroendocrinol**. 27(2):123-130 (2015)
7. Ratanayotha A, **Kawai T***, Higashijima S, Okamura Y (* corresponding author) Molecular and Functional Characterization of the Voltage-Gated Proton Channel in Zebrafish Neutrophils. **Physiological Reports**. 5(15) no. e13345 (2017)
8. **Kawai T**, Okochi Y, Ozaki T, Imura Y, Koizumi S, Yamazaki M, Abe M, Sakimura K, Yamashita T, Okamura Y Unconventional role of voltage-gated proton channels (VSOP/Hv1) in regulation of microglial ROS production. **J Neurochem**. 142(5):686-699 (2017)
9. **Kawai T**, Tatsumi S, Kihara S, Sakimura K, Okamura Y Mechanistic insight into the suppression of microglial ROS production by voltage-gated proton channels (VSOP/Hv1). **Channels**. 12(1):1-8 (2018)
10. Ratanayotha A, **Kawai T**, Okamura Y. Real-time functional analysis of Hv1 channel in neutrophils: a new approach from zebrafish model. **Am J Physiol**. 316(6) (2019)
11. **Kawai T**, Miyata H, Nakanishi H, Sakata S, Morioka S, Sasaki J, Watanabe M, Sakimura K, Fujimoto T, Sasaki T, Ikawa M, Okamura Y. Polarized PtdIns(4,5)P₂ distribution mediated by a voltage-sensing phosphatase (VSP) regulates sperm motility. **Proc. Natl. Acad. Sci. U. S. A.** 116(51):26020-26028(2019).
12. Kawanabe A, Mizutani N, Polat Onur K, Yonezawa T, **Kawai T**, Mori MX, Okamura Y. Engineering an enhanced voltage-sensing phosphatase. **J Gen Physiol**. 152(5): e201912491 (2020)
13. Sakaguchi T, Okumura R, Ono C, Okuzaki D, **Kawai T**, Okochi Y, Tanimiura N, Murakami M, Kayama H, Umemoto E, Kioka H, Ohtani T, Sakata Y, Miyake K, Okamura Y, Baba Y, Takeda K. TRPM5 Negatively Regulates Calcium-Dependent Responses in Lipopolysaccharide-Stimulated B Lymphocytes. **Cell Reports**. 31(10):107755 (2020)
14. **Kawai T***, Okamura Y (* corresponding author). The Slo3/Lrrc52 complex is sensitive to phosphoinositides. **Channels**. 14(1):1-3 (2020)
15. **Kawai T**, Kayama K, Tatsumi S, Akter S, Miyawaki N, Okochi Y, Abe M, Sakimura K, Yamamoto H, Kihara S, Okamura Y. Regulation of hepatic oxidative stress by voltage-gated proton channels (Hv1/VSOP) in Kupffer cells and its potential relationship with glucose metabolism. **FASEB J**. 34(12):15805-15821 (2020)
16. **Kawai T**, Hashimoto M, Eguchi N, Nishino J, Jinno Y, Mori-Kreiner R, Asp aker M, Chiba D, Ohtsuka Y, Kawanabe A, Nishino A, and Okamura Y Heterologous functional expression of ascidian Nav1 channels and close relationship with the evolutionary ancestor of vertebrate Nav channels. **J Biol Chem**. 296:100783 (2021)
17. **Kawai T***, Takao K, Akter S, Abe M, Sakimura K, Miyakawa T, Okamura Y* (* corresponding author) Heterogeneity of microglial proton channel in different brain regions and its relationship with aging. **J Neurochem**. 157(3):624-641 (2021)
18. **Kawai T***, Narita H, Konno K, Akter S, Andriani R, Iwasaki H, Nishikawa S, Yokoi N, Fukata Y, Fukata M, Wiriyasermkul P, Kongpracha P, Nagamori S, Takao K, Miyakawa T, Abe M, Sakimura K, Watanabe M, Nakagawa A, Okamura Y (* corresponding author) Insight into the function of a unique voltage-sensor protein (TMEM266) and its short form in mouse cerebellum. **Biochem J**. 479(11):1127-1145 (2022).
19. Ratanayotha A, Matsuda M, Kimura Y, Takenaga F, Mizuno T, Hossain MI, Higashijima SI, **Kawai T***, Ogasawara M, Okamura Y* (* corresponding author) Voltage-sensing phosphatase (VSP) regulates endocytosis-dependent nutrient absorption in chordate enterocytes. **Communications Biology**. 5(1):948 (2022).
20. Paixao IC, Mizutani N, Matsuda M, Andriani RT, **Kawai T**, Nakagawa A, Okochi Y, Okamura Y Role of K364 next to the active site cysteine in voltage-dependent phosphatase activity of Ci-VSP. **Biophys J**. 122(11):2267-2284 (2023)
21. Iida A, Tsuda N, Yoshida J, Nomura J, Ratanayotha A, **Kawai T**, Hondo E Glucose absorption activity and gene expression of sugar transporters in the trophotaenia of the viviparous teleost *Xenotoca eiseni*. **Biochim Biophys Acta**. 1867(11):130464 (2023).
22. Yokoyama R, Ago Y, Igarashi H, Higuchi M, Tanuma M, Shimazaki Y, **Kawai T**, Seiriki, Hayashida M, Yamaguchi S, Tanaka H, Nakazawa T, Okamura Y, Hashimoto K, Kasai A, Hashimoto H (R)-ketamine

- restores anterior insular cortex activity and cognitive deficits in social isolation-reared mice. **Molecular Psychiatry**. 29(5):1406-1416 (2024).
23. Ratanayotha A*, Iida A, Nomura J, Hondo E, Okamura Y, **Kawai T*** (* corresponding author) Insight into the function of voltage-sensing phosphatase (VSP) in hind-gut derived pseudoplacenta of a viviparous teleost *Xenotoca eiseni*. **Am. J. Physiol.** 326(6):R461-R471 (2024)
 24. **Kawai T***, Morioka S, Miyata H, Andriani RT, Akter S, Toma G, Nakagawa T, Oyama Y, Iida-Norita R, Sasaki J, Watanabe M, Sakimura K, Ikawa M, Sasaki Y, Okamura Y (*** corresponding author**) The significance of electrical signals in maturing spermatozoa for phosphoinositide regulation through voltage-sensing phosphatase. **Nature Communications**, 15:7289 (2024).
 25. **Kawai T***, Mizutani N, Okamura Y (*** corresponding author**) Voltage- and Ca^{2+} -inducible PLC activity for analyzing $PI(4,5)P_2$ sensitivity of ion channels in *Xenopus* oocytes. **Biochim Biophys Acta**. 1867(1):184396.(2025)
 26. Kaneda E, **Kawai T**, Okamura Y, Miyagawa S Effects of moderate static magnetic fields on the voltage-gated potassium ion channels in sympathetic neuron-like PC12 cells. **Physiological Reports**, 13(6):e70236. (2025)
 27. **Kawai T**, Dong P, Bakhurin K, Yin HH, Yang H Calcium-Activated Ion Channels Drive Atypical Inhibition in Medial Habenula Neurons **Science Advances**, 11(12):eadq2629 (2025)

Reviews

1. **Kawai T**, Oka Y, Eisthen H. The role of the terminal nerve and GnRH in olfactory system neuromodulation. **Zoolog Sci**. 26(10):669-680 (2009)
2. Okamura Y, Kawanabe A, **Kawai T**. Voltage-Sensing Phosphatases: Biophysics, Physiology and Molecular Engineering. **Physiological Reviews**. 98(4):2097-2131 (2018)
3. **Kawai T*** and Okamura Y (* corresponding author) Spotlight on the binding affinity of ion channels for phosphoinositides: From the study of sperm flagellum. **Frontiers in Physiology**. 13:834180 (2022)