



# 8th Summer Research Program in Tsukuba

**July 17- August 1, 2017**

List of Laboratories  
University of Tsukuba



筑波大学生命環境系  
Faculty of Life and  
Environmental Sciences  
University of Tsukuba



## Participating Laboratories

1. **Tokie Anme**  
*International Community Care and Lifespan Development: Empowerment Science*
2. **Shigeru Chiba**  
*Hematology*
3. **Koji Hisatake**  
*Gene Regulation*
4. **Kiong Ho**  
*Molecular Parasitology*
5. **Kenji Irie**  
*Molecular Cell Biology*
6. **Mitsuyasu Kato**  
*Experimental Pathology and Cancer Signaling*
7. **Atsushi Kawaguchi**  
*Infectious Biology*
8. **Makoto Kobayashi**  
*Molecular and Developmental Biology*
9. **Yoshito Kumagai**  
*Environmental Biology*
10. **Masafumi Muratani**  
*Genome Biology*
11. **Michio Nagata**  
*Kidney and Vascular Pathology*
12. **Masayuki Noguchi**  
*Diagnostic Surgical Pathology*
13. **Norihiko Ohbayashi**  
*Physiological Chemistry*
14. **Osamu Ohneda**  
*Regenerative Medicine and Stem Cell Biology*
15. **Akira Shibuya**  
*Immunology*
16. **Fumihiko Sugiyama**  
*Laboratory Animal Science*
17. **Masashi Yanagisawa**  
*Molecular Pharmacology*
18. **Shigeyuki Betsuyaku**  
*Plant Immune Dynamics*
19. **Hiroshi Ezura**  
*Olericulture and Floriculture*
20. **Louis John Irving**  
*Plant Ecophysiology*
21. **Yasuhiro Ishiga**  
*Molecular Plant Pathology*
22. **Yooichi Kainoh**  
*Applied Entomology and Zoology*
23. **Natsuko Kinoshita**  
*Plant Molecular Biology and Chemical Ecology*
24. **Yutaka Kitamura**  
*Food and Biomass Process Engineering*
25. **Yuichi Onda**  
*Isotope Hydrogeomorphology and Radioecology*
26. **Sumiko Sugaya**  
*Pomology*

# 1. International Community Care and Lifespan Development: Empowerment Sciences

**Principal Investigator** Tokie Anme

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## Major Scientific Interests

The notion of empowerment is a useful concept and method, which can cross national and cultural boundaries to be utilized in many different situations. Our lab designed such a framework of community empowerment for life span development, and applied to programs in other countries, with special attention to local cultural values.

Participation by and empowerment of the people in areas of health promotion, family caregiving, housing, and community development will be examined. This is offered in the hope that we may be able to create communities that can meet their own needs, in an interdependent manner that draws on many levels of contribution to make lives worth living across the lifespan, regardless of where we live.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Cross-Cultural Perspectives on Community Care and Health-Social Services
- 2) Lifespan Development and Environment
- 3) Health Promotion and Community Empowerment
- 4) Child and Elderly Abuse Prevention
- 5) Human Interface with Universal Design: Assistive devices, Housing, and Community Environments

## Study Programs for Short Stay Students

- 1) Learning skills how to enhance and evaluate empowerment.
- 2) Field visit on health social settings and implementing empowerment skills.

## Recent Publications:

- 1) Gan-Yadam A, Anme T, et al. Factors Associated with Health Service Utilization in Ulaanbaatar, Mongolia: A Population-Based Survey, *Journal of Epidemiology*, Jul 6, 2013
- 2) Mochizuki Y, Anme T, et al. Effects of Wood Education in a Nursery School with a Focus on Changes in Children and Caregivers' Drawings, *Journal of Psychology and Behavioral Sciences*, 3(6), 2013
- 3) Sugisawa Y, Anme T, et al. Strengths and Difficulties of 30-month-olds and Features of the Caregiver- Child Interaction, *Journal of Health Science*, 3(2), 2013
- 4) Anme T, et al. Validity and Reliability of the Social Skill Scale (SSS) as an Index of Social Competence for Preschool Children, *Journal of Health Science*, 3(1), 2013
- 5) Anme T, Kawashima Y et al. Social Interaction and Dementia Prevention : Six-year Follow-up Study, *Public Health Frontier*, 2(2) , 2013
- 6) Anme T, et al. Validity and Reliability of the Index of Child Care Environment (ICCE), *Public Health Frontier*, 2(6), 2013
- 7) Anme T, et al. Wood products Improve the Quality of Life of Elderly People in Assisted Living, *International Multidisciplinary Scientific GeoConference*, 6, 2013
- 8) Anme T, et al. Validity and Reliability of the Index of Active Listening (IAL), *Journal of Applied Medical Sciences*, 2(2), 2013

## 2. Hematology

**Principal Investigator** Shigeru Chiba

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**Other Faculty Members**

Assistant Professor Naoshi Obara

Assistant Professor Mamiko Sakata-Yanagimoto



### Major Scientific Interests

We are studying molecular pathophysiology of hematologic malignancies, aiming at discovery of druggable molecular targets. Patient-derived samples are among the major research materials. We also produce and analyze mouse models of human hematologic malignancies.

### Projects for Regular Students in Doctoral or Master's Programs

- Analysis of molecular mechanisms in hematologic malignancies
- Analysis of stromal cells involved in the bone marrow failure

### Programs for Short Stay Students (one week ~ one trimester)

- Learn procedures for analyzing progenitor cells from mouse bone marrow by flowcytometry
- Learn blood cell transplantation in mouse model

### Recent Publications

- 1) Pierini A\*, Nishikii H\*, et al., Strober W, Velardi A, Shizuru JA, Wu JY, Chiba S, Negrin RS. Foxp3+ regulatory T cells maintain the bone marrow microenvironment for B cell lymphopoiesis. *Nat Commun*, in press (\*equal contribution)
- 2) Nguyen TB, Sakata-Yanagimoto M, Asabe Y, et al., Noguchi M, Chiba S. Identification of cell-type-specific mutations in nodal T-cell lymphomas. *Blood Cancer J* e516, 2017
- 3) Makishima H, Yoshizato T, Yoshida K, Sekeres MA, et al., Chiba S, Miyano S, Shih LY, Haferlach T, Ogawa S, Maciejewski JP. *Nat Genet* 2016. doi: 10.1038/ng.3742.
- 4) Nagata Y, Kontani K, Enami T, et al., Sakata-Yanagimoto M, et al., Chiba S, Watanabe T, Ogawa S. Variegated RHOA mutations in adult T-cell leukemia/lymphoma. *Blood* 127(5):596-604, 2016
- 5) Chiba S, Enami T, Ogawa S, Sakata-Yanagimoto M. G17V RHOA: Genetic evidence of GTP-unbound RHOA playing a role in tumorigenesis in T cells. *Small GTPases* 6(2):100-3, 2015
- 6) Nishikii H, Kanazawa Y, et al., Negrin R, Chiba S. Unipotent megakaryopoietic pathway bridging hematopoietic stem cells and mature megakaryocytes. *Stem Cells* 33(7):2196-207, 2015
- 7) Kato T, Sakata-Yanagimoto M, Nishikii H, et al., Kageyama R, Chiba S. Hes1 suppresses acute myeloid leukemia development through FLT3 repression. *Leukemia* 29(3):576-85, 2015
- 8) Sakata-Yanagimoto M, Enami T, Yoshida K, et al., Nureki O, Miyano S, Nakamura N, Takeuchi K, Ogawa S, Chiba S. Somatic RHOA mutation in angioimmunoblastic T cell lymphoma. *Nat Genet* 46(2):171-5, 2014

# 3. Gene Regulation

**Principal Investigator** Koji Hisatake

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## Major Scientific Interests

Our group studies the regulation of eukaryotic gene expression, focusing on how transcription regulates cell differentiation. In particular, we are studying the roles of transcription factors and epigenetic changes in regulating iPS cell induction and adipocyte differentiation.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Mechanistic analyses of the roles for Oct4, Sox2, Klf4 and c-myc during iPS cell induction.
- 2) Analyses of epigenetic mechanisms of iPS cell induction.
- 3) Identification and functional analyses of transcription factors involved in adipocyte commitment.
- 4) Role of non-coding RNA in epigenetic regulation during adipocyte differentiation.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Analysis of transcriptional regulation during white and brown adipocyte differentiation.
- 2) Induction of iPS cells using a Sendai virus-based vector.

## Recent Publications

- 1) **Fukuda A**, Shimada M, Nakadai T, **Nishimura K**, **Hisatake K**: Heterogeneous Nuclear Ribonucleoprotein R Cooperates with Mediator to Facilitate Transcription Reinitiation on the c-Fos Gene. **PLoS ONE** 8(8): e72496. doi:10.1371/journal.pone.0072496 (2013).
- 2) Wakao H, Yoshikiyo K, Koshimizu U, Furukawa T, Enomoto K, Matsunaga T, Tanaka T, Yasutomi Y, Yamada T, Minakami H, Tanaka J, Oda A, Sasaki T, Wakao R, Lantz O, Udagawa T, Sekiya Y, Higuchi K, Harada N, **Nishimura K**, Ohtaka M, Nakanishi M, Fujita H: Expansion of Functional Human Mucosal-Associated Invariant T Cells via Reprogramming to Pluripotency and Redifferentiation. **Cell Stem Cell** 12, 546-558 (2013).
- 3) Nishimura T, Kaneko S, Kawana-Tachikawa A, Tajima Y, Goto H, Zhu D, Nakayama-Hosoya K, Iriguchi S, Uemura Y, Shimizu T, Takayama N, Yamada D, **Nishimura K**, Ohtaka M, Watanabe N, Takahashi S, Iwamoto A, Koseki H, Nakanishi M, Eto K, Nakauchi H: Generation of rejuvenated antigen-specific T cells by reprogramming to pluripotency and redifferentiation. **Cell Stem Cell** 12, 114-126 (2013).
- 4) **Nishimura K**, Sano M, Ohtaka M, Furuta B, Umemura Y, Nakajima Y, Ikehara Y, Kobayashi T, Segawa H, Takayasu S, Sato H, Motomura K, Uchida E, Kanayasu-Toyoda T, Asashima M, Nakauchi H, Yamaguchi T, Nakanishi M: Development of defective and persistent Sendai virus vector: a unique gene delivery/expression system ideal for cell reprogramming. **J. Biol. Chem.** 286, 4760-4771 (2011).
- 5) Shimada M, Nakadai T, **Fukuda A**, **Hisatake K**. cAMP-response element-binding protein (CREB) controls MSK1-mediated phosphorylation of histone H3 at the c-fos promoter in vitro. **J. Biol. Chem.** 285, 9390-9401 (2010).

## 4. Molecular Parasitology

**Principal Investigator** Kiong Ho

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### Major Scientific Interests

Our primary research interest is to understand the gene expression of eukaryotic parasites with a goal in identifying parasite-specific processes that can be exploited as targets for novel therapeutic interventions. We have focused on how messenger RNA acquire 5' cap in the protozoan parasites that responsible for malaria and sleeping sickness. The structure and mechanism of protozoan capping enzyme is completely different from human host, and thus, capping is an attractive target for anti-protozoal drug discovery. We are also investigating the mechanism of RNA repair and recombination. RNA ligase is the key enzyme that joins the broken RNAs together. We are characterized three separate types of RNA ligases from various species and our immediate goal is to define how these ligases recognize the breaks in the RNA and to identify what types of RNA are repaired in the cell.

### Projects for Graduate Students

- 1) Dissecting the mechanism of hypermethylated cap 4 synthesis in *Trypanosome brucei*.
- 2) Characterization of *T.brucei* capping enzyme complex with transcription and RNA processing factors.
- 3) Defining the physiological targets for RNA ligase through genome wide screening.

### Study Programs for Short Stay Students

- 1) Screening of small molecule inhibitor against malaria and sleeping sickness.
- 2) Regulation of gene expression by cytoplasmic mRNA recapping.
- 3) Defining the optimal RNA substrates for RNA ligase.

### Selected Publications

- 1) Gu H, Yoshinari S, Ghosh R, Murakami KS, Ignatichkina AV, Gollnick P and Ho CK. (2016) Structural and Mutational Analysis of Archaeal ATP-dependent RNA ligase Identifies Amino Acid Required for RNA Binding and Catalysis. *Nucleic Acid Res.* 44: 2337 - 2347.
- 2) Smith P, Ho CK, Takagi Y, Djaballah H, and Shuman S. (2016) Nanomolar Inhibitors of *Trypanosoma brucei* RNA Triphosphatase. *mBIO* 7: e000058-16
- 3) Ignatichkina AV, Takagi Y, Liu Y, Nagata K, and Ho CK. (2015) The Messenger RNA Decapping and Recapping Pathway in *Trypanosoma*. *Proc. Natl. Acad. Sci. USA*
- 4) Torchea C, Takagi Y and Ho CK. Archaea RNA Ligase is a Homodimeric Protein that Catalyzes Intramolecular Ligation of Single-Stranded RNA and DNA. (2008) *Nucleic Acid Res.* 36: 6218 - 6227.
- 5) Takagi Y, Sindkar S, Ekonomidis D, Hall MP and Ho CK. (2007) *Trypanosoma brucei* Encodes a Bifunctional Capping Enzyme Essential for Cap 4 Formation on the Spliced Leader RNA. *J. Biol. Chem*; 282: 15995-16005.
- 6) Hall MP and Ho CK. (2006) Functional Characterization of a 48-kDa *Trypanosoma brucei* Cap 2 RNA Methyltransferase. *Nucleic Acid Res.* 2006 34: 5594 - 5602.
- 7) Pfeffer S, Sewer A, Lagos-Quintana M, Sheridan R, Sander C, Grässer FA, van Dyk LF, Shuman S, Ho CK, Chien M, Russo JJ, Ju J, Randall G, Lindenbach BD, Rice CM, Simon V, Ho DD, Zavolan M, and Tuschl T. Identification of the MicroRNAs of the Herpesvirus Family. *Nature Method* 2005; 2: 269-276.



# 5. Molecular Cell Biology

**Principal Investigator** Kenji Irie

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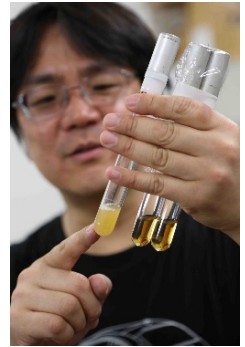
**URL** <http://www.md.tsukuba.ac.jp/public/basic-med/molcellbiol/index.html>

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## Major Scientific Interests

- Post-transcriptional regulation of gene expression by RNA-binding proteins
- Molecular mechanism of mRNA localization and local translation regulating cell polarity, asymmetric cell division, and cell-fate
- Regulation of the endoplasmic reticulum stress response by protein kinases
- Prospore membrane formation by vesicle docking

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Post-transcriptional regulation of gene expression by the Ccr4-Not complex in yeast.
- 2) Regulation of the endoplasmic reticulum stress response by protein kinases.
- 3) Roles of yeast Ataxin-2 ortholog, Pbp1, in the control of mRNA stability and translation.
- 4) Roles of decapping activators in the control of mRNA stability and translation.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Yeast genetic approaches including the isolation and characterization of mutants, tetrad analysis, complementation, and mitotic recombination.
- 2) Molecular genetic techniques including yeast transformation, gene knockout, and generation of mutations in cloned genes.
- 3) Molecular biology and biochemistry techniques analyzing gene expression including Northern blotting, RT-PCR, and Western blotting.
- 4) Imaging yeast cells using indirect immunofluorescence and GFP-protein fusions.

## Recent Publications

- 1) Kimura Y, Irie K, Mizuno T. Expression control of the AMPK regulatory subunit and its functional significance in yeast ER stress response. *Sci Rep*. 2017 in press
- 2) Duy DL, Suda Y, Irie K. Cytoplasmic Deadenylase Ccr4 is Required for Translational Repression of LRG1 mRNA in the Stationary Phase. *PLoS One*. 2017 Feb 23;12(2):e0172476.
- 3) Ito Y, Kitagawa T, Yamanishi M, Katahira S, Izawa S, Irie K, Furutani-Seiki M, Matsuyama T. Enhancement of protein production via the strong DIT1 terminator and two RNA-binding proteins in *Saccharomyces cerevisiae*. *Sci Rep*. 2016 Nov 15;6:36997.
- 4) Lien PT, Izumikawa K, Muroi K, Irie K, Suda Y, Irie K. Analysis of the Physiological Activities of Scd6 through Its Interaction with Hmt1.. *PLoS One*. 2016 Oct 24;11(10):e0164773.
- 5) Li X, Ohmori T, Irie K, Kimura Y, Suda Y, Mizuno T, Irie K. Different Regulations of ROM2 and LRG1 Expression by Ccr4, Pop2, and Dhh1 in the *Saccharomyces cerevisiae* Cell Wall Integrity Pathway. *mSphere*. 2016 Sep 28;1(5).
- 6) Mizuno T, Masuda Y, Irie K. The *Saccharomyces cerevisiae* AMPK, Snf1, Negatively Regulates the Hog1 MAPK Pathway in ER Stress Response. *PLoS Genet*. 2015 Sep 22;11(9):e1005491.
- 7) Kimura Y, Irie K, Irie K. Pbp1 is involved in Ccr4- and Khd1-mediated regulation of cell growth through association with ribosomal proteins Rpl12a and Rpl12b. *Eukaryot Cell*. 2013 Jun;12(6):864-74

## 6. Experimental Pathology and Cancer Signaling

**Principal Investigator** Mitsuyasu Kato

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Assistant Professor Yukihide Watanabe: y-watanabe@md.tsukuba.ac.jp

Assistant Professor Christopher Hipolito: hipolito@md.tsukuba.ac.jp



### Major Scientific Interests

The roles of transforming growth factor- $\beta$  related molecules (TMEPAI, MAFK/GPNMB, THG-1) in cancer stem cells. Establishment of novel cancer therapies targeting cancer stem cells using macrocyclic peptide screening technology.

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Molecular mechanisms of TGF- $\beta$  related molecules (TMEPAI, MafK, GPNMB) in stem cell maintenance and carcinogenesis.
- 2) Molecular mechanisms of TGF- $\beta$  related molecules (THG-1 etc.) in squamous cell carcinoma formation.
- 3) Macrocyclic peptides screening for the establishment of live imaging probes and molecular targeting therapy.

### Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Tissue preparation, Immunohistochemistry and 3D reconstruction
- 2) *In vitro* tumorigenic activities (cell proliferation, sphere assay, Matrigel invasion assay, etc.) of TMEPAI, MAFK, GPNMB, THG-1 and so on.

### Recent Publications

- 1) Okita Y, Kimura M, Xie R, Chen C, Shen LTW, Kojima Y, Suzuki H, Muratani M, Saitoh M, Semba K, Heldin C-H, and **Kato M**. The transcription factor MAFK induces EMT and malignant progression of triple-negative breast cancer cells through its target GPNMB. **Sci. Signal.** 10, eaak9397, 2017.
- 2) Yoon JH, Sudo K, Kuroda M, **Kato M**, Lee IK, Han JS, Nakae S, Imamura T, Kim J, Ju JH, Kim DK, Matsuzaki K, Weinstein M, Matsumoto I, Sumida T, Mamura M. Phosphorylation status determines the opposing functions of Smad2/Smad3 as STAT3 cofactors in TH17 differentiation. **Nat Commun.** 6: 7600, 2015.
- 3) Vo Nguyen TT, Watanabe Y, Shiba A, Noguchi M, Itoh S and **Kato M**. TMEPAI/PMEPAI enhances tumorigenic activities in lung cancer cells. **Cancer Sci.** 105: 334-341, 2014.
- 4) Okita Y, Kamoshida A, Suzuki H, Itoh K, Motohashi H, Igarashi K, Yamamoto M, Ogami T, Koinuma D, and **Kato M**. Transforming Growth Factor- $\beta$  induces transcription factors MafK and Bach1 to suppress expression of the heme oxygenase-1 gene. **J. Biol Chem.** 288: 20658-20667, 2013.
- 5) Itoh F, Itoh S, Adachi T, Ichikawa K, Matsumura Y, Takagi T, Festing M, Watanabe T, Weinstein M, Karlsson S and **Kato M**. Smad2/Smad3 in endothelium is indispensable for vascular stability via S1PR1 and N-cadherin expressions. **Blood.** 119: 5320-5328, 2012.
- 6) Nakano N, Itoh S, Watanabe Y, Maeyama K, Itoh F, and **Kato M**. Requirement of TCF7L2 for TGF- $\beta$ -dependent transcriptional activation of the TMEPAI gene. **J Biol Chem.** 285: 38023-38033, 2010.
- 7) Watanabe Y, Itoh S, Goto T, Ohnishi E, Inamitsu M, Itoh F, Satoh K, Wiercinska E, Yang W, Shi L, Tanaka A, Nakano N, Mommaas AM, Shibuya H, ten Dijke P, and **Kato M**. TMEPAI, a transmembrane TGF- $\beta$ -inducible protein, sequesters Smad proteins from active participation in TGF- $\beta$  signaling. **Mol. Cell** 37: 123-134, 2010.



## 7. Infection Biology

**Principal Investigator** Atsushi Kawaguchi

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### Other Faculty Members

Associate Professor Mitsuru Okuwaki

Assistant Professor Shoko Saito, Kohsuke Kato



### Major Scientific Interests

The research aim of this group is to understand the molecular mechanism of replication and pathogenicity of animal viruses such as influenza virus, adenovirus, etc. The structure and function of virus-encoded factors and host cell-derived factors involved in the above processes are being studied at the atomic, molecular, cellular, and body levels. In addition, we are particularly interested in clarifying the physiological function of identified host factors such as chromatin regulators, molecular chaperones, etc. as well as their roles in infection.

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Identification of novel factors in virus replication and host immune system.
- 2) Control of virus diseases based on the knowledge of host defense systems, or through development of novel anti-viral drugs
- 3) Regulatory mechanism for the structure and function of chromatin
- 4) Leukemogenic mechanism by chromosomal translocation

### Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Molecular mechanism of host factors involved in influenza virus replication
- 2) Molecular mechanism of host inflammatory responses against influenza virus infection
- 3) Action mechanism of an anti-virus drug

### Selected Recent Publications

- 1) Asaka MN, Kawaguchi A, Sakai Y, Mori K, Nagata K. Polycomb repressive complex 2 facilitates the nuclear export of the influenza viral genome through the interaction with M1. *Sci. Rep.*, 2016; 6: 33608.
- 2) Kawaguchi A, Hirohama M, Harada Y, Osari S, Nagata K. Influenza virus induces cholesterol-enriched endocytic recycling compartments for budozone formation via cell-cycle independent centrosome maturation. *PLoS Pathog.*, 2015; 11: e1005284.
- 3) Sugiyama K, Kawaguchi A, Okuwaki M, Nagata K. pp32 and APRIL are host cell-derived regulators of influenza virus RNA synthesis from cRNA. *eLife*, 2015; 4: e08939.
- 4) Kawaguchi A, Asaka MN, Matsumoto K, Nagata K. Centrosome maturation requires YB-1 to regulate dynamic instability of microtubules for nucleus reassembly. *Sci. Rep.*, 2015; 5: 8768.
- 5) Kawaguchi A, Matsumoto K, Nagata K. YB-1 functions as a porter to lead influenza virus ribonucleoprotein complexes to microtubules. *J. Virol.*, 2012; 86: 11086-11095.
- 6) Sugiyama K, Obayashi E, Kawaguchi A, Tame JRH, Nagata K, Park SY. Structural insight into a novel subunit contact within influenza virus RNA polymerase. *EMBO J.*, 2009; 28: 1803-1811.
- 7) Obayashi E, Yoshida H, Kawai F, Shibayama N, Kawaguchi A, Nagata K, Tame JRH, Park SY. The structural basis for an essential subunit interaction in influenza virus RNA polymerase. *Nature*, 2008; 454: 1127-1131.

## 8. Molecular and Developmental Biology

**Principal Investigator** Makoto Kobayashi

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### Major Scientific Interests

- Stress response and gene regulation in the cellular defense system
- Epigenetic regulation in the cell-fate determination

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Defense against a variety of stresses: oxidative stress, ER stress, autophagy defect, heavy metals, ...
- 2) Functional foods and healthy life expectancy
- 3) Development of hematopoietic stem cells
- 4) Development of internal organs: liver, pancreas, gill, ...

### Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Whole body expression analyses of anti-stress or hematopoietic genes in zebrafish
- 2) Examination of toxicity/medicinal effects of active ingredients in foods or drugs using zebrafish
- 3) Investigation of hematopoietic stem cell generation using transgenic GFP zebrafish

### Recent Publications

- 1) Fuse Y and **Kobayashi M.** (2017) Conservation of the Keap1-Nrf2 system: An Evolutionary Journey through Stressful Space and Time. *Molecules* 22: 436.
- 2) Fuse Y, Nguyen VT and **Kobayashi M.** (2016) Nrf2-dependent protection against acute sodium arsenite toxicity in zebrafish. *Toxicol Appl Pharmacol* 305: 136-142.
- 3) Nguyen TV, Fuse Y, Tamaoki J, Akiyama S, Muratani M, Tamaru Y and **Kobayashi M.** (2016) Conservation of the Nrf2-mediated gene regulation of proteasome subunits and glucose metabolism in zebrafish. *Oxid Med Cell Longev* 2016: 5720574
- 4) Takeuchi M, Fuse Y, Watanabe M, Andrea CS, Takeuchi M, Nakajima H, Ohashi K, Kaneko H, Kobayashi-Osaki M, Yamamoto M and **Kobayashi M.** (2015) LSD1/KDM1A promotes hematopoietic commitment of hemangioblasts through downregulation of Etv2. *Proc Natl Acad Sci USA* 112: 13922-13927.
- 5) Fuse Y, Nakajima H, Nakajima-Takagi Y, Nakajima O and **Kobayashi M.** (2015) Heme-mediated inhibition of Bach1 regulates the liver specificity and transience of the Nrf2-dependent induction of zebrafish heme oxygenase 1. *Genes Cells* 20: 590-600.
- 6) Mukaigasa K, Nguyen LTP, Li L, Nakajima H, Yamamoto M and **Kobayashi M.** (2012) Genetic evidence of an evolutionarily conserved role for Nrf2 in the protection against oxidative stress. *Mol Cell Biol* 32: 4455-4461.
- 7) Nakajima H, Nakajima-Takagi Y, Tsujita T, Akiyama S, Wakasa T, Mukaigasa M, Kaneko H, Tamaru Y, Yamamoto M and **Kobayashi M.** (2011) Tissue-restricted induction of Nrf2 and its target genes in zebrafish with gene-specific variations in the induction profiles. *PLoS ONE* 6: e26884.

## 9. Environmental Biology

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**Other Faculty Members** Assistant Professors, Yasuhiro Shinkai, Yumi Abiko, and Masahiro Akiyama; Junior Assistant Professor Takamitsu Unoki



### Major Scientific Interests

We focus on preventive medicine through reduction of environmental risks and elucidation of signaling alterations by environmental electrophiles and regulatory mechanisms.

### Projects for Regular Students in Doctoral and Master's Programs

- 1) Elucidation of biological response systems elicited by environmental electrophiles and mechanisms underlying disruption of these systems.
- 2) Elucidation of mechanisms regulating the threshold of redox signaling activated by environmental electrophiles.

### Study Programs for Short Stay Students

- 1) Assays to evaluate existence of reactive sulfur species to capture environmental electrophiles.
- 2) Analysis of S-modification of protein by electrophiles using UPLC-MS/MS

### Recent Publications

- 1) Abiko Y, Sha L, Shinkai Y, Unoki T, Luong CN, Tsuchiya Y, Watanabe Y, Hirose R, Akaike T, **Kumagai Y**. 1,4-Naphthoquinone activates the HSP90/HSF1 pathway through the S-arylation of HSP90 in A431 cells: Negative regulation of the redox signal transduction pathway by persulfides/polysulfides. *Free Radic Biol Med*. 2017; 104: 118-128.
- 3) Shinaki Y, Masuda A, Akiyama M, Xian M, **Kumagai Y**. Cadmium-mediated activation of the HSP90/HSF1 pathway regulated by reactive persulfides/polysulfides. *Toxicol Sci*. 2017; in press.
- 4) **Kumagai Y**, Abiko Y. Environmental electrophiles: protein adducts, modulation of redox signaling and interaction with persulfides/polysulfides. *Chem Res Toxicol*. 2017; 30: 203-219.
- 5) **Kumagai Y**, Abiko Y, Luong CN. Chemical toxicology of reactive species in the atmosphere: two decades of progress in an electron acceptor and an electrophile. *J Toxicol Sci*. 2016; 41: SP37-SP47.
- 6) Abiko Y, Lin FY, Lee H, Puga A, **Kumagai Y**. Quinone-mediated induction of cytochrome P450 1A1 in HepG2 cells through increased interaction of aryl hydrocarbon receptor with aryl hydrocarbon receptor nuclear translocator. *J Toxicol Sci*. 2016; 41: 775-781.

# 10. Genome Biology

**Principal Investigator** Masafumi Muratani

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## Major Scientific Interests

We develop methods for genome and epigenome analysis of limited samples. Main area of application is characterization of clinical tissue samples from Tsukuba Human Tissue Bank. We try to link histopathological features of human diseases to regulatory status of the genome.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Clinical sample analysis using chromatin immunoprecipitation combined with 2<sup>nd</sup> generation sequencing (ChIPseq) and RNAseq, data analysis and validation of potential disease biomarkers.
- 2) Genomics and epigenomics analysis of human and experimental mouse samples at single-cell resolution.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Access to genomics databases, integrative analysis of regulatory regions, gene expression and genetic variations.
- 2) Genomics and epigenomics assays, chromatin immunoprecipitation, RNA assays and genotyping.

## Selected Publications

- 1) Kumar V\*, Rayan NA\*, Muratani M\*, Lim S, Elanggovan B, Lixia X, Lu T, Makhija H, Poschmann J, Lufkin T, Ng HH, Prabhakar S. Comprehensive benchmarking reveals H2BK20 acetylation as a distinctive signature of cell-state-specific enhancers and promoters. *Genome Res.* pii: gr.201038.115, 2016. (\*Equal contribution)
- 2) Kakran M\*, Muratani M\*, Tng WJ, Liang H, Trushina DB, Sukhorukov GB, Ng HH, Antipina MN. Layered polymeric capsules inhibiting the activity of RNases for intracellular delivery of messenger RNA. *J. Mater. Chem. B.* Vol.3, 5842-5848, 2015. (\*Equal contribution)
- 3) Muratani M, Deng N, Ooi WF, Lin SJ, Xing M, Xu C, Qamra A, Tay ST, Malik S, Wu J, Lee MH, Zhang S, Tan LL, Chua H, Wong WK, Ong HS, Ooi LL, Chow PK, Chan WH, Soo KC, Goh LK, Rozen S, Teh BT, Yu Q, Ng HH, Tan P. Nanoscale chromatin profiling of gastric adenocarcinoma reveals cancer-associated cryptic promoters and somatically acquired regulatory elements. *Nat Commun.* 5:4361, 2014.
- 4) V. Kumar, M. Muratani, N.A. Rayan, P. Kraus, T. Lufkin, H.H. Ng, S. Prabhakar. Uniform, optimal signal processing of mapped deep-sequencing data. *Nature Biotechnology*, Vol.31(7), 615-22, 2013
- 5) J.H. Ng\*, V. Kumar\*, M. Muratani\*, P. Kraus, J.C. Yeo, L.P. Yaw, K. Xue, T. Lufkin, S. Prabhakar, H.H. Ng: In vivo epigenomic profiling of germ cells reveals germ cell molecular signatures, *Developmental Cell*, Vol.24(3), 324-33, 2013 (\*Equal contribution)

# 11. Kidney and Vascular Pathology

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## Major Scientific Interests

Kidney pathology is the main issue in our group.

Current interests include podocyte pathology, pathophysiology of FSGS, systemic vasculitis (ANCA-related) and cystogenesis in polycystic kidney.

Vascular pathology in chronic kidney disease is another focus in our group.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Pathophysiology and molecular mechanisms of focal segmental glomerulosclerosis from the view of podocyte and parietal cell transdifferentiation.
- 2) Morphologic investigation in systemic vascular changes and kidney injury.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Diagnosis of human kidney biopsy samples according to the specific interest.
- 2) Immunohistochemistry and molecular biologic techniques using podocyte-specific transgenic animals.

## Recent Publications

- 1) Hara S, Kobayashi N, Sakamoto K, Ueno T, Manabe S, Takashima Y, Hamada J, Pastan I, Fukamizu A, Matsusaka T, **Nagata M**. Podocyte injury-driven lipid peroxidation accelerates the infiltration of glomerular foam cells in focal segmental glomerulosclerosis. *Am J Pathol*. 2015 in press
- 2) Kobayashi N, Ueno T, Ohashi K, Yamashita H, Takahashi Y, Sakamoto K, Manabe S, Hara S, Takashima Y, Dan T, Pastan I, Miyata T, Kurihara H, Matsusaka T, Reiser J, **Nagata M**. Podocyte injury-driven intracapillary PAI-1 accelerates podocyte loss via uPAR mediated beta 1 integrin endocytosis. *Am J Physiol Renal Physiol*. 2015 15;308(6):F614-26.
- 3) Sakamoto K, Ueno T, Kobayashi N, Hara S, Takashima Y, Pastan I, Matsusaka T, **Nagata M**. The direction and role of phenotypic transition between podocytes and parietal epithelial cells in focal segmental glomerulosclerosis. *Am J Physiol Renal Physiol*. 2014 Jan 1;306(1):F98-F104.
- 4) Hara S, Umeyama K, Yokoo T, Nagashima, **Nagata M**. Diffuse glomerular nodular lesions in diabetic pigs carrying a dominant-negative mutant hepatocyte nuclear factor 1-alpha, an inheritant diabetic gene in humans. *PLoS One*. 2014 Mar 19;9(3):e92219.
- 5) Hara S, Kawano M, Mizushima I, Yamada K, Fujita K, Harada K, Matsumura M, Yamagishi M, Sato Y, Yamaguchi Y, Nakanuma Y, **Nagata M**. A condition closely mimicking IgG4-related disease despite the absence of serum IgG4 elevation and IgG4-positive plasma cell infiltration. *Mod Rheumatol*. 2014 Jun 2:1-6.
- 6) Iijima K, Sako M, Oba MS, Ito S, Hataya H, Tanaka R, Ohwada Y, Kamei K, Ishikura K, Yata N, Nozu K, Honda M, Nakamura H, **Nagata M**, Ohashi Y, Nakanishi K, Yoshikawa N Cyclosporine C2 monitoring for the treatment of frequently relapsing nephrotic syndrome in children: a multicenter randomized phase II trial.; Japanese Study Group of Kidney Disease in Children. *Clin J Am Soc Nephrol*. 2014 Feb;9(2):271-8.



## 12. Diagnostic Surgical Pathology

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### **Major Scientific Interests**

Molecular pathology of multistep carcinogenesis

Studies of the initial genetic alterations of precancerous lesions and early carcinoma

Studies of the interactions between cancer cells and interstitial cells

### **Projects for Regular Students in Doctoral or Master's Programs**

- Analysis for the molecular mechanisms of pulmonary adenocarcinogenesis. Screening of the differentially expressed genes and proteins between early adenocarcinoma of the lung (*in situ* adenocarcinoma) and early advanced tumors.
- Produce monoclonal antibodies against fetal swine to screen for specific antibodies against human carcinomas.
- *In vitro* and *in vivo* studies of the molecular mechanisms of the reproduction of liver tissue.

### **Study Programs for Short Stay Students (one week ~ one trimester)**

- Basic techniques of immunohistochemistry, and FISH
- Basic techniques of tissue micro-dissection

### **Recent Publications**

- 1) Sato T, Shiba-Ishii A, Kim Y, Dai T, Husni RE, Hong J, Kano J, Sakashita S, Iijima T, Noguchi M, miR-3941: A novel microRNA that controls IGBP1 expression and is associated with malignant progression of lung adenocarcinoma. **Cancer Sci** 108:536-542, 2017.
- 2) Iyama S, Ono M, Kawai-Nakahara H, Husni RE, Dai T, Shiozawa T, Sakata A, Kohrogi H, Noguchi M, Drebrin: A new oncofetal biomarker associated with prognosis of lung adenocarcinoma. **Lung Cancer** 102:74-81, 2016.
- 3) Shiozawa T, Iyama S, Toshima S, Sakata A, Usui S, Minami Y, Sato Y, Hizawa N, Noguchi M, Dimethylarginine dimethylaminohydrolase 2 promotes tumor angiogenesis in lung adenocarcinoma. **Virchows Archiv**. 468:179-190, 2016.
- 4) Husni RE, Shiba-Ishii A, Iyama S, Shiozawa T, Kim Y, Nakagawa T, Sato T, Kano J, Minami Y, Noguchi M, DNMT3a expression pattern and its prognostic value in lung adenocarcinoma. **Lung Cancer** 97:59-65, 2016.
- 5) Shiba-Ishii A, Kim Y, Shiozawa T, Iyama S, Satomi K, Kano J, Sakashita S, Morishita Y, Noguchi M, Stratifin accelerates progression of lung adenocarcinoma at an early stage. **Mol Cancer** 14:142-147, 2015.
- 6) Shiba-Ishii A and Noguchi M, Aberrant Stratifin overexpression is regulated by tumor-associated CpG demethylation in lung adenocarcinoma. **Am J Pathol** 180:1653-1662, 2012.



# 13. Physiological Chemistry

**Principal Investigator** Norihiko Ohbayashi

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## Major Scientific Interest

Studies on regulatory mechanisms and physiological functions of membrane trafficking systems through small GTP-binding proteins such as Rabs and Arfs.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Physiological functions of the small GTP-binding proteins (Rabs and Arf6) and their regulators in tumorigenesis/metastasis, morphogenesis, and neural plasticity.
- 2) Regulatory mechanisms of ubiquitylation of cargo proteins in the recycling system.
- 3) Molecular mechanisms of biogenesis of melanin-containing organelles through Rab small GTP-binding proteins.
- 4) Development of specific agonists/antagonists for certain small GTP-binding proteins.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Enzyme assay and imaging of molecules regulating membrane trafficking systems.
- 2) Assays for cell functions such as cell proliferation, cell motility, focal adhesion, secretion, endocytosis, exocytosis, recycling, etc.

## Recent Publication

- 1) Marubashi S, Shimada H, Fukuda M, **Ohbayashi N**. RUTBC1 Functions as a GTPase-activating Protein for Rab32/38 and Regulates Melanogenic Enzyme Trafficking in Melanocytes. *J Biol Chem*. 291, 1427-40, (2016).
- 2) Miura Y, Hongu T, Yamauchi Y, Funakoshi Y, Katagiri N, **Ohbayashi N**, **Kanaho Y**. ACAP3 regulates neurite outgrowth through its GAP activity specific to Arf6 in mouse hippocampal neurons. *Biochem J*. 473, 2591-602, (2016).
- 3) Marubashi S, **Ohbayashi N**, Fukuda M. A Varp-Binding Protein, RACK1, Regulates Dendrite Outgrowth through Stabilization of Varp Protein in Mouse Melanocytes. *J Invest Dermatol*. 136, 1672-80, (2016).
- 4) Okada R, Yamauchi Y, Hongu T, Funakoshi Y, **Ohbayashi N**, Hasegawa H, **Kanaho Y**. Activation of the Small G Protein Arf6 by Dynamin2 through Guanine Nucleotide Exchange Factors in Endocytosis. *Sci Rep*. 27, 14919, (2015).
- 5) Yatsu A, Shimada H, **Ohbayashi N**, Fukuda M. Rab40C is a novel Varp-binding protein that promotes proteasomal degradation of Varp in melanocytes. *Biol Open*. 4, 267-75, (2015).
- 6) Hongu T, Funakoshi Y, Fukuhara S, Suzuki T, Sakimoto S, Takakura N, Ema M, Takahashi S, Itoh S, Kato M, Hasegawa H, Mochizuki N, **Kanaho Y**. Arf6 regulates tumour angiogenesis and growth through HGF-induced endothelial  $\beta 1$  integrin recycling. *Nat Commun*. 6, 7925, (2015).
- 7) Ishida M, **Ohbayashi N**, Fukuda M. Rab1A regulates anterograde melanosome transport by recruiting kinesin-1 to melanosomes through interaction with SKIP. *Sci Rep*. 5, 8238, (2015).
- 8) Funakoshi Y, Chou MM, **Kanaho Y**, Donaldson JG. TRE17/USP6 regulates ubiquitylation and trafficking of cargo proteins that enter cells by clathrin-independent endocytosis. *J Cell Sci*. 127, 4750-61, (2014).

# 14. Regenerative Medicine and Stem Cell Biology

**Principal Investigator** Osamu Ohneda

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## **Major Scientific Interests**

- 1) Identification and analyses of functional stem cells for cell therapy in human tissues
- 2) Hypoxic responses in stem cell development and tumor development

## **Projects for Regular Students in Doctoral or Master's Programs:**

- 1) Analysis of functional stem cells (MSC and EPC) for clinical application
- 2) Analysis of how hypoxic inducible factors (HIFs) are involved in stem cell development
- 3) Analysis of how HIFs are involved in tumor development (tumor and tumor endothelial cell)

## **Summer School Course (2016)**

- 1) Analysis of Mesenchymal Stem Cells
- 2) Neural Differentiation of human iPS

## **Recent Publications:**

- 1) Akimoto K, Kimura K, Nagano M, Takano S, Salazar G, Yamashita T, and Ohneda O. Umbilical cord blood-derived mesenchymal stem cells inhibit, but adipose tissue-derived mesenchymal stem cells promote, glioblastoma multiforme proliferation. **Stem Cells and Dev.** 2013; 22: 1370-1386.
- 2) Tu T, Kimura K, Nagano M, Yamashita T, Ohneda K, Sugimori H, Sato F, Sakakibara Y, Hamada H, Yoshikawa H, Son H, and Ohneda O. Identification of human placenta-derived mesenchymal stem cells involved in re-endothelialization. **J Cell Physiol.** 2011; 226: 224-235.
- 3) Nagano M, Kimura K, Yamashita T, Ohneda K, Nozawa D, Hamada H, Yoshikawa H, Ochiai N, and Ohneda O. Hypoxia responsive mesenchymal stem cells derived from human umbilical cord blood are effective for bone repair. **Stem Cells and Dev.** 2010; 19: 1195-1210.
- 4) Yamashita T, Ohneda O, Sakiyama A, Iwata F, Ohneda K, and Fujii-Kuriyama Y. The microenvironment for erythropoiesis is regulated by HIF-2alpha through VCAM-1 in endothelial cells. **Blood** 2008; 112: 1482-1492.
- 5) Yamashita T, Ohneda K, Nagano M, Miyoshi C, Kaneko N, Miwa Y, Yamamoto M, Ohneda O, and Fujii-Kuriyama Y. HIF-2alpha in endothelial cells regulates tumor neovascularization through activation of ephrin A1. **J Biol Chem** 2008; 283: 18926-18936.
- 6) Nagano M, Yamashita T, Hamada H, Ohneda K, Kimura K, Nakagawa T, Shibuya M, Yoshikawa H, and Ohneda O. Identification of functional endothelial progenitor cells suitable for the treatment of ischemic tissue using human umbilical cord blood. **Blood** 2007; 110: 151-160.

# 15. Immunology

**Principal Investigator** Akira Shibuya

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## Other Faculty Members

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Chigusa Oda, M.D., Ph.D (chigusano@md.tsukuba.ac.jp)

Yumi Kanemaru, Ph.D. (yamashitay@md.tsukuba.ac.jp)



## Major Scientific Interests

The molecular mechanisms of tumor immunity, autoimmunity, infectious immunity and allergy and clinical applications of our basic research findings

## Projects for Regular Students in Doctoral or Master's Programs

- 1) In vivo and in vitro function of the immunoreceptors DNAM-1, Fcα/mR, MAIR-I, MAIR-II, and Allergin-1, all of which were identified in our laboratory, in immune responses
- 2) The pathophysiological roles of the immunoreceptors in tumors, autoimmune diseases, allergy and infectious disease

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Generation of monoclonal antibodies and their application for expression analyses by flow cytometry and immunohistochemistry
- 2) Cell separation by sorting on flow cytometry or magnetic beads and analyses of cytokine production or proliferation upon antigen stimulation

## Recent Publications

- 1) Honda, et al. Marginal zone B cells exacerbate endotoxic shock via interleukin-6 secretion induced by Fcα/mR-coupled TLR4 signaling. *Nature Commun*, in press (2016)
- 2) Nakahashi-Oda C, et al. Apoptotic epithelial cells control regulatory T cell expansion. *Nature Immunol*, 2016 Feb 8. doi: 10.1038/ni.3345.
- 3) Totsuka N, et al. Toll-like receptor 4 and MAIR-II/CLM-4/LMIR2 immunoreceptor regulate VLA-4-mediated inflammatory monocyte migration. *Nature Commun*, 5:4710, 2014
- 4) Kim YG, et al. Gut dysbiosis promotes M2 macrophage polarization and allergic airway inflammation via fungi-induced PGE<sub>2</sub>. *Cell Host & Microbe*, 15(1):95–102, 2014
- 5) Nakahashi-Oda C, et al. Apoptotic cells suppress mast cell inflammatory responses via the CD300a immunoreceptor. *J. Exp. Med.* 209, 1493-1503, 2012
- 6) Nakano-Yokomizo T, et al. The immunoreceptor adapter protein DAP12 suppresses B lymphocyte-driven adaptive immune responses. *J. Exp. Med.* 208, 1661-1671, 2011.
- 7) Hitomi K, et al. An immunoglobulin-like receptor, Allergin-1, inhibits immunoglobulin E-mediated immediate hypersensitivity reactions. *Nature Immunol.* 11: 601-607, 2010
- 8) Nabekura T, et al. Critical role of DNAX accessory molecule-1 (DNAM-1) in the development of acute graft-versus-host disease in mice. *Proc Natl Acad Sci USA*, 107(43):18593-18598, 20

# 16. Laboratory Animal Science

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**Other Faculty Members**

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## Major Scientific Interests

Laboratory animals are essential and important bio-resources for the advancement of medical sciences. Gene-modified animals are used very often to study *in vivo* function of genes and proteins in development, homeostasis and disease. In particular, we focus on 1) development of genome editing technology for developmental engineering and 2) creation of mouse models for elucidating biological function and human diseases.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Development of the advanced cre-loxP system in mice.
- 2) Development of mouse models for *in vivo* imaging.
- 3) Elucidating biological function of gene leading to early embryonic lethality.

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Mouse embryo manipulation.
- 2) Mouse genome editing with the CRISPR/Cas9 system.

## Recent Publications

- 1) Hasegawa Y, Hoshino Y, Abdelaziz E. Ibrahim, Kato K, Daitoku Y, Tanimoto Y, Ikeda Y, Oishi H, Takahashi S, Yoshiki A, Yagami K, Iseki H, Mizuno S, Sugiyama F. Generation of CRISPR/Cas9-mediated bicistronic knock-in Ins1-cre driver mice. *Exp Anim.* 65: *In pressed*, 2016
- 2) Mizuno S, Takami K, Daitoku Y, Tanimoto Y, Dinh TT, Mizuno-Iijima S, Hasegawa Y, Takahashi S, Sugiyama F (Corresponding Author), Yagami K. Peri-implantation lethality in mice carrying megabase-scale deletion on 5q3.3 is caused by Exoc1 null mutation. *Sci. Rep.* 5:13632. 2015
- 4) Mizuno S, Dinh TT, Kato K, Mizuno-Iijima S, Tanimoto Y, Daitoku Y, Hoshino Y, Ikawa M, Takahashi S, Sugiyama F (Corresponding Author), Yagami K. Simple generation of albino C57BL/6J mice with G291T mutation in the tyrosinase gene by the CRISPR/Cas9 system. *Mamm. Genome* 25:327-334. 2014
- 5) Hasegawa Y, Daitoku Y, Mizuno S, Tanimoto Y, Mizuno-Iijima S, Matsuo M, Kajiwarra N, Ema M, Oishi H, Miwa Y, Mekada K, Yoshiki A, Takahashi S, Sugiyama F (Corresponding Author), Yagami K. Generation and characterization of Ins1-cre-driver C57BL/6N for exclusive pancreatic beta cell-specific Cre-loxP recombination. *Exp. Anim.* 63:183-191. 2014

# 17. Molecular Pharmacology

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## Major Scientific Interests

- 1) Exploring genes regulating sleep/wake
- 2) Real-time visualization and manipulation of neuronal mechanisms controlling sleep/wake
- 3) Finding new drugs for sleep disorders

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Large-scale, forward genetic screening of genes responsible for sleep/wake regulation in mutagenized mice
- 2) Screening for orexin receptor agonists
- 3) Analysis of sleep and wakefulness in genetically modified mice
- 4) in vivo real-time imaging of neuronal activities in hypothalamus and other deep brain structures in freely behaving mice

## Study Programs for Short Stay Students (one week ~ one trimester)

- 1) EEG/EMG electrode implantation and recording in mice
- 2) patch clamp recording in cells and brain slices
- 3) imaging of nerve cell activities in brain slices

## Recent Publications

- 1) Funato, H., Tsai, A.L., Willie, J.T., Kisanuki, Y., Williams, S.C., Sakurai, T., Yanagisawa, M. Enhanced orexin receptor-2 signaling prevents diet-induced obesity and improves leptin sensitivity. *Cell Metab.* 9: 64-76, 2009.
- 2) Funato, H., Sato, M., Sinton, C.M., Gautron, L., Williams, S.C., Skach, A., Elmquist, J.K., Skoultschi, A.I., Yanagisawa, M. Loss of Goosecoid-like and DiGeorge syndrome critical region 14 in interpeduncular nucleus results in altered regulation of rapid eye movement sleep. *Proc. Natl. Acad. Sci. USA* 107: 18155-18160, 2010.
- 3) Suzuki, A., Sinton, M.C., Green, W.R., Yanagisawa, M. Behavioral and biochemical dissociation of arousal and homeostatic sleep need influenced by prior wakeful experience in mice. *Proc. Natl. Acad. Sci. USA* 110: 10288-10293, 2013.
- 4) Ikeda, Y., Kumagai, H., Skach, A., Sato, M., Yanagisawa, M. Modulation of circadian glucocorticoid oscillation through adrenal opioid-CXCR7 signaling alters emotional behavior. *Cell* 155: 1323-1336, 2013.
- 5) Wei, W., Motoike, T., Krzeszinski, J.Y., Jin, Z., Xie, X., Dechow, C.P., Yanagisawa, M., Wan, Y. Orexin regulates bone remodeling via a dominant positive central action and a subordinate negative peripheral action. *Cell Metab.* 19: 927-240, 2014.
- 6) Lee, I.T., Chang, A.S., Manandhar, M., Shan, Y., Fan, J., Izumo, M., Ikeda, Y., Motoike, T., Dixon, S., Seinfeld, E.J., Takahashi, S.J., Yanagisawa, M. Neuromedin S-Producing Neurons Act as Essential Pacemakers in the Suprachiasmatic Nucleus to Couple Clock Neurons and Dictate Circadian Rhythms. *Neuron* 85: 1086-1102, 2015.
- 7) Nagahara, T., Saitoh, T., Kutsumura, N., Irukayama-Tomobe, Y., Ogawa, Y., Kuroda, D., Gouda, H., Kumagai, H., Fujii, H., Yanagisawa, M., Nagase, H. Design and Synthesis of Non-Peptide, Selective Orexin Receptor 2 Agonists. *J. Med. Chem.* 58: 7931-7937, 2015.
- 8) Funato H., Miyoshi C., Fujiyama T., Kanda T., Sato M., Wang Z., Ma J., Nakane S., Tomita J., Ikkyu A., Kakizaki M., Hotta N., Kanno S., Komiya H., Asano F., Honda T., Kim J.S., Harano K., Muramoto H., Yonezawa T., Mizuno S., Miyazaki S., Connor L., Kumar V., Miura I., Suzuki T., Watanabe A., Abe M., Sugiyama F., Takahashi S., Sakimura K., Hayashi Y., Liu Q., Kume K., Wakana S., Takahashi J.S., Yanagisawa M. Forward genetic analysis of sleep in randomly mutagenized mice. *Nature* 539: 378-383, 2016
- 9) Ogawa, Y., Irukayama-Tomobe, Y., Murakoshi, N., Kiyama, M., Ishikawa, Y., Hosokawa, N., Tominaga, H., Uchida, S., Kimura, S., Kanuka, M., Morita, M., Hamada, M., Takahashi, S., Hayashi, Y., Yanagisawa, M. Peripherally administered orexin improves survival of mice with endotoxin shock. *eLife* DOI: 10.7554/eLife.21055, 2016
- 10) Nagase, H., Yamamoto, N., Yata, M., Ohnishi, S., Okada, T., Saitoh, T., Kutsumura, N., Nagumo, Y., Irukayama-Tomobe, Y., Ishikawa, Y., Ogawa, Y., Hirayama, S., Kuroda, D., Watanabe, Y., Gouda, H., Yanagisawa, M. Design and Synthesis of Potent and Highly Selective Orexin 1 Receptor Antagonists with a Morphinan Skeleton and Their Pharmacologies. *J. Med. Chem* 60: 1018-1040, 2017



# 18. Plant Immune Dynamics

**Principal Investigator** Shigeyuki Betsuyaku

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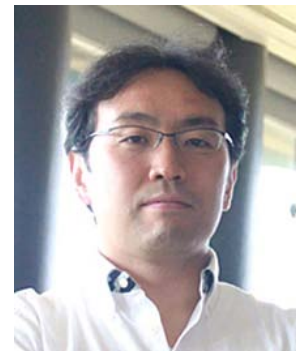
**URL** <http://www.envr.tsukuba.ac.jp/~microbio/en/index.html>

<http://www.trios.tsukuba.ac.jp/en/researcher/0000003906>

**Other Faculty Members**

Nomura ERATO Laboratory; Professor Nobuhiko Nomura

Associate Professor Andrew Utada, Assistant Professor Nozomu Obana



## Major Scientific Interests

The aim of our group is to unravel the basic principles that govern the spatiotemporal regulation of plant immune responses. Upon microbial infections, plants mount a battery of defence responses around the infection sites. Recently, we have identified that, using intravital imaging, two phytohormone signaling pathways in a mutually inhibitory relationship are activated in distinct concentric domains around the infection foci in Arabidopsis, thus providing, for the first time, compelling evidence for the existence of a "plant immune field" around the infection site (Betsuyaku et al, in prep.). We are currently deepening our understanding of the plant immune field formation with the aid of multidiscipline approaches.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Functional analysis of the genes required for salicylic acid production during effector-triggered immunity (ETI)
- 2) Systems understanding of plant immunity through various single-cell technologies
- 3) Functional analysis of the negative regulators involved in "plant immune field" formation
- 4) Live imaging-based analysis of virulence-related genes of *Pseudomonas syringae* isolates

## Study Programs for Short Stay Students

- 1) *in planta* live imaging analysis of defence-related promoter reporter activities in ETI
- 2) Live single-cell imaging analysis of defence-related promoter reporter activities upon stimuli

## Selected Recent Publications

- 1) Inada N, Betsuyaku S, Shimada TL, Ebine K, Ito E, Kutsuna N, Hasezawa S, Takano Y, Fukuda H, Nakano A, Ueda T. Modulation of Plant RAB GTPase-Mediated Membrane Trafficking Pathway at the Interface Between Plants and Obligate Biotrophic Pathogens. *Plant Cell Physiol.* 57(9):1854-64,2016.
- 2) Endo S, Betsuyaku S, Fukuda H. Endogenous peptide ligand-receptor systems for diverse signaling networks in plants. *Current Opinion in Plant Biology.* 2014 Oct;21:140-6.
- 3) Betsuyaku S, Sawa S, Yamada M. The Function of the CLE Peptides in Plant Development and Plant-Microbe Interactions. *The Arabidopsis Book.* 2011;9:e0149. doi: 10.1199/tab.0149.
- 4) Betsuyaku S\*, Takahashi F\*, Kinoshita A, Miwa H, Shinozaki K, Fukuda H, Sawa S. Mitogen-activated protein kinase regulated by the CLAVATA receptors contributes to shoot apical meristem homeostasis. *Plant & Cell Physiology.* 2011 Jan;52(1):14-29. \*Co-First Authors, #Corresponding Author
- 5) Azevedo C\*, Betsuyaku S\*, Peart J, Takahashi A, Noël L, Sadanandom A, Casais C, Parker J, Shirasu K. Role of SGT1 in resistance protein accumulation in plant immunity. *The EMBO Journal.* 2006 May 3;25(9):2007-16. \*Co-First Authors



# 19. Olericulture and Floriculture

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Associate Professors Naoya Fukuda, Ph.D., Kang Seungwon, Ph.D. Tohru Ariizumi, Ph.D.,

Kyoko Tanase-Hiwasu Ph.D.

Assistant Professors Satoko Nonaka, Ph.D., Ken Hoshikawa, Ph.D., Ryoichi Yano Ph.D.,

Yoshihiro Okabe Ph.D., Naomichi Fujiuchi



## Major Scientific Interests

Exploring genes regulating tomato fruit development

Analysis of the mechanism for sugar and GABA metabolism in tomato

Creation of genetic modified tomato accumulating functional materials benefit for human health

Innovating crop transgenic and genome editing technologies for crop breeding

Improving cultivation method for increasing sugar accumulation in tomato fruit

Development of advanced plant factory equipped with AI and robotics

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Forward genetic screening of genes that influence fruit development in tomato
- 2) Reverse genetic screening of novel mutations that increase fruit shelf-life of tomato
- 3) Functional analysis of GABA metabolism genes in tomato

## Study Programs for Short Stay Students (one week)

- 1) DNA/RNA purification from plants
- 2) DNA amplification by PCR reaction, digestion by restriction enzymes, and electrophoresis
- 3) cDNA synthesis and RT-PCR reaction

## Recent Publications

- 1) Ueta R, Abe C, Watanabe T, Sugano S, Ishihara R, Ezura H, Osakabe Y, Osakabe K. (2017) Rapid breeding of parthenocarpic tomato plants using CRISPR/Cas9. *Scientific Reports*. 7(1):507.
- 2) Shimatani Z, Kashojiya S, Takayama M, Terada R, Arazoe T, Ishii H, Teramura H, Yamamoto T, Komatsu H, Miura K, Ezura H, Nishida K, Ariizumi T, Kondo A (2017) Targeted base editing in rice and tomato using a CRISPR-Cas9 cytidine deaminase fusion. *Nature Biotechnology*. doi: 10.1038/nbt.3833
- 3) Nonaka S, Someya T, Zhou S, Takayama M, Nakamura K, Ezura H (2017). An *Agrobacterium tumefaciens* strain with gamma-aminobutyric acid transaminase activity shows an enhanced genetic transformation ability in plants. *Scientific Reports*. 7, Article number: 42649
- 4) Shikata M, Hoshikawa K, Ariizumi T, Fukuda N, Yamazaki Y, Ezura H (2016) TOMATOMA Update: Phenotypic and metabolite information of Micro-Tom mutant resource. *Plant Cell Physiol*. 57(1): 1-10.
- 5) Takayama M, Koike S, Kusano M, Matsukura C, Saito K, Ariizumi T, Ezura H. (2015) Tomato glutamate decarboxylase genes SIGAD2 and SIGAD3 play key roles in regulation of  $\gamma$ -aminobutyric acid level in tomato (*Solanum lycopersicum*). *Plant Cell Physiol*. 56(8): 1533-1545.
- 6) Shinozaki Y, Hao S, Kojima M, Sakakibara H, Oseki-Iida Y, Zhen Y, Fei Z, Zhong S, Giovannoni J, Rose JKC, Okabe Y, Heta Y, Ezura H, Ariizumi T. (2015) Ethylene suppresses tomato fruit set through modification of gibberellin metabolism. *Plant J*. 83(2): 237-251.
- 7) Ariizumi T, Kishimoto S, Kakami R, Maoka T, Hirakawa H, Suzuki Y, Ozeki Y, Shirasawa K, Bernillon S, Okabe Y, Moing A, Asamizu E, Rothan C, Ohmiya A, Ezura H (2014) Identification of the Carotenoid Modifying Gene *PALE YELLOW PETAL 1* as an Essential Factor in Xanthophyll Esterification and Yellow Flower Pigmentation in Tomato (*Solanum lycopersicum*). *Plant J* 79:453-465

# 20. Plant Ecophysiology

**Principal Investigator** Louis John Irving

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## Major Scientific Interests

- Effect of parasitic plants on host growth and metabolism
- Allocation of carbon to roots in nutrient rich patches
- Cs uptake and allocation in rice
- Importance environmental factors controlling water uptake and seed germination rates

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Factors determining the abstraction of C and N by parasitic plants
- 2) Environmental drivers of root growth, maintenance and death in grasses
- 3) Effects of nutrient status on Cs uptake and partitioning in rice
- 4) Environmental drivers of seed germination rate in wheat

## Study Programs for Short Stay Students (one week)

- 1) Measuring nutrient abstraction from host plants using stable isotopes
- 2) Quantifying effects of nutrient status on plant leaf chemistry and photosynthesis
- 3) Determining nutrient uptake by plants using  $^{15}\text{N}$  as a tracer
- 4) Influence of NaCl / PEG in determining water uptake in wheat seeds

## Recent Publications

- 1) Yamori W, Irving LJ, Adachi S, Busch FA (2016) Strategies for optimizing photosynthesis with biotechnology to improve crop photosynthesis. *Handbook of Photosynthesis* 741 – 759
- 2) Irving LJ (2015) Carbon assimilation, biomass partitioning and productivity in grasses. *Agriculture* **5** 1116 – 1134
- 3) Khaembah EN, Irving LJ, Thom ER, Faville MJ, Easton HS, Matthew C (2013) Leaf Rubisco turnover in a perennial ryegrass (*Lolium perenne* L.) mapping population: genetic variation, identification of associated QTL, and correlation with plant morphology and yield. *Journal of Experimental Botany* **64** (5) 1305 – 1316
- 4) Zhang HX, McGill CR, Irving LJ, Kemp PD, Zhou D (2013) A modified thermal time model to predict germination rate of ryegrass and tall fescue at constant temperatures. *Crop Science* **53** 1 – 10
- 5) Irving LJ, Cameron DD (2009) You are what you eat: interactions between root parasitic plants and their hosts. *Advances in Botanical Research* **50** 87 – 138

# 21. Molecular Plant Pathology

**Principal Investigator** Yasuhiro Ishiga

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**Other Faculty Members**

Plant Parasitic Mycology Laboratory; Professor Yuichi Yamaoka Associate Professor Izumi

Okane, Assistant Professor Junichi P Abe



## Major Scientific Interests

The research aim of our group is to understand the molecular mechanisms of plant immunity and pathogenicity of plant pathogens in the interactions of plant and microbes. Our primary target pathosystem is soybean and soybean rust interactions. Soybean rust caused by *Phakopsora pachyrhizi* is one of the most devastating foliar diseases affecting soybean production worldwide. In addition, we are interested in bacterial pathosystem, such as *Pseudomonas syringae*-tomato interactions. By working on the molecular basis of plant-microbe interactions, we are trying to establish the sustainable disease control strategies.

## Projects for Regular Students in Doctoral or Master's Programs

- 1) Multi-omics approached to study host-resistance on soybean against soybean rust using *Rpp* near-isogenic lines (NILs)
- 2) Development of Host Induced Gene Silencing (HIGS) in the interactions of soybean and soybean rust towards crop protection
- 3) Functional analysis of retrograde signaling in plant immunity
- 4) Reactive Oxygen Species (ROS)-mediated plant-microbe interactions

## Study Programs for Short Stay Students

- 1) Molecular mechanism of plant immunity against fungal and bacterial pathogens
- 2) Functional analysis of pathogenicity related genes in bacterial and fungal pathogens.

## Selected Recent Publications

- 1) **Ishiga, Y.**, Ishiga, T., Ikeda, Y., Matsuura, T. and Mysore, K.S. (2016) NADPH-dependent thioredoxin reductase C plays a role in nonhost disease resistance against *Pseudomonas syringae* pathogens by regulating chloroplast-generated reactive oxygen species. *PeerJ*.
- 2) **Ishiga, Y.** and Ichinose, Y. (2015) *Pseudomonas syringae* pv. tomato OxyR is required for virulence in tomato and Arabidopsis. *Mol. Plant-Microbe Interact.* 29:119-31.
- 3) **Ishiga, Y.**, Uppalapati, S.R., Gill, U.S., Huhman, D., Tang, Y. and Mysore, K.S. (2015) Transcriptomic and metabolomic analyses identify a role for chlorophyll catabolism and phytoalexin during *Medicago* nonhost resistance against Asian soybean rust. *Scientific Reports* 12;5:13061
- 4) **Ishiga, Y.**, Ishiga, T., Uppalapati, S.R. and Mysore, K.S. (2013) Jasmonate ZIM-domain (JAZ) protein regulates host and nonhost pathogen-induced cell death in tomato and *Nicotiana benthamiana*. *PLoS ONE* 8: e75728.
- 5) Uppalapati, S.R., **Ishiga, Y.**, Doraiswamy, V., Bedair, M., Mittal, S., Chen, J., Nakashima, J., Tang, Y., Tadege, M., Ratet, P., Chen, R., Schultheiss, H. and Mysore K.S. (2012) Loss of abaxial leaf epicuticular wax in *Medicago truncatula* *irg1/palm1* mutants results in reduced spore differentiation of anthracnose and nonhost rust pathogens. *The Plant Cell* 24: 353-370.
- 6) **Ishiga, Y.**, Ishiga, T. Wangdi, T., Mysore, K.S. and Uppalapati, S.R. (2012) NTRC and chloroplast-generated reactive oxygen species regulate *Pseudomonas syringae* pv. *tomato* disease development in tomato and Arabidopsis. *Mol. Plant-Microbe Interact.* 25: 294-306.

## 22. Applied Entomology and Zoology

**Principal Investigator** Yooichi Kainoh

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**Other Faculty Members**

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Assistant Professor Natsuko Kinoshita: kinoshita.natsuko.gf@u.tsukuba.ac.jp



### Major Scientific Interests

Experimental studies using insects, spiders and ticks for elucidation of behavioral and physiological mechanisms underlining host location behavior, physiology of reproduction and immunity, innate immune response to various infections, and molecular mechanisms inducing the release of plant volatiles from herbivore-infested plants.

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Flight response of parasitic wasps to the plant infested by host insect.
- 2) Endocrinological and nutritional regulation of tick and spider ecdysis, reproduction and immunity.
- 3) Molecular mechanisms in the regulation of insect immunity
- 4) Visualization and modeling of volatile compound mediated plant-plant and plant-insect interaction.

### Study Programs for Short Stay Students

- 1) Head space volatile collection and olfactometer study using the volatile extract.
- 2) Measurement of insect immune activity against infection by molecular techniques.
- 3) Molecular mechanism of plant-insect interaction by expression analyses and bio-imaging

### Recent Publications:

- 1) Piyasaengthong, N., Y. Sato, N. Kinoshita and Y. Kainoh (2016) Oviposition preference for leaf age in the smaller tea tortrix *Adoxophyes honmai* (Lepidoptera: Tortricidae) as related to performance of neonates. *Applied Entomology and Zoology*. 10.1007/s13355-016-0408-5
- 2) Deshpande, S. A. and Y. Kainoh (2012) Herbivore egg deposition induces tea leaves arresting the egg-larval parasitoid *Ascogaster reticulata* Watanabe (Hymenoptera: Braconidae). *Entomol. Exp. Appl.* 144:172-180.
- 3) Ogihara, M.H., J. Hikiba, Y. Suzuki, D. Taylor and H. Kataoka (2015) Ovarian Ecdysteroidgenesis in Both Immature and Mature Stages of an Acari, *Ornithodoros moubata*. *PLOS ONE* 10(4): e0124953. doi:10.1371/journal.pone.0124953.
- 4) Ogihara, M.H. and D. Taylor (2013) Female Reproductive System: Anatomy, Physiology and Molecular Biology, Chapter 17. In D.E. Sonenshine and R.M. Roe (Editors). *Biology of Ticks*, Volume 1. Second Edition, Oxford University Press, New York, USA. pp. 449-483.
- 5) Furukawa, S., H. Tanaka, A. Sagisaka, J. Ishibashi, and M. Yamakawa. (2012) Both kB and C/EBP binding sites are indispensable for full expression of a nitric oxide synthase gene in the silkworm, *Bombyx mori*. *J. Seric. Sci. Jpn.* 81:13-20.
- 6) Furukawa, S., K. Tanaka, T. Ikeda, T. Fukatsu and T. Sasaki. (2012) Quantitative analysis of the lytic cycle of WO phages infecting *Wolbachia*. *Appl. Entomol. Zool.* 47:449-456.
- 7) Kinoshita, N., H. Wang, H. Kasahara, J. Liu, C. MacPherson, Y. Machida, Y. Kamiya *et al.* (2012) *IAA-Ala Resistant 3 (IAR3)*, a new evolutionarily conserved target of miR167, mediates *Arabidopsis* root architecture changes during high osmotic stress. *Plant Cell* 24: 3590-602.
- 8) Kinoshita, N., A. Berr, C. Belin, R. Chappuis *et al.* (2010) Identification of *growth insensitive to ABA3 (gia3)*, a recessive mutation affecting ABA signaling for the control of early post-germination growth in *Arabidopsis thaliana*. *Plant Cell Physiol.* 51: 239-251.

## 23. Plant Molecular Biology and Chemical Ecology

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### Major Scientific Interests

- Communication between plant communities and insects via volatile compounds (odors or smells)
- Synthetic Biology: producing Green Fine Chemicals (e.g. Perfumes, Spices, and Food additives) in or from plants
- Visualization of “odors” mediated communication around plants
- Mechanisms of plant immune system activation by plant-to-plant communication
- Time-lapse fluorescent microscopy imaging and video image processing
- Soil microbiome evolution
- Mathematical modeling

### Projects for Regular Students in Doctoral or Master's Programs

- 1) How are biological stress signals propagated within plant communities
- 2) Using a Systems Biology approach to digitalize a field's ecosystem
- 3) Introducing food additive biosynthetic pathway to plants
- 4) Plant sensory evaluation

### Study Programs for Short Stay Students (one week)

- 1) Visualization of plants' response to biological stress using time-lapse fluorescent microscopy
- 2) Soil DNA extraction and ribosomal barcoding
- 3) Isolation of biosynthetic enzymes for the production of food additives

### Recent Publications

- 1) Piyasaengthong, N., Y. Sato, **N. Kinoshita** and Y. Kainoh (2016) Oviposition preference for leaf age in the smaller tea tortrix *Adoxophyes honmai* (Lepidoptera: Tortricidae) as related to performance of neonates. *Applied Entomology and Zoology*. 10.1007/s13355-016-0408-5
- 2) Piyasaengthong N., **Kinoshita N.**, Sato Y., Kainoh Y. (2016) Sex-specific elicitor of *Adoxophyes honmai* (Lepidoptera: Tortricidae) on tea leaf arrests the egg-larval parasitoid *Ascogaster reticulata* (Hymenoptera: Braconidae). *Applied Entomology and Zoology* 10.1007/s13355-016-0407-6
- 3) **Kinoshita, N.**, H. Wang, H. Kasahara, J. Liu, C. MacPherson, Y. Machida, Y. Kamiya *et al.* (2012) *IAA-Ala Resistant 3 (LAR3)*, a new evolutionarily conserved target of miR167, mediates *Arabidopsis* root architecture changes during high osmotic stress. *Plant Cell* 24: 3590-602.
- 4) **Kinoshita, N.**, A. Berr, C. Belin, R. Chappuis *et al.* (2010) Identification of *growth insensitive to ABA3 (gia3)*, a recessive mutation affecting ABA signaling for the control of early post-germination growth in *Arabidopsis thaliana*. *Plant Cell Physiol.* 51: 239-251.



## 24. Food and Biomass Process Engineering

**Principal Investigator** Yutaka Kitamura

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**Other Faculty Member** Assistant Professor Mito Kokawa



### Major Scientific Interests

Focusing on agricultural products, food, unused resources and biomass as local biological materials, process development and characteristics for utilization and conversion of these resources are investigated to produce food, energy and industrial materials. By implementing the advanced technology for the local biological resources, we have the goal to contribute widely to the promotion of agriculture, energy conservation, environmental protection and industry creation in local and global view point.

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Development of Florescence Fingerprint Monitoring System for Microbial Content of Beef
- 2) Processing of Orange Juice (Citrus sinensis) Powder by Micro Wet Milling and Vacuum Spray Drying Process
- 3) Study on Production of Mugwort with Bio-active Compounds
- 4) Process Characteristics of Whole Fruit Brewed Wine of Strawberry
- 5) Anaerobic Fermentation for Biogas from Agricultural and Food Waste

### Study Programs for Short Stay Students

- 1) Development of hydro gel beads for functional foods
- 2) Processing of rice milk and rice milk products

### Recent Publications

- 1) Dheni Mita Mala, Masatoshi Yoshimura, Susumu Kawasaki, Mizuki Tsuta, Mito Kokawa, Vipavee Trivittayasil, Junichi Sugiyama, Yutaka Kitamura, Fiber optics fluorescence fingerprint measurement for aerobic plate count prediction on sliced beef surface, LWT - Food Science and Technology, 68, 14-20, 2016
- 2) M.Z. Islam, Yutaka Kitamura, Yoshitsugu Yamano, Mai Kitamura, Effect of vacuum spray drying on the physicochemical properties, water sorption and glass transition phenomenon of orange juice powder, Journal of Food Engineering, 169, 131-140, 2016
- 3) Masaru Koyama, Yutaka Kitamura, Development of a new rice beverage by improving the physical stability of rice slurry, Journal of Food Engineering, 131, 89-95, 2014
- 4) Kenji Takisawa, Kazuyo Kanemoto, Tatsuo Miyazaki, Yutaka Kitamura, Hydrolysis for direct esterification of lipids from wet microalgae, Bioresource Technology, 144, 38-43, 2013
- 5) C. Song, Y. Kitamura, S. Li, J. Lu. Deposition CO2 Capture Process Using a Free Piston Stirling Cooler. Industrial & Engineering Chemistry Research, 52 (42), 14936–14943, 2013
- 6) Chunfeng Song, Yutaka Kitamura, Shuhong Li. Energy analysis of the cryogenic CO2 capture process based on Stirling coolers. Energy. 65, 580-589, 2014



## 25. Isotope Hydrogeomorphology and Radioecology

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Assistant Professor Junko Takahashi, [takahashi.junko.ka@u.tsukuba.ac.jp](mailto:takahashi.junko.ka@u.tsukuba.ac.jp)



### Major Scientific Interests

- 1) Transfer of radionuclides in terrestrial environment after the Fukushima Daiichi NPP accident
- 2) Interaction between subsurface water movement and sediment yield
- 3) Development of innovative technologies for increasing in watershed runoff and improving river environment by the management practice of devastated forest plantation

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Monitoring and modeling radionuclides migrated with water and sediment
- 2) Transfer mechanism of radionuclides in the forest and soil
- 3) Estimation of surface soil erosion and sources of sediment production using radionuclides

### Study Programs for Short Stay Students

- 1) Studying the method of Radiocesium analysis of water, soils and litter
- 2) Lab studies on physical and chemical properties of soil and water
- 3) Field work of monitoring and sampling of radiocesium in Fukushima
- 4) Experiencing hillslope hydrological monitoring in Tochigi

### Recent Publications

- 1) Kato, H., Onda, Y., Hisadome, K., Loffredo, N., Kawamori, A. (2017) Temporal changes in radiocesium deposition in various forest stands following the Fukushima Dai-ichi Nuclear Power Plant accident. *Journal of Environmental Radioactivity*, 166, Part 3, 449-457.
- 2) Iwagami, S., Tsujimura, M., Onda, Y., Nishino, M., Konuma, R., Abe, Y., Hada, M., Pun, I., Sakaguchi, A., Kondo, H., Yamamoto, M., Miyata, Y., Igarashi, Y. (2017) Temporal changes in dissolved  $^{137}\text{Cs}$  concentrations in groundwater and stream water in Fukushima after the Fukushima Dai-ichi Nuclear Power Plant accident. *Journal of Environmental Radioactivity*, 166, Part 3, 458-465.
- 3) Iwagami, S., Onda, Y., Tsujimura, M. and Abe, Y. (2017) Contribution of Radioactive  $^{137}\text{Cs}$  discharge by Suspended Sediment, Coarse Organic Matter, and Dissolved Fraction from a Headwater Catchment in Fukushima after the Fukushima Dai-ichi Nuclear Power Plant Accident, *Journal of Environmental Radioactivity*, 166, Part 3, 466-474.
- 4) Yoshimura, K., Onda, Y., Wakahara, T. (2016) Time dependence of the  $^{137}\text{Cs}$  concentration in particles discharged from rice paddies to freshwater bodies after the Fukushima Daiichi NPP accident, *Environmental Science & Technology*, DOI: 10.1021/acs.est.5b05513
- 5) Sun, X., Onda, Y., Otsuki, K., Kato, H., Gomi, T. (2016) The effect of strip thinning on forest floor evaporation in a Japanese cypress plantation. *Agriculture and Forest Meteorology*, 216, 48-57.
- 6) Onda, Y., Kato, H., Hoshi, M., Takahashi, K., Saito, K., and Ngyuen, L. M. (2015) Soil sampling and analytical strategies for mapping fallout in nuclear emergencies. *Journal of Environmental Radioactivity*, 139, 300-307.
- 7) Takahashi, J., Tamura, K., Suda, T., Matsumura, R., and Onda, Y. (2015) Vertical distribution and temporal changes of  $^{137}\text{Cs}$  in soil profiles under various land uses after Fukushima Dai-ichi Nuclear Power Plant Accident. *Journal of Environmental Radioactivity*, 139, 351-361.

## 26. Pomology

**Principal Investigator** Sumiko Sugaya, Ph.D.

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**Other Faculty Member**

Assistant Professor Yoshihiko Sekozawa, Ph.D.



### Major Scientific Interests

- 1) Molecular mechanism underlying fruit quality involving coloring, taste and flavor in fruit trees.
- 2) Mechanism of bud dormancy in deciduous trees and role of chilling in winter.
- 3) Postharvest physiology in fruits to develop technologies for prolonging shelf life.

### Projects for Regular Students in Doctoral or Master's Programs

- 1) Carbohydrate metabolism in dormancy of Japanese pear under mild winter condition.
- 2) Effects of the joint training system on phytohormone metabolism and flowering in fruit trees.
- 3) Effects of heat treatment on ripening and quality during storage of fruits.

### Study Programs for Short Stay Students (one week)

- 1) Determination of fruit quality with sugar analysis in fruits.
- 2) Analysis of flavor compounds in fruits.
- 3) Extraction of DNA/RNA from fruits and amplification by PCR.

### Recent Publications

- 1) Chutinantakun, T., J.S. Maninang, Sugaya Sumiko, Y. Sekozawa, Gemma H. 2014. Tree jointing and branch bending influence endogenous levels of hormones and flowering in Japanese plum 'Kiyo'. *Acta Horticulturae* 1042: 57-63.
- 2) Yooyongwech, S., A. K. Horigane, M. Yoshida, Y. Sekozawa, S. Sugaya, S. Cha-um and H. Gemma. 2012. Hydrogen cyanamide enhances MRI-measured water status in flower buds of peach (*Prunus persica* L.) during winter. *Plant Omics Journal* 5: 400-404.
- 3) Boonkorn, P., H. Gemma, S. Sugaya, S. Setha, J. Uthabult and K. Wangchai. 2012. Impact of high-dose, short periods of ozone exposure on green mold and antioxidant enzyme activity of tangerine fruit. *Postharvest Biology and Technology* 67: 25-28.
- 4) Kondo, S., S. Sugaya, S. Sugawa, M. Ninomiya, M. Kittikorn, K. Okawa, H. Ohara, K. Ueno, Y. Todoroki, M. Mizutani and N. Hirai. 2012. Dehydration tolerance in apple seedlings is affected by an inhibitor of ABA 8'-hydroxylase CYP707A. *Journal of Plant Physiology* 169: 234-241.
- 5) Maninang, J. S., C. Wong-Aree, S. Kanlayanarat, S. Sugaya, and H. Gemma. 2011. Influence of maturity and postharvest treatment on the volatile profile and physiological properties of the durian (*Durio zibethinus* Murray) fruit. *International Food Research Journal* 18: 1067-1075.
- 6) Pongprasert, N., Y. Sekozawa, S. Sugaya and H. Gemma. 2011. A novel postharvest UV-C treatment to reduce chilling injury (membrane damage, browning and chlorophyll degradation) in banana peel. *Scientia Horticulturae* 130: 73-77.
- 7) Pongprasert, N., Y. Sekozawa, S. Sugaya and H. Gemma. 2011. The role and mode of action of UV-C hormesis in reducing cellular oxidative stress and the consequential chilling injury of banana fruit peel. *International Food Research Journal* 18: 741-749.
- 8) Pathirana, U. A. P., Y. Sekozawa, S. Sugaya and H. Gemma. 2011. Effect of combined application of 1-MCP and low oxygen treatments on alleviation of chilling injury and lipid oxidation stability of avocado (*Persea americana* Mill.) under low temperature storage. *Fruits* 66: 161-170.