

TORU TAKAHATA

Principal Investigator, Zhejiang University, Interdisciplinary Institute of Neuroscience and Technology (ZIINT), 268 Kaixuan Road, Hangzhou, Zhejiang, China 310027

Email: toru_takahata@zju.edu.cn

EDUCATION

Ph.D. in Basic Biology

September, 2005

Department of Life Science, The Graduate University for Advanced Studies (SOKENDAI), Okazaki, Japan

BS, V.M.D.

March, 2002

School of Veterinary Medicine, Hokkaido University, Sapporo, Japan

RESEARCH INTERESTS

Evolution, Development, Neuroscience, Molecular Biology, Anatomy, Physiology

RESEARCH EXPERIENCE

Interdisciplinary Institute of Neuroscience and Technology (ZIINT), Zhejiang University, Hangzhou, China (professor)

November, 2014-present

- Investigated plastic changes after restricted retinal injury.
- Investigated cross-species differences of ocular dominance columns among primates, rodents and tree shrews.

Department of Psychology, Vanderbilt University, Nashville, TN (Postdoc)

April, 2008-October, 2014

- Investigated cross-species differences of V1-selective gene expression among Old World, New World and prosimian primates (Pub.3).
- Investigated cross-species differences of ocular dominance columns among primates, rodents and tree shrews.
- Analyzed histological changes in the brain after restricted retinal laser lesion since infancy in macaques.
- Investigated mRNA expression patterns of vesicular glutamate transporter in sensory

systems of primate brains (Pub.4, 5).

Supervisor/Adviser: Jon H. Kaas, Ph.D., Troy A. Hackett, Ph.D.

Division of Brain Biology, National Institute for Basic Biology (NIBB), Okazaki, Japan (Ph.D. student, Postdoc)

April, 2002-March, 2008

- Studied details of expression pattern of a primate-visual-cortex-enriched gene, *OCC1*, Comparing cell type specificity, activity dependence, species specificity in the expression *OCC1* (Pub.10, 11).
- Also examined expression patterns of family genes of *OCC1* (Pub.8).
- Discovered novel structures within ocular dominance columns in macaque V1 (Pub.7).

The title of Ph.D. thesis: “A comparative analysis of expression patterns of *occ1* mRNA in mammalian brains.”

Mentor/Supervisor: Tetsuo Yamamori, M.D., Ph.D.

Laboratory of Physiology, Department of Biomedical Sciences, Graduate School of Veterinary Medicine, Hokkaido University (V.M.D. student)

April, 2000-March, 2002

- Studied the mechanisms of salivary secretion in the bovine parotid gland, in particular about an intracellular Ca^{2+} -dependent K^+ channel that drives salivary secretion. Identified that SK4/IK1-like channel drives such secretion (Pub.13).
- Examined molecular basis of the salivary secretion with the submandibular gland of rats and found that the same type of channel works in rats as well (Pub.12).

Mentor: Toru Ishikawa, V.M.D., Ph.D.

PUBLICATIONS

1. **Takahata, T.**, and Kaas, J. H. *c-FOS* expression in the visual system of tree shrews after monocular inactivation. (2017) *J Comp Neurol* 525 (1): 151-165
2. **Takahata, T.** What does cytochrome oxidase histochemistry represent in the visual cortex? (2016) *Front Neuroanat* Jul 20; 10: 79
3. Hackett, T. A., Clause, A. R., **Takahata, T.**, Hackett, N. J., and Polley, D. B. Differential maturation of vesicular glutamate and GABA transporter expression in the mouse auditory forebrain during the first weeks of hearing. (2016) *Brain Struct Funct* 221 (5): 2619-2673
4. Laing, R. J., Turecek, J., **Takahata, T.**, and Olavarria, J. F. Identification of eye-specific domains and their relation to callosal connections in primary visual cortex of Long Evans rats. (2015) *Cerebral Cortex* 25 (10): 3314-3329

5. **Takahata, T.**, Miyashita, M., Tanaka, S. and Kaas, J. H. Identification of ocular dominance domains in New World owl monkeys by immediate-early gene expression. (2014) *Proc Natl Acad Sci USA* 111 (11): 4297-4302
6. **Takahata, T.**, Shukla, R., Yamamori, T. and Kaas, J. H. Differential expression patterns of striate-cortex-enriched genes among Old World, New World and prosimian primates. (2012) *Cerebral Cortex* 22 (10): 2313-2321
7. Balaram, P., **Takahata, T.** and Kaas, J. H. VGLUT2 mRNA and protein expression in the visual thalamus and midbrain of prosimian galagos (*Otolemur garnetti*). (2011) *Eye and Brain* 3: 5-15
8. Hackett, T. A., **Takahata, T.** and Balaram, P. VGLUT1 and VGLUT2 mRNA expression in the primate auditory pathway. (2011) *Hearing Research* 274 (1-2): 129-141
9. **Takahata, T.**, Hashikawa, T., Tochitani, S. and Yamamori, T. Differential expression pattern of OCC1-related, extracellular matrix proteins in the lateral geniculate nucleus of macaque monkeys. (2010) *Journal of Chemical Neuroanatomy* 40 (2): 112-122
10. **Takahata, T.**, Higo, N., Kaas, J.H. and Yamamori, T. Expression of immediate-early genes reveals functional compartments within ocular dominance columns after brief monocular inactivation. (2009) *Proc Natl Acad Sci USA* 106 (29): 12151-12155
11. **Takahata, T.**, Komatsu, Y., Watakabe, A., Hashikawa, T., Tochitani, S. and Yamamori, T. Differential expression patterns of *occ1*-related genes in adult monkey visual cortex. (2009) *Cerebral Cortex* 19 (8): 1937-1951
12. Watakabe, A., Komatsu, Y., Sadakane, S., Shimegi, S., **Takahata, T.**, Higo, N., Tochitani, S., Hashikawa, T., Naito, T., Osaki, H., Sakamoto, H., Okamoto, M., Ishikawa, A., Hara, S., Akasaki, T., Sato, H. and Yamamori, T. Enriched expression of serotonin 1B and 2A receptor genes in macaque visual cortex and their bidirectional modulatory effects on neuronal responses. (2009) *Cerebral Cortex* 19 (8): 1915-1928
13. **Takahata, T.**, Hashikawa, T., Higo, N., Tochitani, S. and Yamamori, T. Difference in sensory dependence of *occ1/Follistatin-related protein* expression between macaques and mice. (2008) *Journal of Chemical Neuroanatomy* 35 (1):146-157
14. **Takahata, T.**, Komatsu, Y., Watakabe, A., Hashikawa, T., Tochitani, S. and Yamamori, T. Activity-dependent expression of *occ1* in excitatory neurons is a characteristic feature of the primate visual cortex. (2006) *Cerebral Cortex* 16 (7): 929-940
15. Hayashi, M., Kunii, C., **Takahata, T.** and Ishikawa, T. ATP-dependent regulation of SK4/IK1-like currents in rat submandibular acinar cells: possible role of cAMP-dependent protein kinase. (2004) *American Journal of Physiology (Cell Physiology)* 286:C635-C646
16. **Takahata, T.**, Hayashi, M. and Ishikawa, T. SK4/IK1-like channels mediate TEA-insensitive, Ca²⁺-activated K⁺ currents in bovine parotid acinar cells. (2003) *American Journal of Physiology (Cell Physiology)* 284:C127-C144

PRESENTATIONS

1. **Takahata, T.** What does cytochrome oxidase histochemistry truly represent in the visual cortex? *Society for Neuroscience 45th Annual Meeting*, Chicago McCormick Place, Chicago, IL, October, 2015, poster
2. **Takahata, T.**, Kaas, J. H. Long-term histological changes in macaque primary visual cortex and lateral geniculate nucleus after monocular deprivation produced by restricted retinal lesions shortly after birth. *The 6th FAONS Congress and the 11th Biennial Conference of Chinese Society for Neuroscience*, Wuzhen Zhejiang, China, September, 2015, poster
3. **Takahata, T.**, Kaas, J. H. Laminar segregation of ocular dominance domains in tree shrew V1 revealed by immediate–early gene expression. *The Japanese Neuroscience Society 2015*, July, 2015, Kobe International Exhibition Hall, Kobe, Hyogo, Japan, poster
4. **Takahata, T.**, Hackett, T. Postnatal changes of expression patterns of VGLUT1, VGLUT2 and VGAT1 in mouse visual cortex and thalamus. *Society for Neuroscience 44th Annual Meeting*, Washington Convention Center, Washington D.C., November, 2014, poster
5. **Takahata, T.**, Patel, N. B., Chino, Y. M. and Kaas, J. H. Histological changes in macaque V1 after monocular deprivation produced by restricted retinal lesions and a defocusing lens shortly after birth. *Society for Neuroscience 42nd Annual Meeting*, Ernest N. Morial Convention Center, New Orleans, LA, October, 2012, poster
6. **Takahata, T.**, Shukla, R. M., Yamamori, T. and Kaas, J. H. Evolutionary changes in V1-selective gene expression in primate species. *Society for Neuroscience 41st Annual Meeting*, Washington Convention Center, Washington D.C., November, 2011, poster
7. **Takahata, T.** and Kaas, J. H. Representation of ocular dominance columns in owl monkeys and galagos. *Society for Neuroscience 40th Annual Meeting*, San Diego Convention Center, San Diego, CA, November, 2010, oral
8. **Takahata, T.**, Higo, N., Kaas, J. H. and Yamamori, T. Novel functional architecture within ocular dominance columns revealed by immediate-early gene expression after brief monocular inactivation in monkeys. *Society for Neuroscience 39th Annual Meeting*, Chicago McCormick Place, Chicago, IL, October, 2009, poster
9. **Takahata, T.**, Higo, N., Watakabe, A., Hashikawa, T., Tochitani, S. and Yamamori, T. The effect of short-term monocular deprivation on expression of *occ1*, 5-HTR, *testican*, *GAP-43*, *SCG10*, *zif268*, *c-fos* and *arc* in adult monkey visual cortex and visual thalamus *Society for Neuroscience 38th Annual Meeting*, Washington Convention Center, Washington D.C., November, 2008, poster
10. **Takahata, T.**, Komatsu, Y., Watakabe, A., Hashikawa, T., Tochitani, S. and Yamamori, T. Family genes of *occ1* are expressed in relation to the visual processing pathway in the primate visual cortex and visual thalamus. *Society for Neuroscience 37th Annual Meeting*, San Diego Convention Center, San Diego, CA, November, 2007, poster
11. **Takahata, T.**, Hashikawa, T., Watakabe, A., Tochitani, S and Yamamori, T. The expression of

the primate V1-enriched gene, *occ1*, is strongly dependent on sensory input in macaque V1, but not in mouse visual cortices and subcortical regions: the contrast with immediate-early genes, *c-fos*, and *zif268*, *Society for Neuroscience* 36th Annual Meeting, Atlanta World Congress Center, Atlanta, GE, October, 2006, poster

12. **Takahata, T.**, Komatsu, Y., Watakabe, A. and Yamamori, T. Comparative analysis of transcription patterns of *occ1/frp* in mammalian brains. *Society for Neuroscience* 34th Annual Meeting, San Diego Convention Center, San Diego, CA, October, 2004, poster

AWARDS

- Japan Society for Promotion of Science, Postdoctoral Fellowship, 2010 (2 year-fellowship from April 2011 to March 2013, 5,250,000 JPY per year)
- Naito Foundation, Postdoctoral Fellowship, 2007 (1 year-fellowship from April 2008 to March 2009, 1,000,000 JPY)
- Uehara Memorial Foundation, Postdoctoral Fellowship, 2007 (1 year-fellowship from April 2008 to March 2009, 3,400,000 JPY)
- Daiko Foundation (Nagoya), Scholarship, 2004 (1 year-scholarship from April 2004 to March 2005, 360,000 JPY)

RESEARCH GRANTS

- TOYOBO Biofoundation, Short-Term Research Grants, 2006 (Travel award for SfN meeting, 250,000 JPY)
- Narishige Neuroscience Research Foundation, Research Grant, 2007 (Research grant from April 2007 to March 2008, 300,000 JPY)

TECHNICAL SKILLS

In situ hybridization, immunohistochemistry, cytochrome oxidase staining, RT-PCR, Western blotting, synthesizing cDNA library, plasmid cloning, synthesizing RNA probes for in situ hybridization, sectioning brain tissue, patch clamp

TEACHING EXPERIENCES

Mentoring graduate students

2009-2014 Pooja Balaram (Vanderbilt University)

2011-2014 Daniel J. Miller (Vanderbilt University)

2014 Randall M. Golovin (Vanderbilt University)

Completed the Center for the Integration of Research Teaching and Learning (CIRTL) Network course, Research Mentor Training, on April 9, 2014.

ORGANIZATION OF MEETINGS

2009-2014 Sukiyakini Club (Journal club in the Department of Psychology, Vanderbilt University)

REFERENCES

Anna W. Roe, Ph.D.

Professor, Interdisciplinary Institute of Neuroscience and Technology (ZIINT), Zhejiang University
38 Zheda Road, 505 Zhouyiqing Building, Hangzhou, Zhejiang 310027, China

Phone: +86 (158) 5711-7104

Email: annawang@zju.edu.cn

Jon H. Kaas, Ph.D.

Distinguished Centennial Professor, Department of Psychology, Vanderbilt University
111 21st Avenue South, 301 Wilson Hall, Nashville, TN 37240, U.S.A.

Phone: +1 (615) 292-7936

Email: jon.h.kaas@vanderbilt.edu

Troy A. Hackett, Ph.D.

Associate Professor, Department of Psychology, Vanderbilt University
465 21st Avenue South, 7114 MRB3, Nashville, TN 37232, U.S.A.

Phone: +1 (615) 668-9792

Email: troy.a.hackett@vanderbilt.edu

Tetsuo Yamamori, M.D., Ph.D.

Professor, Division of Brain Biology, the National Institute for Basic Biology (NIBB)
38 Nishigonaka, Myodaiji, Okazaki, Aichi 444-8585, Japan

Phone: +81 (564) 55-7615

Email: yamamori@nibb.ac.jp

Toru Ishikawa, V.M.D., Ph.D.

Professor, Division of Biomedical Science, Department of Basic Veterinary Medicine, Obihiro
University of Agriculture and Veterinary Medicine

11 Nishi 2, Inadacho, Obihiro, Hokkaido 080-8555, Japan

Phone: +81 (155) 49-5356

Email: torui@obihiro.ac.jp

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