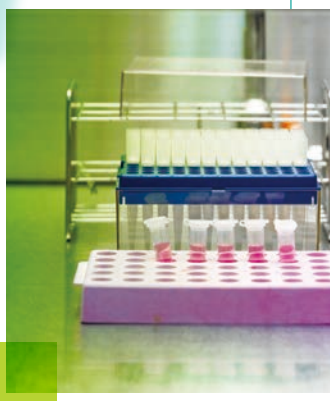












Institute for Life and Medical Sciences, Kyoto University

2026-2027

LiMe

Institute for Life and Medical Sciences
Kyoto University



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Attached Research Facilities

Research Center for Infectious Diseases
32 Lab. of Supramolecular Structural Biology
32 Animal Experiments Faculty for Viral Infection
32 Reproductive Engineering Team
33 Center for Animal Experiments
34 Center for Human ES Cell Research
35 Division of Clinical Basis for ES Cell Research
Lab. of Embryonic Stem Cell Research

36 Map & Access /
Life and Medical Sciences Research Fund



Message from the Director

Keizo Tomonaga
Director
Institute for Life and Medical Sciences

I am Keizo Tomonaga, and in April 2026, I had the honor of being appointed Director of the Institute for Life and Medical Sciences (LiMe), Kyoto University. As I assume this important responsibility, I wish to express my profound respect for the many distinguished predecessors who built this Institute and led advances in the life and medical sciences worldwide. At the same time, I am keenly aware of the responsibility entrusted to me to carry their legacy forward into the future.

The Institute traces its origins to two distinguished institutions: the Institute for Virus Research, which played a leading role in the development of virology and molecular biology, and the Institute for Frontier Medical Sciences, which made major contributions to regenerative medicine, immunology, and bioengineering. The two institutes merged in 2016, and in 2022, the resulting organization embarked on a new chapter as the Institute for Life and Medical Sciences. The year 2026 marks the tenth anniversary of this merger. Over the past decade, researchers with different histories and areas of expertise have come together within a single institution, sharing their knowledge and technologies and giving rise to numerous studies that transcend conventional disciplinary boundaries. I regard these ten years not as the completion of the integration process, but as a new point of departure for the Institute's next leap forward.

The name "Institute for Life and Medical Sciences" reflects our commitment to pursuing basic biology, which seeks a deep understanding of living systems, and medicine, which applies that knowledge to human health and healthcare, as inseparable endeavors. Medical research is rightly expected to benefit society. Yet research begins with a sense of wonder in the face of the unknown and the intellectual curiosity that compels us to keep asking "why." Rather than focusing solely on outcomes with immediate practical value, we must continue to cherish fundamental research, even when it may appear to take an indirect path. Such research can ultimately lead to discoveries that transform medicine and society. One of the Institute's most important missions is therefore to preserve the freedom and excitement of fundamental research while building bridges from its discoveries to healthcare and society.

The Institute brings together a rich spectrum of disciplines, including virology, infectious diseases, immunology, stem cell and regenerative medicine, developmental biology, structural biology, mathematical biology, and bioengineering. Cross-disciplinary collaboration is steadily gaining momentum in such areas as infectious disease and regenerative medicine research using organoids, structural approaches to understanding biological phenomena, and biomedical research incorporating mathematical and engineering methodologies. Looking ahead, we will further enhance an environment in which each field can pursue original research at the highest international level, while researchers from diverse backgrounds interact on a daily basis, engage in open discussion, and cultivate unexpected ideas. Above all, I want the Institute to be a place where early-career researchers—the leaders of the next generation—can trust in their own ideas and take on unexplored challenges without fear of failure.

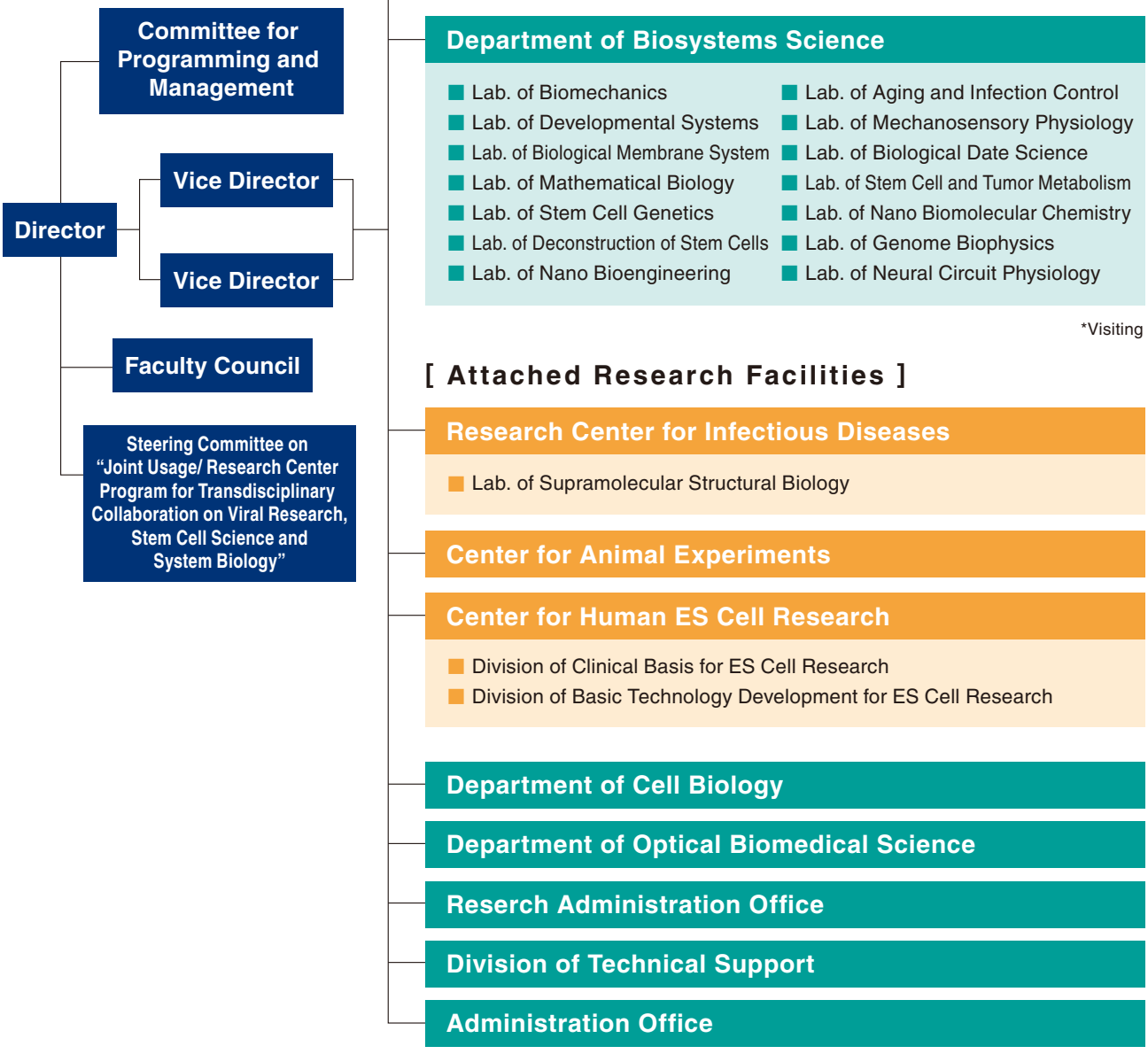
The Institute is not only a center for research but also a place of education, where we nurture the people who will shape the future of the life and medical sciences. We will further strengthen research-based education and international exchange so that students and early-career researchers can encounter perspectives from different fields and develop both the ability to formulate important questions and the capacity to seek answers independently.

Our research is supported by affiliated centers and facilities, including the Research Center for Infectious Diseases, the Center for Human ES Cell Research, and the Center for Animal Experiments, as well as advanced research infrastructure such as biosafety level 3 infection research facilities and cryo-transmission electron microscopes. Through the Joint Usage/Research Center Program for Transdisciplinary Collaboration on Viral Research, Stem Cell Science and System Biology, we have made these resources widely available to researchers in Japan and abroad, promoting collaboration across disciplines, institutions, and national borders. We will continue to make the fullest possible use of our research resources and specialized expertise and develop the Institute into a vital hub within international research networks.

This year, Kyoto University was accredited as a University for International Research Excellence, and its Research System Strengthening Plan was approved. The University will now embark in earnest on reforms to strengthen its research capabilities, centering on the transition to a Department System based on academic disciplines and including the enhancement of research support structures and the development of core facilities. The Institute must likewise establish a framework that brings its diverse fields of research into closer alignment with its advanced affiliated facilities and shared instrumentation, thereby fostering research that transcends disciplinary boundaries.

The true strength of the Institute lies in the originality of each of its members and in their ability to collaborate across differences in expertise. Together with all members of the Institute, I will work to uphold the academic integrity and spirit of intellectual freedom inherited from our predecessors, to create new knowledge, and to turn the light of discovery toward the health and well-being of humankind.

Organization



As of October 1st, 2026

History

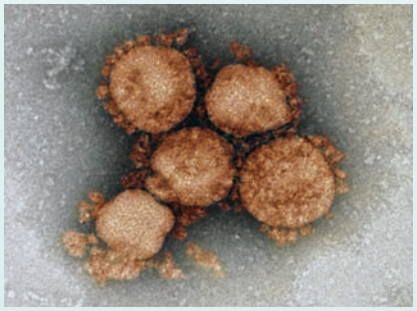
The predecessor of the Institute, the Institute for Frontier Life and Medical Sciences (inFront), was formed by the merger of the Institute for Virus Research and the Institute for Frontier Life and Medical Science in 2016.

The Institute for Virus Research was known for its brilliant groundbreaking research in medical science, including the discovery of the human leukemia virus, and for pioneering work in molecular biology. The Institute for Frontier Medical Sciences, on the other hand, had built an innovative foundation in regenerative medicine by establishing human embryonic stem cells (ES cells) and discovering induced pluripotent stem cells (iPS cells) and regulatory T cells.

In April 2022, the Institute made a new start under the current name, The Institute for Life and Medical Sciences (LiMe), with the aim of exploring new academic fields in medical science and life science.



Cell processing facility exclusive to human ES cells



Coronavirus image captured by an electron microscope



Unveiling ceremony for the establishment of the Institute for Frontier Life and Medical Sciences (inFront)

1941
Tuberculosis Research Institute

1956
Institute for Virus Research

1967
Chest Disease Research Institute

1980
Research Center for Medical Polymers and Biomaterials

1988
Chest Disease Research Institute (structural reorganization)

1990
Research Center for Biomedical Engineering

1998
Institute for Frontier Medical Sciences

2008
Joint Usage/Research Center Program for Transdisciplinary Collaboration on Tissue Engineering and Regenerative Medicine

2010
Joint Usage/Research Center Program for Fusion of Advanced Technologies and Innovative Approaches to Viral Infections and Life Science

2016
Institute for Frontier Life and Medical Sciences

2022
Institute for Life and Medical Sciences
Joint Usage/Research Center Program for Transdisciplinary Collaboration on Viral Research, Stem Cell Science and System Biology

LiMe at a Glance



85-year History

P.5 ▶

The origin of the Institute for Life and Medical Sciences (LiMe) dates back to 1941.



Faculty and Staff Members

172

67 Faculty (14 Professors) | **45 Non-teaching researchers** | **60 Non-teaching staff**

Faculty and Staff (As of August 1st, 2026)

Professor	14(3)	Program-Specific Researcher	15
Assoc.Prof.	11(1)	Technical Staff	8
Senior Lecturer	1	Administrative Staff	2
Assist.Prof.	26	Researcher (Part-Time)	30
SUBTOTAL	52(4)	Other	50
Program-Specific Assoc.Prof.	5	TOTAL	105
Program-Specific Senior Lecturer	0		
Program-Specific Assist. Prof.	10		
SUBTOTAL	15		
TOTAL	67(4)		

(*) Including cocurrent faculty
Numbers in parenthesis indicate visiting faculty

Research Fellows and Research Students (As of August 1st, 2026)

Research student	2
JSPS*	8
Private Sector Researcher	5
TOTAL	15

*The Japan Society for the Promotion of Science



Expenditure in academic year 2025

2.1 billion yen

Financial data in academic year 2025 (Unit: KJPY)

University grants Cost of equipment and others	662,020
Grants in aid for Scientific Research	280,776
Research funds	1,016,873
Other subsidies	6,741
Donations	115,118
TOTAL	2,081,529

Graduate Students

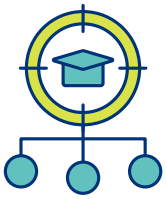
108



The Institute accepts graduate students from six graduate schools.

(As of May 1st, 2026)

Graduate School of Medicine	13
Graduate School of Science	11
Graduate School of Engineering	26
Graduate School of Human and Environmental Studies	0
Graduate School of Biostudies	43
Graduate School of Pharmaceutical Sciences	15
TOTAL	108



Organization

P.4 ▶

3 Departments
3 Attached Research Facilities

The Iinstitute comprises three departments: the Department of Virus Research, the Department of Regenerative Science and Engineering, and the Department of Biosystems Science, and three attached research facilities: the Research Center for Infectious Diseases, the Center for Animal Experiments, and the Center for Human ES Cell Research.



27 Laboratories

P.4 ▶

3 Visiting Laboratories

*** As of October 1st, 2026**



38 Joint Research Projects adopted for Joint Usage/Research Center Program



Overseas Partner Institutions

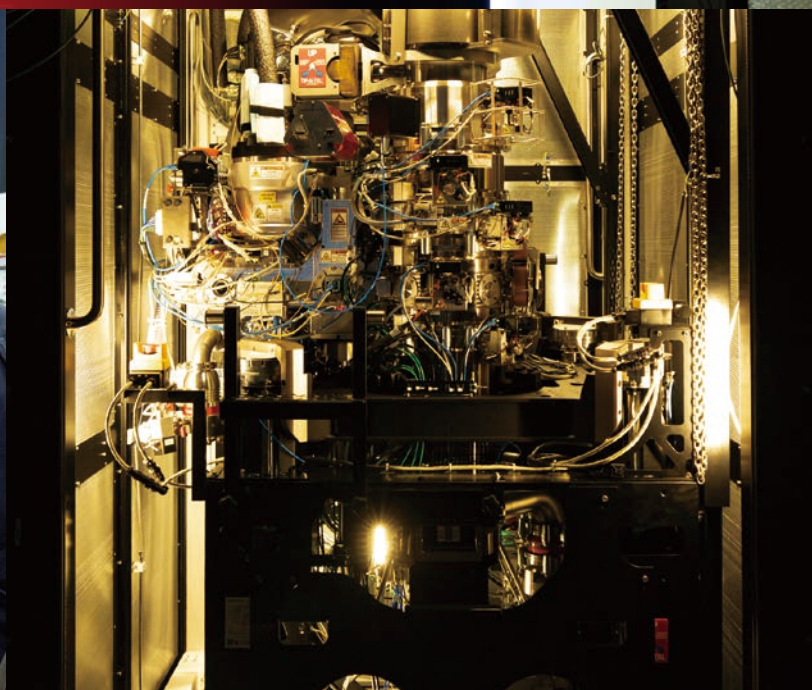
3 MOUs for academic cooperation and exchange

International exchange (As of August 1st, 2026)

Departmental-Level Academic Exchange Memoranda	[China] China Medical University China Rehabilitation Research Center [Germany] Bonn Institutes of Immunosciences and Infection, Medical Faculty, University of Bonn

Joint Usage / Research Center Initiative

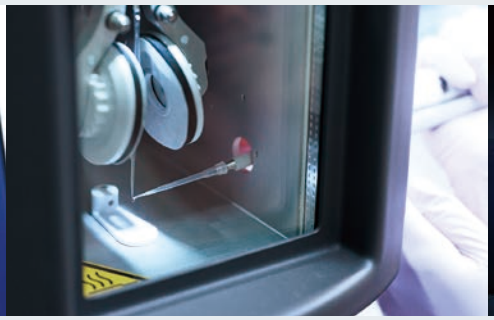




Joint Usage / Research Center

The Institute for Life and Medical Sciences has been accredited by the Minister of Education, Culture, Sports, Science and Technology as a “Joint Usage / Research Center for Transdisciplinary Collaboration on Viral Research, Stem Cell Science and System Biology” since 2022, and provides the international research community with the resources and technologies of the Institute through collaborative research.

Since being formed by the merger of the Institute for Virus Research and the Institute for Frontier Life and Medical Science in 2016, the Institute for Life and Medical Sciences has promoted cutting-edge research in the life sciences in three divisions: the Department of Virus Research, the Department of Regenerative Science and Engineering, and the Department of Biosystems Science. There is collaboration across departments, as well as a system for conducting interdisciplinary research. The activities of the two joint centers, the “Joint Usage / Research Center for Fusion of Advanced Technologies and Innovative Approaches to Viral Infections and Life Science” and the “Joint Usage / Research Center for Transdisciplinary Collaboration on Tissue Engineering and Regenerative Medicine,” which continued at the Institute until FY2021, have been integrated into the new Center, which started activities in FY2022.



Research conducted at the Center

The Center is involved in activities on three main themes

(1) Viral Research
(2) Stem Cell Science Research
(3) Biosystems Integration Science Research

and the technologies and methodologies developed by the Institute are deployed both domestically and internationally. The Center aims to conduct cutting-edge, interdisciplinary research. Specific initiatives include (1) viral infection experiments and analysis of the microstructure and molecular structure of viruses, (2) the use of human ES cells, stem cell research and the development of tissue regeneration technology through the Human ES Cell Research Center, and (3) activities to explore various life phenomena as systems in collaboration with faculty members from diverse backgrounds in the Biosystems Research Group. In 2024, the first year of the program, 34 projects were adopted and implemented.

Total number adopted in 2026	
(1) Viral Research	8
(2) Stem Cell Science Research	10
(3) Biosystems Integration Science Research	20
Total	38

A list of these proposals is available in Japanese on the Institute’s website at:

https://www.infront.kyoto-u.ac.jp/en/kyoten/

Lab. of Medical Virology

LiMe Bldg. No.2

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/lab02/





Assistant Professor	SUZUKI, Tateki
Assistant Professor	KIMURA, Kanako
Assistant Professor	SATO, Yuma

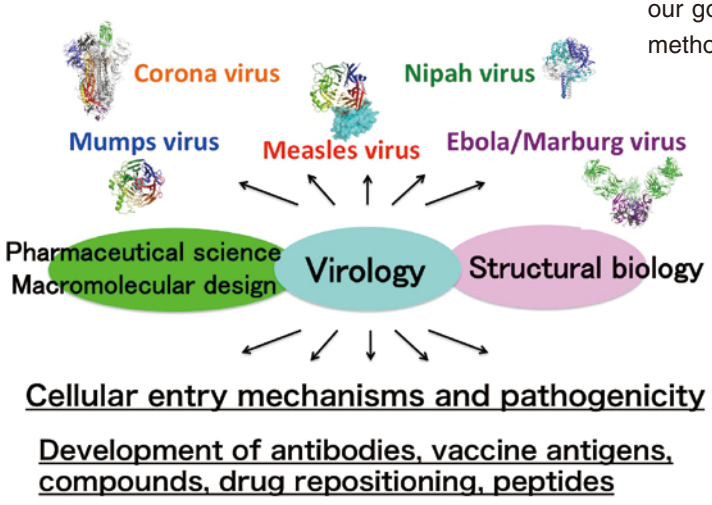
Professor

HASHIGUCHI, Takao

Infectious diseases still have remained a fatal threat to children, worldwide. To solve the problem, we have been studying on pediatric virology. In particular, we focus on the mechanisms of viral entry into cells and the inhibition of entry by compounds, peptides, glycans, and antibodies, using a combination of virological and structural biological approaches. Our major goals are the elucidation of viral pathogenesis and the development of preventive and therapeutic methods for viral diseases. Our laboratory was newly joined in this institute in September 2020, and started to research on paramyxoviruses and coronaviruses.

Measles virus (MeV) and mumps virus (MuV), members of the family Paramyxoviridae, are important human pathogens causing respiratory and neural infections. Globally, MeV has been causing outbreaks recently and over 200,000 deaths were reported in 2019. MeV usually causes acute measles, but in rare instances induces fatal and intractable neurological diseases. MuV causes epidemic parotitis, meningitis, encephalitis and deafness. Large outbreak of mumps occurs once every four to five years in Japan. Currently no licensed therapeutic agents are available for both viruses, and the mechanisms that cause CNS diseases remain unknown. Therefore, we are currently working on research to solve these problems.

Our laboratory has been also studying the development of new drugs for infectious diseases caused by SARS-CoV-2, Ebola and Marburg viruses, and Nipah virus, for which biosafety level 3 or 4 is required. One of our goals is to develop vaccines, therapeutics, and new methods of immunoanalysis using structural information.



Enveloped viruses possess glycoproteins that interact with receptors and other host factors to invade target cells via sequential membrane fusion and exert pathogenicity against humans. On the other hand, viral glycoproteins are also critical antigens in human immune responses and are one of the targets of antiviral drugs. Therefore, they are important not only in viral pathogenicity but also in the development of vaccines and new drugs. In our laboratory, we aim to elucidate the detailed mechanisms of infection and its inhibition by integrating virology with structural biology and drug discovery science.

Lab. of RNA Viruses

LiMe Bldg. No.3

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo03/



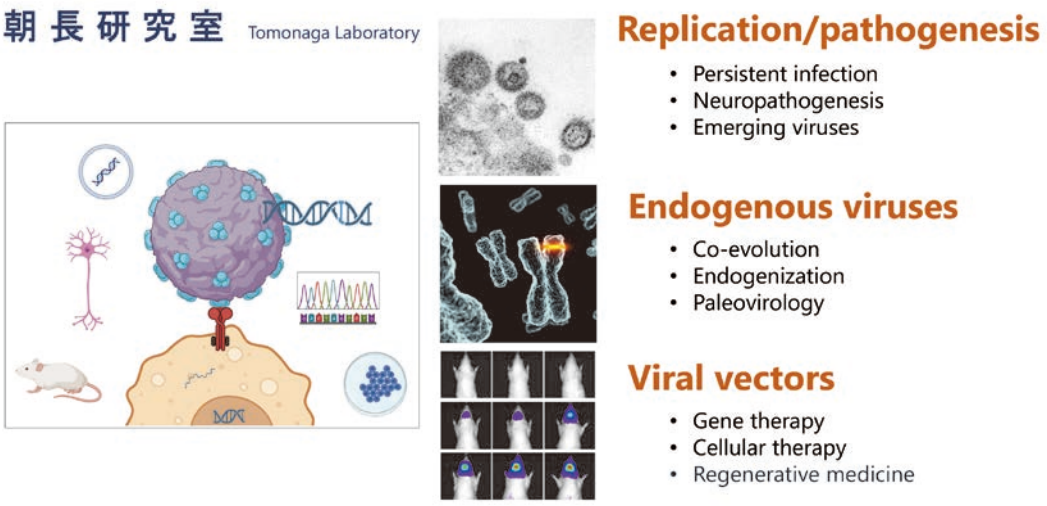
*Program-Specific



Professor, Director
TOMONAGA, Keizo

Associate Professor	MAKINO, Akiko
Assistant Professor	KITABATAKE, Makoto
Assistant Professor	KANDA, Takehiro
Assistant Professor (*)	TAKEUCHI, Fumihiko

All viruses rely on the cellular machinery to complete their replication cycles. Therefore, the study of viruses can provide fundamental knowledge and understanding not only of viral pathogenesis and host responses but also of cellular function. The research carried out in this laboratory are focused on negative strand RNA viruses replicating in the cell nucleus, especially bornaviruses. All our projects aim to understand the fundamental mechanisms of the replication, pathogenesis and evolution of bornaviruses. In current research, we are investigating the replication and persistent mechanism of the bornaviruses in the nucleus. The understanding the biological and evolutional significances of the endogenous bornavirus-like elements (EBLs) found in the genomes of many vertebrate species is one of the main focuses of our laboratory. Furthermore, we are analyzing emerging bornaviruses, which include avian bornaviruses as well as a squirrel bornavirus that may be highly pathogenic to humans. We also aim to develop a next-generation RNA viral vector based on bornavirus for applying to gene and cellular therapy using stem cells.



Lab. of Ultrastructural Virology

LiMe Bldg. No.3

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo04/





Assistant Professor | MURAMOTO, Yukiko

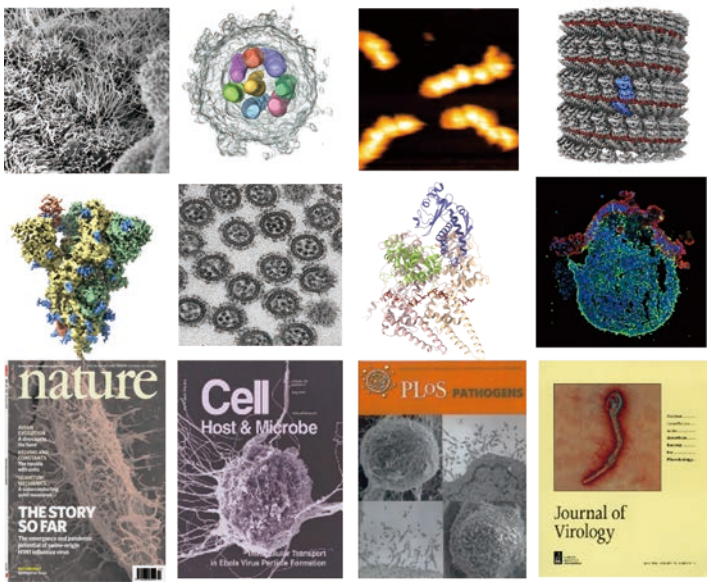
Professor, Vice Director

NODA, Takeshi

In our laboratory, we have been studying pathogenic RNA viruses in human, such as influenza and Ebola viruses. Despite their genome RNA encoding only about 10 kinds of proteins, each of these proteins exhibits multiple functions and properly controls these functions to synthesize genome RNA and viral proteins within infected cells, leading to the formation of progeny virus particles.

Therefore, we focus on the structure, function, and regulation of viral genome RNA and viral proteins that constitute virus particles, aiming to unravel the mystery of why these viruses, with only several kinds of viral proteins, efficiently replicate within infected cells and cause severe diseases in humans and animals.

In additionally, to gain new insights into virus replication mechanisms, we are promoting interdisciplinary research. By integrating new technologies into our virus research, such as structural analysis of viral proteins using cryo-electron microscopy and analysis using human respiratory organoids differentiated from human ES cells/iPS cells through developmental biology techniques, we aim to reveal aspects of the viral world that have never been seen before.



From top left to right: 1. SEM image of human nasal organoids, 2. 3D reconstruction model of influenza virus by electron tomography, 3. AFM image of influenza virus RNP, 4. Structure of helical NP-RNA complex of Ebola virus determined by cryo-electron microscopy. From middle left to right: 5. Structure of S protein of SARS-CoV-2 determined by cryo-electron microscopy, 6. Ultra-thin section image of influenza virus particles, 7. Atomic model of NP-VP24-RNA complex of Ebola virus determined by cryo-electron microscopy, 8. Immunostaining image of human nasal organoids, From bottom left to right: 9. SEM image of cells infected with swine influenza virus, 10. SEM image of cells expressing Ebola virus proteins, 11. TEM and SEM images of Ebola virus-infected cells, 12. Negative staining image of Ebola virus-like particles.

Lab. of Tumor Viruses

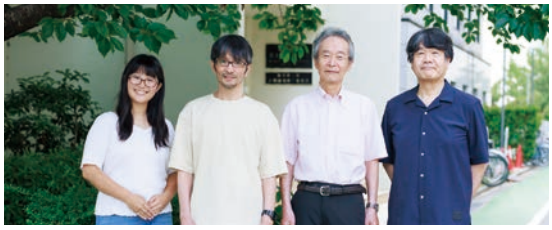
South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo05/



Associate Professor

SAKAI, Hiroyuki



Papillomavirus infection and its tumorigenic potential: The infection of papillomavirus induces benign tumors, such as warts and condylomas, and occasionally they are converted into cancers. We are investigating the molecular mechanisms of the virus replication and the virus-related tumor progression.

Analysis of Wnt intracellular signaling pathway: Wnt signaling regulates a variety of adult and developmental processes and mutations in several components of the Wnt pathway are oncogenic. I am analyzing this pathway in vitro and in vivo.

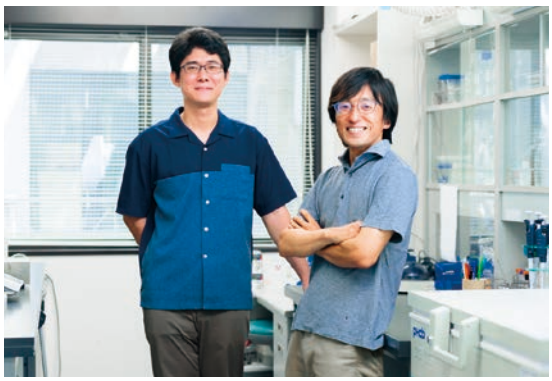


Horn-shaped warts induced by Shope papillomavirus infection

Lab. of Cell Regulation

South Research Bldg. No.1 / LiMe Bldg. No.1

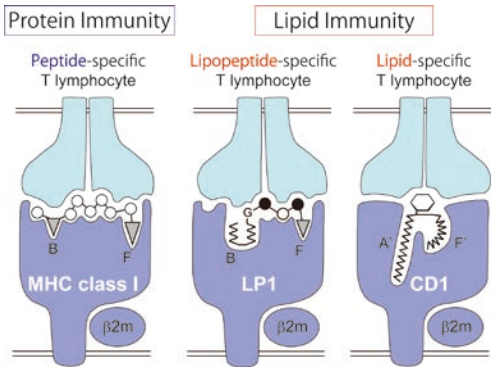
▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo06/



Assistant Professor

MORITA, Daisuke

The universe of antigens recognized by the immune system has recently been expanded to include not only protein antigens but also lipid and lipopeptide antigens. By orchestrating immunological, cell biological, structural, and lipid-biocheical approaches and by developing valuable animal systems, our laboratory aims to establish the molecular and cellular basis underlying “lipid immunity” and develop a new types of lipid-based vaccines.



Whereas MHC molecules bind peptide antigens and present them to T lymphocytes, LP1 and CD1 molecules bind lipopeptide and lipid antigens, respectively, and activate specific T lymphocytes. Our frontier research focuses on these lipid-specific immune responses, that we call “lipid immunity”.

Lab. of Viral Molecular Pathogenesis

LiMe Bldg. No.3

Lab URL
https://vmp.infront.kyoto-u.ac.jp/home-en/



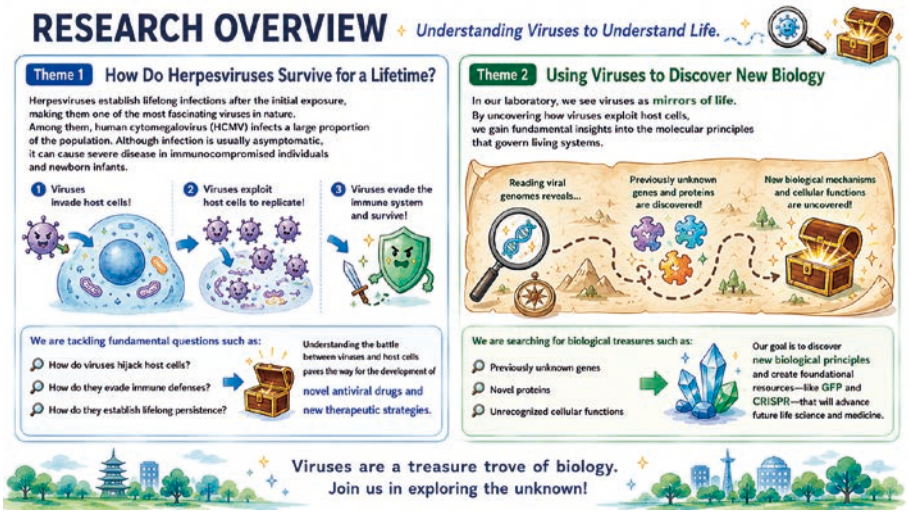


Assistant Professor | SHIO, Saori

Professor

KATO, Akihisa

Our laboratory studies large DNA viruses, including herpes simplex virus (HSV) and human cytomegalovirus (HCMV), with the goal of advancing both infectious disease research and our understanding of fundamental biological processes. While viruses are widely recognized as pathogens, they also serve as powerful tools for exploring the basic principles of life because they rely on and manipulate host cellular machinery for their replication. We therefore regard viruses not merely as pathogens, but as “mirrors of life” that reveal previously hidden biological principles. By investigating virus–host interactions at the molecular level, we seek to uncover novel mechanisms underlying host antiviral defense as well as the pathogenesis of neurological and congenital viral diseases. Understanding how viruses exploit host cellular systems—and how hosts counter these strategies—provides fundamental insights into the organization and regulation of life itself. In parallel, we investigate the molecular mechanisms by which herpesviruses cause severe diseases, including herpes simplex encephalitis and congenital cytomegalovirus infection. We also study virus-specific enzymes, which represent major targets of current antiviral therapies, with the aim of translating our findings into new therapeutic and preventive strategies. Ultimately, by integrating virology with fundamental life science, our goal is to discover new biological principles that have yet to appear in textbooks.



Research Summary

Lab. of Bioresponse Analysis (Visiting)

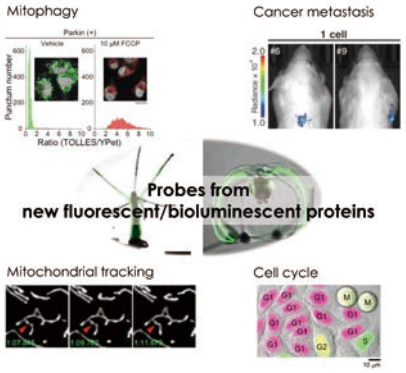
▶ Lab URL
https://cfds.riken.jp/



Visiting Professor

MIYAWAKI, Atsushi

In a signal transduction diagram, arrows are generally used to link molecules to show enzymatic reactions and intermolecular interactions. To obtain an exhaustive understanding of a signal transduction system, however, the diagram must contain three axes in space and the time base, because all events are regulated ingeniously in space and time. The scale over time and space is ignored in biochemical approaches in which electrophoresis is applied to a specimen prepared by grinding millions of cells. We advocate employing the so-called real-time and single-cell imaging technique to fully appreciate cell-to-cell heterogeneity. We also steadfastly pursue the creation of a reliable gate that would enable researchers to better understand the "feelings" of individual cells. Over the past two decades, various genetically encoded probes have been generated principally using fluorescent or bioluminescent proteins and are used to investigate the function of specific signaling mechanisms in a variety of biological systems. We believe that these approaches will continue to improve due to the various features of fluorescent/bioluminescent proteins that serve as the interface between light and life.



Lab. of Bioresponse Analysis is developing fluorescent and bioluminescent probes to study various biological processes, such as mitophagy and cancer metastasis.

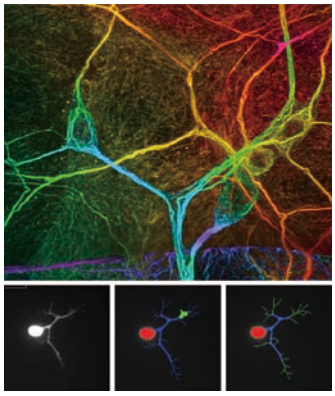


Visiting Associate Professor

Adrian Walton Moore

▶ Lab URL
https://cbs.riken.jp/en/faculty/a.moore/

As neurons differentiate and assemble into circuits, they form among the most complex and diverse structures of any cell type. They construct complex dendrite arbors that connect them to their partners, and which must be patterned to support the precise connectivity and computational requirements of each neuron. The differentiation programs that create this pattern and connectivity are genetically programmed, and when they fail this leads to neurodevelopmental disorders. To reveal the molecular control processes of neuron differentiation, my lab is using multidisciplinary approaches in Drosophila, mouse and human experimental systems. Our work connects from transcriptional and genomic level controls, through cell biological cytoskeleton effector interaction networks, to in vivo mapping of neuron structural differentiation, and arbor pattern formation over time.



Drosophila sensory neurons.
Top: A super-resolution image of neuronal microtubules.
Bottom: AI-based feature extraction from in vivo imaging of dendrite arbor differentiation

Lab. of Viral Immunology (Visiting)

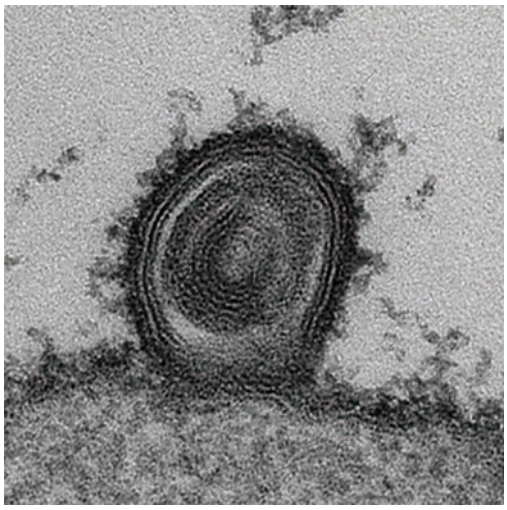
▶ Lab URL
https://www.ims.u-tokyo.ac.jp/Kawaguchi-lab/KawaguchiLabTop.html



Visiting Professor

KAWAGUCHI, Yasushi

Using herpes simplex viruses (HSVs) as models, we are promoting strategic fundamental research aimed at developing novel methods to control viral infections by elucidating the mechanisms underlying viral proliferation and pathogenesis. By utilizing viruses as biological probes to precisely analyze interactions with host cells, we are advancing research that uncovers unknown cellular and physiological mechanisms that are often overlooked in general biological studies. Moreover, we are challenging next-generation virology to reconsider the viruses as homeostasis factors and exploring their significance on the host.



An electron micrograph image of HSV invading a host cell. We discovered a new receptor necessary for HSV cell entry and demonstrated that its regulatory mechanism could be a target for antiviral drug development. The identified receptor was later found to be a receptor not only for herpesviruses but also for other RNA and DNA viruses, influencing various virology studies.

Lab. of Immunology

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo14/



*Program-Specific



Professor

KAWAMOTO, Hiroshi

Associate Professor	MIYAZAKI, Masaki
Assistant Professor	NAGANO, Seiji
Assistant Professor (*)	KOBAYASHI, Yuka
Assistant Professor (*)	UEHORI, Junji
Inter-Organ Communication Research Team	
Associate Professor (*)	KAWAOKA, Shimpei
Assistant Professor (*)	KONISHI, Riyo

The major aim of our laboratory is to elucidate the molecular mechanisms that regulate cell fate decisions in the process of lineage restriction from multipotent hematopoietic stem cells to unipotent progenitors. We are recently studying how various blood lineages have been created during evolution (Figure 1).

As another project, we have been developing an approach aiming to apply our culture method in clinical settings. Whereas cytotoxic T lymphocytes (CTLs) represent the most promising therapeutic avenue in cancer immunotherapy, adaptive transfer of antigen-specific CTLs has faced difficulty in efficient expansion of CTLs from patients in ex vivo culture. To solve this issue, we have proposed a strategy to use iPSC technology for cloning and expansion of tumor antigen specific CTLs; iPSCs produced from T cells (T-iPSCs) should inherit rearranged TCR genes, and thus all regenerated T cells from T-iPSCs should express the same TCR. Based on this idea, we have succeeded in regenerating MART1-specific CTLs from a melanoma patient (Vizcardo et al, Cell Stem Cell, 2013). Recently we have developed a method by which CTLs are regenerated from iPS cells transduced with exogenous TCR gene(TCR-iPSCs). This new method provides a convincing rationale for application of this strategy in clinical settings targeting cancer or viral infection (Figure 2).

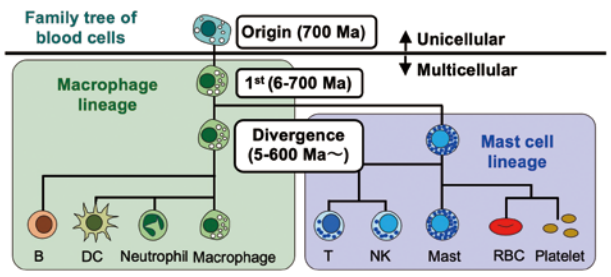


Figure 1 The History of the Origin and Diversification of Blood Cells
In this study, by developing a method to compare the expression of genes across a wide variety of cell types in various animals and single-celled organisms, it was revealed that: (1) the ancestors of animals utilized a genetic program that had been established when they were still single-celled organisms to give rise to macrophage-like blood cells within their body cavity; (2) mast cells diverged from macrophages; (3) primitive T cells branched off from these mast cells; (4) primitive B cells branched off from macrophages; and (5) red blood cells branched off from mast cells. It can be said that the blood cells and immune cells circulating within our bodies represent a successful extension and development of the legacy bequeathed to us by our unicellular ancestors (PNAS, 123, 23, e2528110123, 2026).

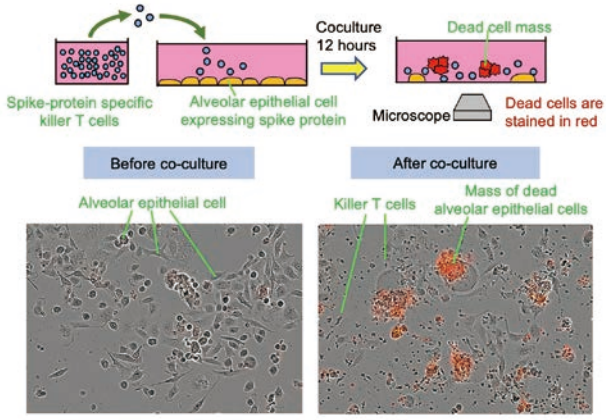


Figure 2 Killing of alveolar epithelial cells expressing viral protein by the killer T cell medicine
Alveolar epithelial cells were used as target cells that were enforced to express spike protein of SARS-CoV-2 to mimic infected cells. Killer T cells produced from HLA-deleted ES cell expressing T cell receptors specific for the spike protein were added and co-cultured for 12 hours. Most of epithelial cells were found to be killed.

Lab. of Developmental Epigenome

South Research Bldg. No.1 / LiMe Bldg. No.1

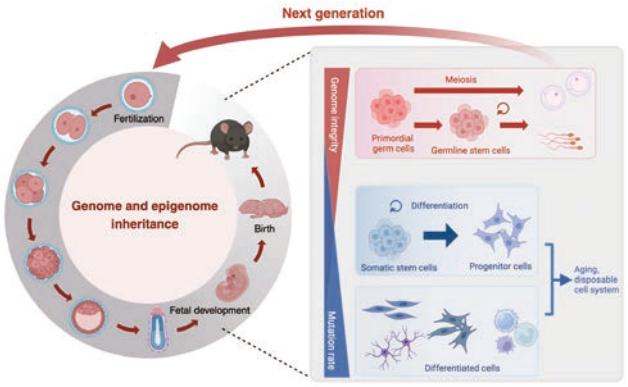
▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo17/



Associate Professor
CHUMA, Shinichiro



During development of multicellular organisms, genetic stability is differentially regulated depending on developmental stages, cellular lineages and physiological conditions etc. We are currently investigating (1) how pluripotent stem cells and germline cells maintain their genome and epigenome integrity, and (2) how the genome and epigenome stability is coordinated with developmental programs of the germline-stem cell cycle. We also aim to identify genes and pathways with which the genetic stability of stem cell resources can be improved.



Our research aims to understand the genome and epigenome dynamics of the germline cycle and apply the findings to stem cell resources

CHECK

Event Announcement

Every July, the Institute holds a public lecture where faculty members present their latest research findings. The lecture's theme changes each year, offering a glimpse into the breadth and depth of research across the Institute's many fields. The event is open to everyone, whether from within or outside the university, and it is well-received every year. We warmly welcome your participation.



For details and the latest information, please visit the Institute's website:
https://www.infront.kyoto-u.ac.jp/en/

Lab. of Integrative Biological Science

LiMe Bldg. No.5

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo19/



*Program-Specific

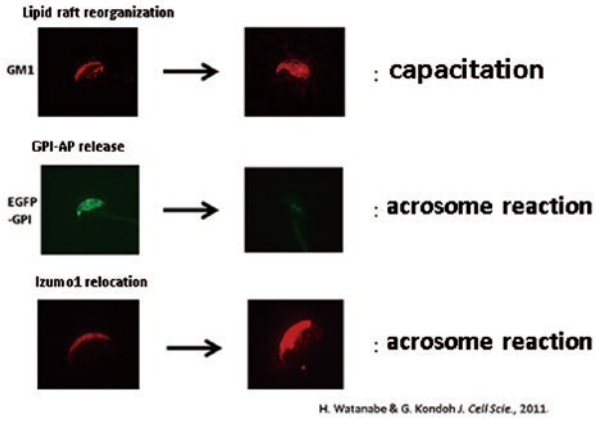


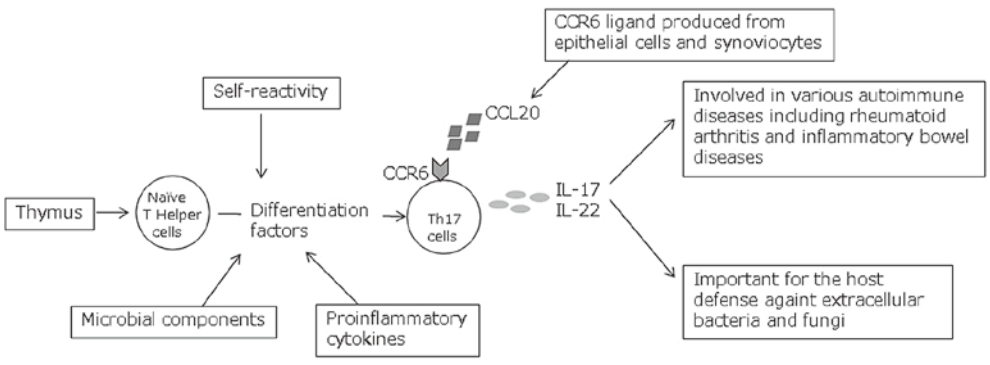
Associate Professor (*)	HIROTA, Keiji
Assistant Professor (concurrent)	WATANABE, Hitomi
Assistant Professor (*)	OHARA, Daiya *Hakubi Project

Professor

KONDOH, Gen

Mammalian sperm undergo multiple maturation steps after leaving testis to be competent for fertilization. Serial important changes occur in the female reproductive tract on sperm, although the molecular mechanisms underlying these processes remain unclear. In our early study, we found that angiotensin-converting enzyme (ACE) releases GPI-anchored proteins (GPI-AP) from the cell membrane and plays a critical role in mammalian fertilization. We also found that sperm undergoing GPI-AP release associated with reorganization of lipid raft and acrosome reaction acquire fertilization potential. In terms of identifying factors triggering these processes in vivo, we found Lipocaline2 as a sperm maturation factor of female. Recently, we started new research projects elucidating character and function of new helper T cell, Th17 cell, to clarify the mechanism of inflammation.





Lab. of Immunopathogenesis

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://ito-lab-en.labby.jp/



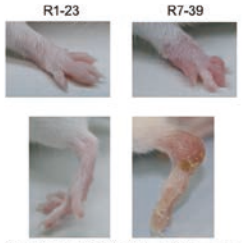


Assistant Professor	OSAKI, Motonao
Assistant Professor	NAKAYAMA, Yoichi

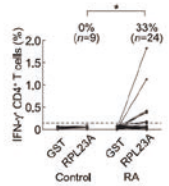
Professor

ITO, Yoshinaga

We study an interplay between immune system and self-organs/tissues, with particular focus on its physiological roles and the mechanisms of disease development when the interaction becomes aberrant. We place autoimmunity and cancer immunology from an integrated perspective: both of them are ‘destruction of self-derived components by immune system’. We strive to discover key molecular pathways shared by both autoimmune diseases and cancer immunotherapy in order to develop innovative treatment arms for these devastating diseases.

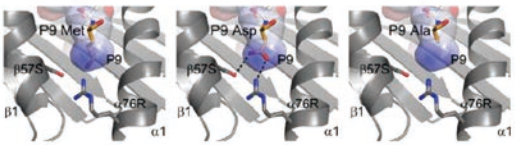


自己免疫疾患新規モデルマウス
A novel autoimmune disease model

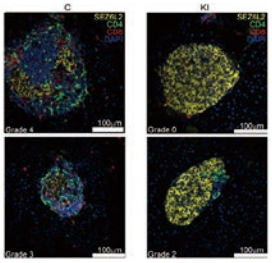


ヒト関節リウマチの標的自己抗原の同定
Identification of an autoantigen in rheumatoid arthritis

Ito Y et. al. *Science*. 2014



生化学的特性に基づく遺伝子改変モデルマウス設計
An animal model with a single amino acid substitution



自己免疫炎症の抑制
Control of autoimmune inflammation

Ito Y et. al. *J Exp Med*. 2018

By employing our own new technology, we will elucidate the whole repertoire of autoantigens critical for disease development in autoimmune diseases in order to establish antigen-specific therapeutics.

Lab. of Experimental Immunology (Visiting)

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
http://exp.immunol.ifrec.osaka-u.ac.jp/?lang=en



*Program-Specific



Assistant Professor (*) | KAWAKAMI, Ryoji

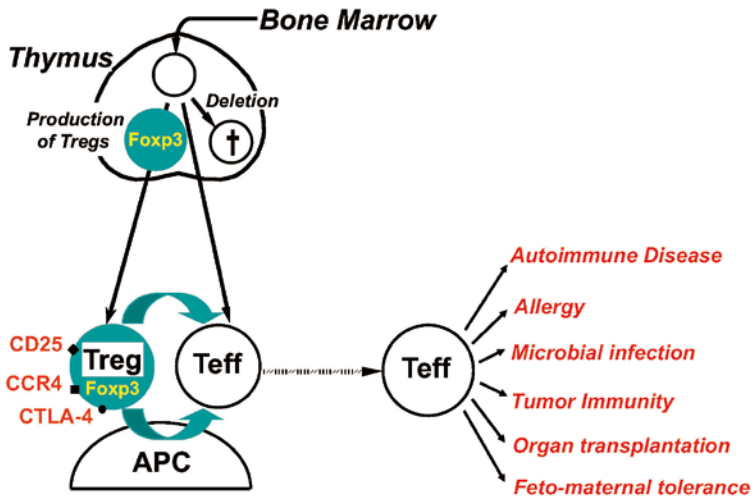
Visiting Professor

SAKAGUCHI, Shimon

Our laboratory studies the mechanisms of immunological tolerance. We discovered naturally occurring regulatory T (Treg) cells as a T-cell subpopulation that is specialized for immune suppression and engaged in the maintenance of immunological self-tolerance and homeostasis. We have been studying the molecular and cellular basis of Treg cells development and maintenance, in mice and humans by using immunological, genetic and bioinformatics approaches. Since Treg cells are involved in various physiological as well as pathological immune responses, we are developing various ways to manipulate Treg cells for clinical application, which is a novel immuno-therapy for autoimmune diseases, allergy, infection, organ transplantation and cancer.

We are also studying the pathogenetic mechanism of rheumatoid arthritis by analyzing our newly developed model (SKG mouse). SKG mice have a mutation in the ZAP70 gene, which plays a critical role in T cell recepter signaling. Because of this mutaion, SKG mice show altered thymic selection and allow a leakage of self-reactive T-cell from the thymus. We are investigating how such impaired signal transduction causes autoimmune diseases.

Control of immune responses by Foxp3⁺CD25⁺CD4⁺ Tregs

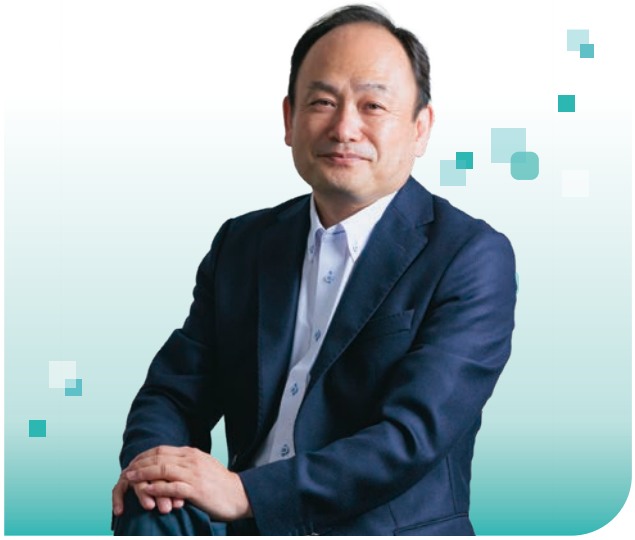


CD25+CD4+ regulatory T (Treg) cells are produced by the normal thymus as a functionally mature T-cell subpopulation. They specifically express the transcription factor FoxP3. Reduction of Treg cells or attenuation of their suppressive activity may enhance tumor immunity and microbial immunity. In contrast, increase of the number of Treg cells or augmentation of their suppressive activity can treat autoimmunity and induce transplantation tolerance.

Lab. of Biomechanics

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
http://www2.infront.kyoto-u.ac.jp/bf05/index-e.html



*Program-Specific



Professor, Vice Director

ADACHI, Taiji

Associate Professor	MAKI, Koichiro
Associate Professor (*)	KUMETA, Masahiro *Hakubi Project
Assistant Professor	KIM, Young Kwan
Assistant Professor	TAKEDA, Hironori
Assistant Professor	SUMITA, Hiromi

The Laboratory of Biomechanics aims to clarify the self-organized regulatory mechanisms of diverse biological phenomena through interdisciplinary approaches encompassing mechanics, life science, and medical science. Our research topics cover developmental processes (cell differentiation, morphogenesis, and growth) as well as tissue/organ remodeling and regeneration which underlie functional adaptation to the environment. A major focus of our research is to understand how well-organized dynamics of living systems emerges from complex molecular and cellular interactions. To this end, we are integrating biomechanics and mechanobiology approaches to highlight the roles of “adaptation to mechanical environment” and “hierarchy of structure and function” in the living organisms using mathematical modeling, simulation and experiments.

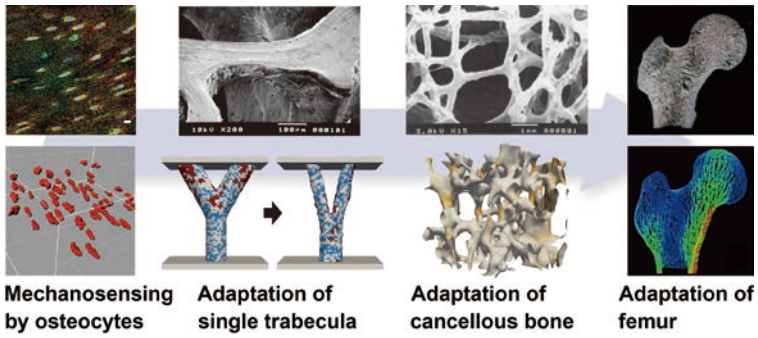


Figure 1 Bone can remodel its outer shape and inner structure to adapt to the surrounding mechanical environment. This study aims to clarify the mechanism of bone functional adaptation achieved through cooperative cellular activities.

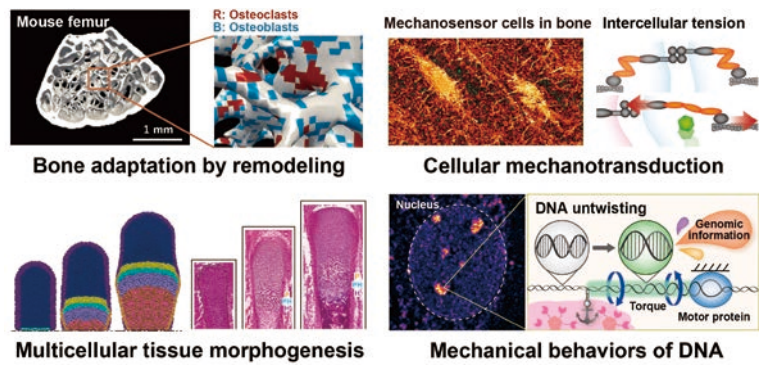


Figure 2 We combine experiments and modeling at multiscale to provide mechanical insights into biological systems, such as morphogenesis of multicellular tissues and cell fate determination under mechano-biochemical environment.

Lab. of Developmental Systems

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://www2.infront.kyoto-u.ac.jp/bs01/aboutus_en.html



*Program-Specific



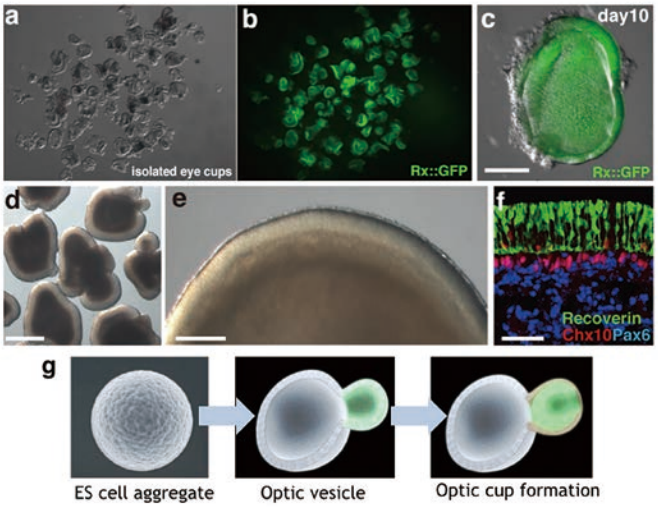
Associate Professor	OHGUSHI, Masatoshi
Assistant Professor	MII, Yusuke
Assistant Professor (*)	WANG, Zhe

Professor

EIRAKU, Mototsugu

Organogenesis is a highly dynamic process in which multicellular behaviors are regulated by mechanisms in multiple scales from molecules and cells to tissues. In vitro generation of functional organ with complex structure is a major challenge of cell biology. Toward this goal, it is a reasonable strategy to recapitulate the ontogeny that is the most efficient and robust process for organogenesis acquired through evolution. Our laboratory aims to clarify molecular and cellular mechanisms underlying organogenesis, and to develop new technologies for in vitro recapitulation, that is, three-dimensional functional organ generation from stem cells. We have previously established efficient three-dimensional cultures for generation of mouse and human ES/iPS cell-derived brain and retinal tissue as well as other ectoderm-derived tissues. Based on our past achievements in 3D tissue formations from pluripotent stem cells, we have been attempting to extend our limit of understanding for self-organization phenomena in neural development and advance the culture technology for generation of more complex tissues from ES/iPS cells in a more robust manner. To do that, we mainly focus on following points.

1) Elucidation of self-organization phenomena in neural development and morphogenesis
2) Development of novel technologies for in vitro formation of functional organ
3) Molecular analysis of species-specific regulation for developmental timing and tissue size determination.

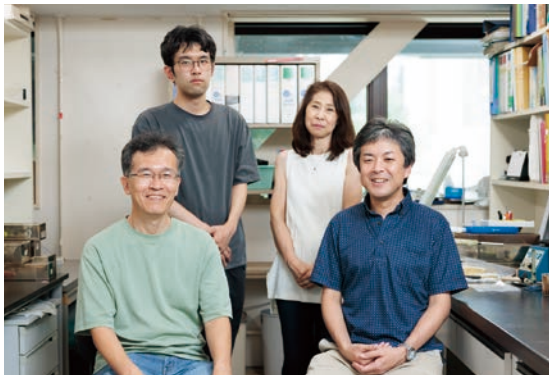


in vitro formation of optic cup and layered retina from ES cells
a-c, Isolated optic cup structure generated from mouse ES cells. d-f, ES cell-deirved optic cup differentiate into layered retinal structure. g, Scheme of in vitro optic cup formation in ES cell culture.

Lab. of Biological Membrane System

LiMe Bldg. No.2

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo31/



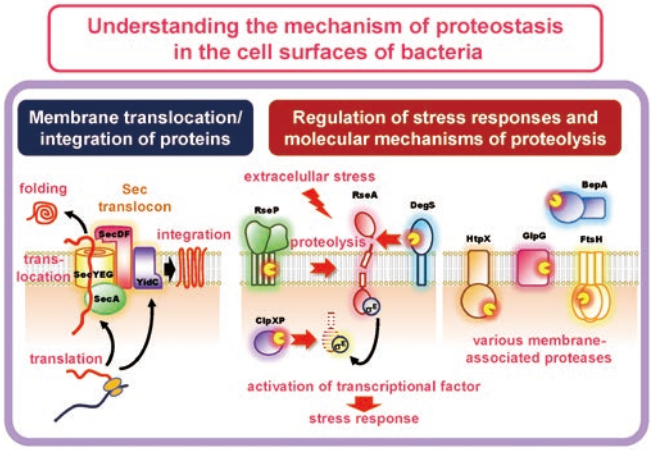
Associate professor

MORI, Hiroyuki

Assistant Professor | HIZUKURI, Yohei

The research prejects carried out in the laboratory of Biological membrane system.

Our research seeks to understand the molecular mechanisms by which bacterial cells coordinate protein secretion, membrane insertion, degradation, and stress responses to establish a functional network that ensures the proper biogenesis and homeostasis of surface proteins. Our current research is particularly focused on two major topics: (1) the function and regulation of the protein translocation machinery, and (2) the physiological roles and the regulation mechanism of the regulated intramembrane proteolysis mediated by intramembrane proteases.



Department of Biosystems Science

CHECK

Outreach and Communications

We share information through the following channels to introduce the Institute.

Newsletter: As part of the activities of the Joint Usage/ Research Center for Transdisciplinary Collaboration on Viral Research, Stem Cell Science, and Systems Biology, we publish the Center's newsletter three times a year. It covers topics such as the Center's latest research achievements, new faculty introductions, and upcoming events.

Video Channel: We share the latest updates about the Institute on our YouTube channel, "Iseiken Channel" (医生研チャンネル).



Newsletter
https://www.infront.kyoto-u.ac.jp/kyoten/01-newsletter/

Video Channel
https://www.youtube.com/channel/UCQBisvT4JPt5rdgMWpSVSqg

Lab. of Mathematical Biology

LiMe Bldg. No.3

▶ Lab URL
https://mathbio.infront.kyoto-u.ac.jp/en/



*Program-Specific

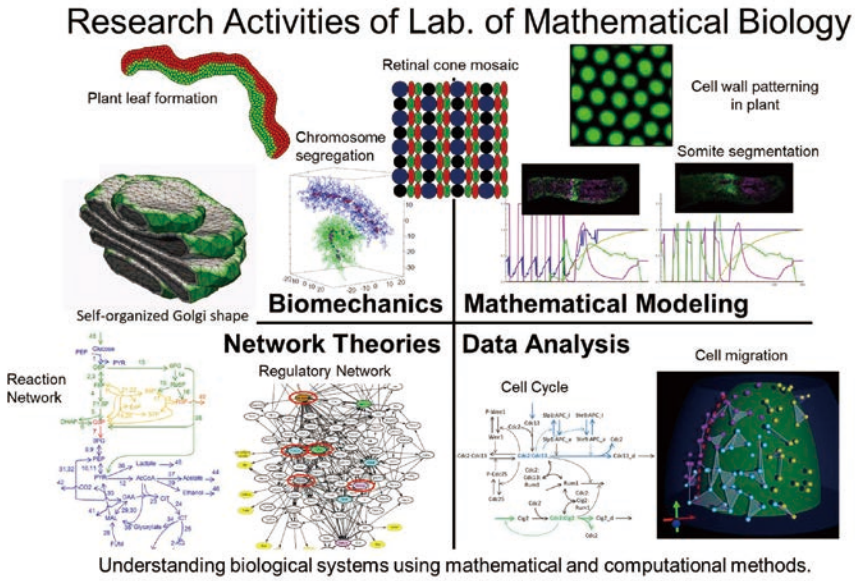


Assistant Professor	ISHIKAWA, Masato
Assistant Professor (*)	SUN, Liangjie

Professor

MOCHIZUKI, Atsushi

The progress of modern biology revealed that biological phenomena are governed by complex network systems including many molecules, cells or organs. For the aim of understanding the functions of complex systems, we adopt mathematical and computational methods. By theoretical approaches we decipher huge amounts of experimental information, and to give integrative understanding for the biological systems. Our final goal is to open a new bioscience which will progress by the repeats of the theoretical predictions and the experimental verifications. We are promoting multiple projects of collaborations with experimental biologists. One of our recent projects is studying dynamics of complex network systems in biology. We developed some theoretical frameworks to extract the important aspects of dynamics from network structure alone, without assuming other quantitative details. By combining our theory with experimental measuring and controling, we will determine mechanism of dynamical behaviours and understand the principles for the biological functions.



Research topics in lab. of Mathematical Biology

Lab. of Stem Cell Genetics

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo40/

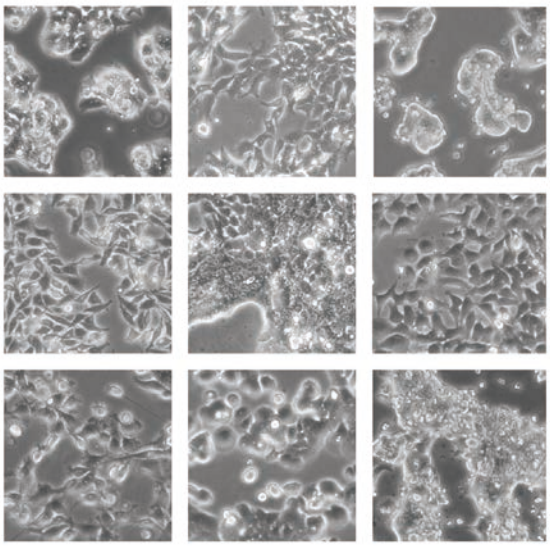




Professor
YUSA, Kosuke

Assistant Professor	TARUMOTO, Yusuke
Assistant Professor	NISHIBUCHI, Gohei
Assistant Professor	AOKI, Kazunari

Forward genetic approach can comprehensively reveal genes involved in a phenotype of interest. This approach was frequently applied in lower model organisms such as yeast, Caenorhabditis elegans and fruit fly to identify genes involved in fundamental biological processes. In contrast, forward genetic approach had been hampered in mammalian cultured cells as there was no efficient way to inactivate all copies of every gene. Our research has been focusing on developing novel genetic tools that enable us to apply powerful forward genetics in mammalian cells. As one solution, we developed a functional genetic screening method using the CRISPR-Cas9 system, which is highly efficient to genetically dissect a wide range of mammalian biology. Our current work focuses on molecular function studies of genes identified through CRISPR-based genetic screening in the following two research area: 1. Molecular mechanisms of pluripotency maintenance and differentiation of human pluripotent stem cells and 2. Genetic vulnerabilities in cancer cells and drug development. In the oncology area, we also focus on tackling drug resistance. Additionally, we also aim to develop novel genetic methodology by combining CRIPSR methods with emerging technologies.



Colorectal cancer cell lines showing various cell morphologies. This cancer type can be classified into a few sub-groups based on gene mutations and gene expression profiles. Drug targets that show specificity in certain groups are most valuable as these targets are associated with biomarkers that can be used for patient stratification, and prioritised in follow-up analysis and subsequent drug development process.

Lab. of Deconstruction of Stem Cells

LiMe Bldg. No.2

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo43/



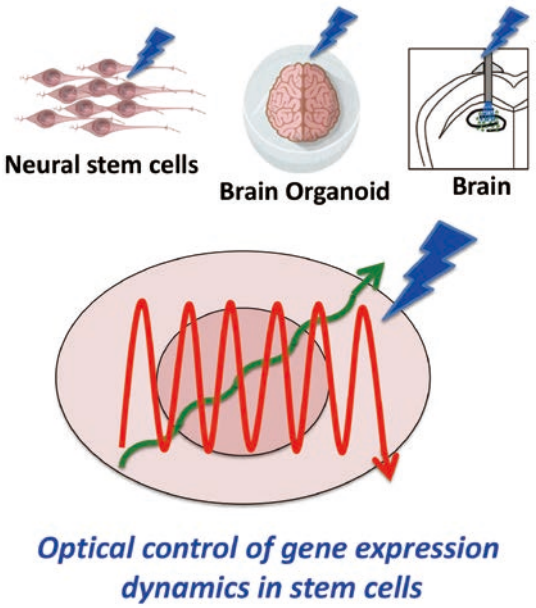


Professor

IMAYOSHI, Itaru

The recent discovery of neural stem cells in the adult central nervous system has raised the possibility of repairing the damaged tissue by recruitment of their latent, endogenous regenerative potentials. Development of innovative methods that can noninvasively manipulate neural stem cells in the brain has been expected for regenerative medicine of the nervous system. We have recently demonstrated the first success of such an approach in artificial manipulation of proliferation and neuronal differentiation of neural stem cells by light. We are currently extending this regenerative approach to various types of neural disease models in mice and primates, such as traumatic injury, neurodegeneration or psychiatric disorder. In our laboratory, by applying the novel light-inducible gene expression system, we will try developing novel methods to selectively and efficiently induce various neural cell types from neural stem cells.

More specifically, we will focus on the dynamic expression changes of transcription factors in neural stem cells and manipulate them by the optogenetic approach. We will improve the specificity and efficiency of differentiation of neural stem cells and direct reprograming processes. We will apply these light-mediated control methods to neural stem cells in the brain and iPS cells-derived brain organoids, as well as to cultured neural stem cells.



Development of novel optical methods to regulate differentiation of neural stem cells in neural stem cell cultures, brain organoids, and living brains.

Lab. of Nano Bioengineering

LiMe Bldg. No.2

▶ Lab URL
https://www.hshintaku.com/



*Program-Specific



Associate Professor (*)	SHIOMI, Akifumi *Hakubi Project
Assistant Professor	KANEKO, Taikopaul
Assistant Professor	MINEGISHI, Misa

Professor

SHINTAKU, Hirofumi

Established in April 2023, the Nano Bioengineering Lab delves into the intricate organization of multicellular systems. Our research endeavors focus on elucidating the cross-scale system from single cells to complex organisms and understanding the mechanisms underlying diseases that arise from organizational disruptions. We pioneer innovative omics methodologies, leveraging advancements in micro/nanofluidics and electrokinetics, to unravel these fundamental questions. Our interdisciplinary approach unites experts from diverse fields including basic biology, cancer biology, biophysics, and mechanical engineering. As a recent achievement, we developed ELASTomics (electroporation-based lipid-bilayer assay for cell surface tension and transcriptomics), which measures cell surface tension and gene expression with single-cell resolution. Additionally, we created an optical-indexing method that integrates microscopic images and gene expression by combining fluorescent color codes and DNA barcodes. At the heart of our work lies the collaborative environment of LiMe, serving as a dynamic hub for interdisciplinary exchange. Together, we strive to push the boundaries of knowledge and contribute to breakthroughs in biomedical science and engineering.

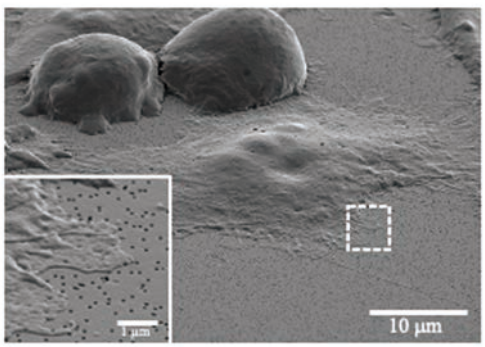


Figure 1 The mechanical properties of cells are known to be associated with physiological states in various biological contexts, such as cell differentiation, cancer, and aging. To elucidate the intricate molecular mechanisms governing mechanical properties of cells, we have developed a novel method capable of integrating cell mechanics profiling with unbiased transcriptomics for thousands of single cells (Shiomi et al., Nat Commun., 2024).

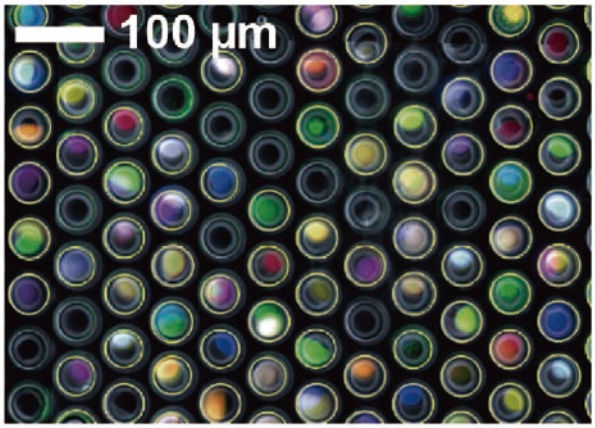


Figure 2 Genetically identical cells can show diverse responses to drugs, leading to different cell fates, such as drug resistance in cancer. To study the molecular cascade of how the variation in gene expression gives rise to different phenotypic responses, we introduced a method combining optical indices from cells and hydrogel beads with single-cell RNA sequencing, linking cellular drug responses to gene expression variations (Tsuchida et al., LabChip, 2024).

Lab. of Aging and Infection Control

LiMe Bldg. No.2

▶ Lab URL
https://www.kagenakadailab.com/English.html

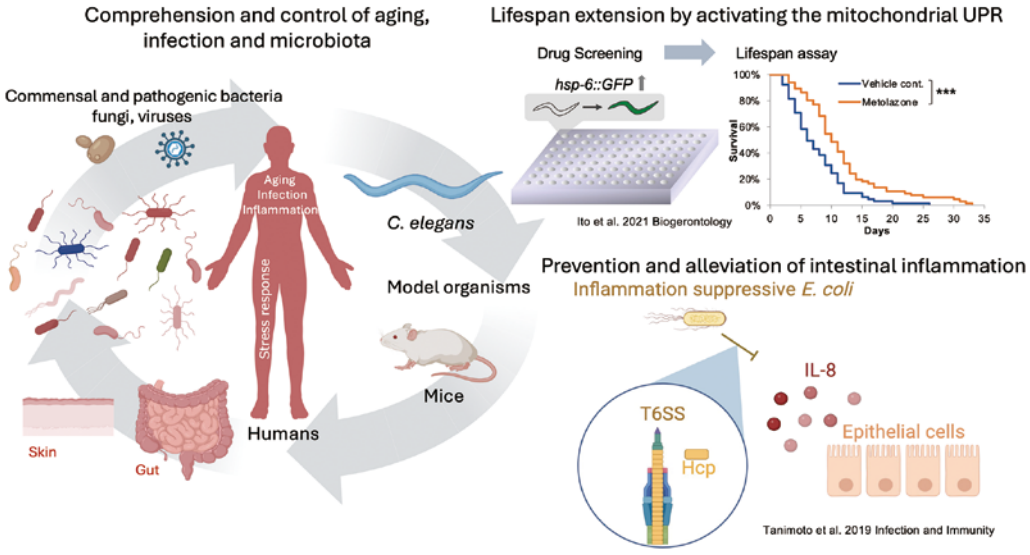




Professor
NAKADAI, Eriko

Assistant Professor	TANIMOTO, Yoshihiko
Assistant Professor	OKAHATA, Misaki

We aim to elucidate the mechanisms of interaction between the indigenous microflora and host aging, infection, and inflammation. Based on those mechanisms, we hope to construct methods to control aging and infection through food and indigenous microbiota. We are also developing methods to extend healthy life span by targeting life phenomena such as mitochondrial quality control and epigenetics, which are closely related to aging. In recent years, it has become clear that inflammation is closely related not only to infection but also to various chronic diseases, and we are focusing on the possibility of using intestinal bacteria to suppress inflammation. We invite you to join us in our research.



We aim to understand the mechanisms of aging, infection and inflammation, and to construct methods to control them via food and indigenous microorganisms. We are mainly using the nematode C. elegans as a model organism, but we also incorporate cultured cells and mouse models of pathological conditions, depending on the topic.

Lab. of Mechanosensory Physiology

LiMe Bldg. No.2

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/laboratory/labo49/

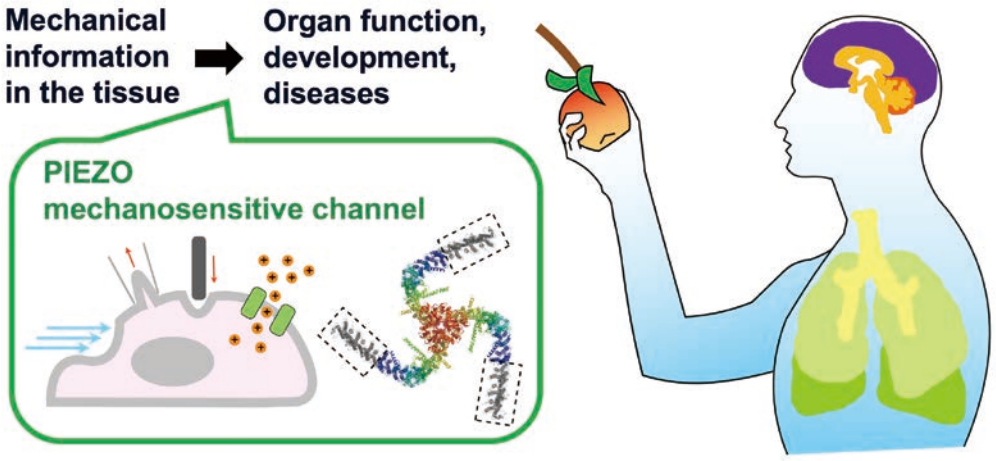




Professor
NONOMURA, Keiko

Senior Lecturer GOTO, Teppei
Assistant Professor SUZUKI, Minako

We are studying physiological roles of mechanosensation mediated by PIEZO mechanically activated channel (awarded Nobel prize 2021) in tissues/cells including sensory neurons, brain tissue and lymphatic vessels. <Main themes> 1. Elucidating physiological roles of PIEZO expressing mechanosensory neurons innervating lung and/or other organs. We have been specifically investigating their contribution to breathing pattern of newborns, as starting breathing immediately after birth is critical for survival of mammalian newborns and its underlying mechanism is still mostly elusive. 2. Studying the contribution of PIEZO mediated mechanosensation in the brain, focusing on both developmental process and brain function. 3. Studying the mechanism in which PIEZO1 mediated mechanosensation contributes to venous/lymphatic valve formation, utilizing KO or reporter mouse lines and cultured endothelial cells.



PIEZO mechanically activated channel senses positive/negative stretch of cell membrane or fluid flow around the cell. We are investigating the physiological roles of the mechanosensory system involving PIEZO channel and also types of mechanical stress activating PIEZO.

Lab. of Biological Data Science

South Research Bldg. No.1 / LiMe Bldg. No.1

▶ Lab URL
https://genomics.virus.kyoto-u.ac.jp/lab/index.html



Professor (concurrent)

TOMONAGA, Keizo

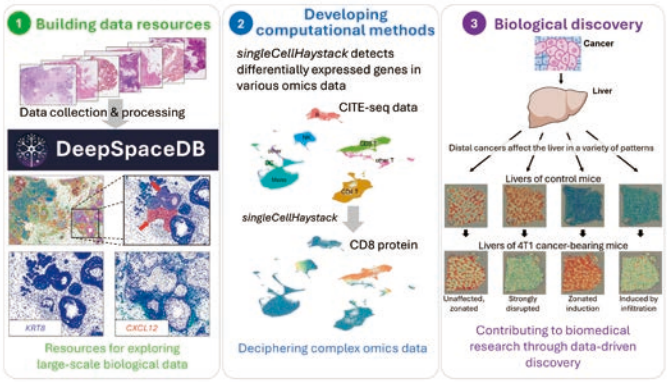
Associate Professor | VANDENBON, Alexis

Overview of our research. We build large-scale biological data resources, develop bioinformatics and machine learning methods for analysing single-cell and spatial transcriptomics data, and apply these approaches to advance our understanding of tissue organisation and disease.

Our laboratory conducts research in bioinformatics, applying machine learning to analyse life science data, including single-cell and spatial transcriptomics. We develop novel computational methods to better understand cell-cell interactions and tissue organisation.

In particular, we focus on the integrated analysis of spatial transcriptomics data and the development of databases to uncover the fundamental principles of tissue organisation and the spatial changes associated with disease, thereby contributing to advances in the life sciences and biomedical research.

Understanding Cells and Tissues through Life Science Data



Lab. of Stem Cell and Tumor Metabolism

LiMe Bldg. No.3

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo41/

Professor (concurrent)

TOMONAGA, Keizo

Associate Professor | HATTORI, Ayuna
Assistant Professor | MATSUURA, Kenkyo

We study the molecular basis of cell fate regulation in normal and malignant stem cells. We are investigating pathways of hematopoiesis and skeletal muscle systems in mice and humans. Stem cells have a remarkable ability to self-renew, which supports tissue regeneration and repair after injury. But this ability is a double-edged sword; the same mechanism of self-renewal can be hijacked during malignant transformation and lead to cancer. In recent decades, we have learned a great deal about the mechanisms of oncogenic transformation, yet finding effective ways to eradicate cancer cells has remained an elusive goal in many types of cancer. This is partly because tumors are often complex and heterogeneous mixtures of neoplastic cells with different self-renewal and differentiation potentials. Unlike many differentiated cells within a tumor, some cancer cells retain the ability to self-renew. These self-renewing cancer cells, or cancer stem cells, are therapy-resistant and can drive tumor relapse and metastasis following treatment cessation. Recent studies, including our own work, suggest that normal and malignant stem cells operate on cell fate regulatory signals that are common or specific to each population. Our research program seeks to deepen our understanding of stem cell and cancer biology and to apply this knowledge to the development of novel and effective approaches to treat human disease and cancer.

Lab. of Biomolecular Chemistry

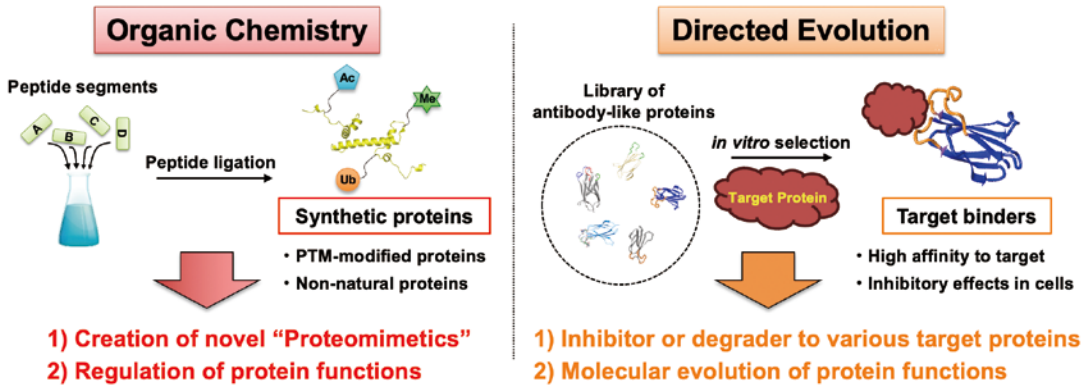
South Research Bldg. No.1 / LiMe Bldg. No.1



Professor

HAYASHI, Gosuke

Over the past half century, the structures and functions of a wide variety of biomolecules including proteins and nucleic acids have been elucidated, driving remarkable progress in the life sciences. In parallel, advances in organic chemistry and directed evolution have matured our ability to synthesize and produce not only complex natural products but also useful molecules that do not exist in nature. In our laboratory, we focus on proteins—the central players in biological phenomena—and aim to create novel molecules that advance research in biology and the pharmaceutical sciences by integrating the techniques and underlying principles of organic chemistry and directed evolution. Specifically, we are pursuing the creation of proteomimetics with backbone structures distinct from those of natural proteins, the control of protein function through the incorporation of non-natural amino acids, the functional analysis of post-translational modifications using chemically synthesized proteins, and the development of inhibitors and degraders targeting specific proteins based on peptide and protein binders. Through the "molecular-level creation approach", we aim to contribute to the advancement of the life sciences and medicine.



We aim to create original molecules by developing, advancing, and integrating two types of molecular technologies—organic chemistry and directed evolution—thereby contributing to the advancement of the life sciences and the pharmaceutical sciences.

Research Center for Infectious Diseases

Lab. of Supramolecular Structural Biology

LiMe Bldg. No.3

▶ Lab URL
https://www.infront.kyoto-u.ac.jp/en/laboratory/labo51/

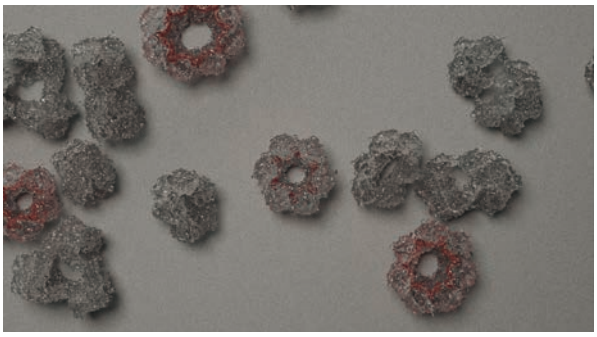


The Laboratory of Supramolecular Structural Biology uses cryo-electron microscopy as a core technology to elucidate the structures and functions of viruses, biomolecules, and intracellular supramolecular complexes. Combining single-particle analysis and cryo-electron tomography, we investigate self-assembling molecular machines from the atomic/molecular level to the organelle/cellular level, and apply the resulting structural insights to molecular design and drug discovery. We also actively pursue collaborative research within and outside the university, including with industry.

Professor (concurrent)

NODA, Takeshi

Associate Professor | SUGITA, Yukihiko



Three-dimensional CG model based on the cryo-EM structure of the Borna disease virus 1 nucleoprotein-RNA complex, visualizing at high resolution how nucleoprotein protomers, adopting diverse oligomeric states, enclose the RNA (red) (Sugita and Hirai et al., Science Advances, 2026).

Animal Experiments Faculty for Viral Infection

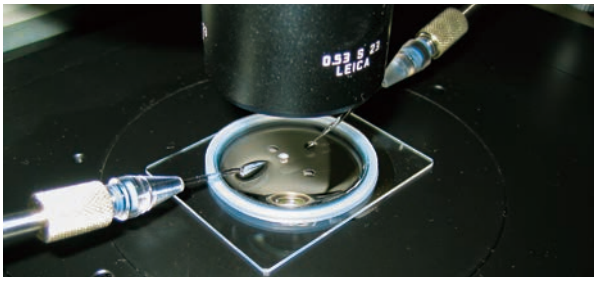
LiMe Bldg. No.3



We have a laboratory facility for investigation of biological reactions with virus infection. After permission from the committee of faculty and technical staff (veterinarians), viral infection experiments are conducted under strict control.

Reproductive Engineering Team

LiMe Bldg. No.3







Reproductive engineering team is a support unit for generating transgenic mouse (Tg) and knockout mouse (KO) and genome editing mouse (CRISPR). We also perform cryopreservation of mouse-fertilized eggs.

Center for Animal Experiments

LiMe Bldg. No.3 / No.4

▶ Lab URL
https://anif4.infront.kyoto-u.ac.jp/ [Internal Access Only]

*Program-Specific



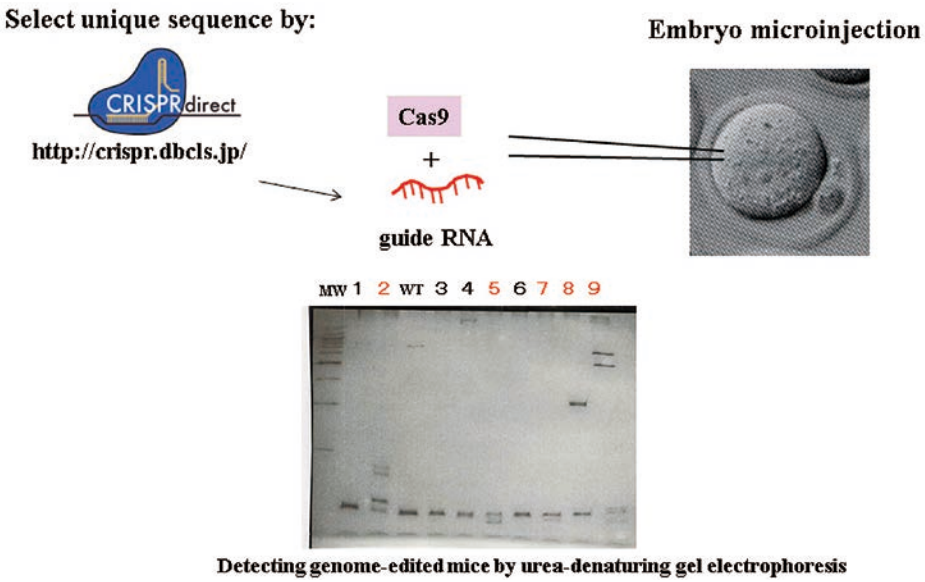


Associate Professor (concurrent)(*)	HIROTA, Keiji
Assistant Professor	WATANABE, Hitomi
Assistant Professor (*)	KATANAYA, Ami

Professor (concurrent)

KONDOH, Gen

Experimental animals, such as mouse, rat and others, are housed in our Center under strict regulation of animal experimental committee and institutional guidelines for animal welfare. Moreover, we have been considered for long time: how to make gene-manipulated mice more rapidly and conveniently. Recently, genome engineering methods have been established using TALEN or CRISPR-Cas9 systems. We have searched for many methods and finally developed our own protocol making such mice more easily and reproducibly.



Our strategy for developing genome-edited mice using CRISPR-Cas9 system.

Center for Human ES Cell Research

LiMe Bldg. No.5

▶ Lab URL
http://chesr.infront.kyoto-u.ac.jp/



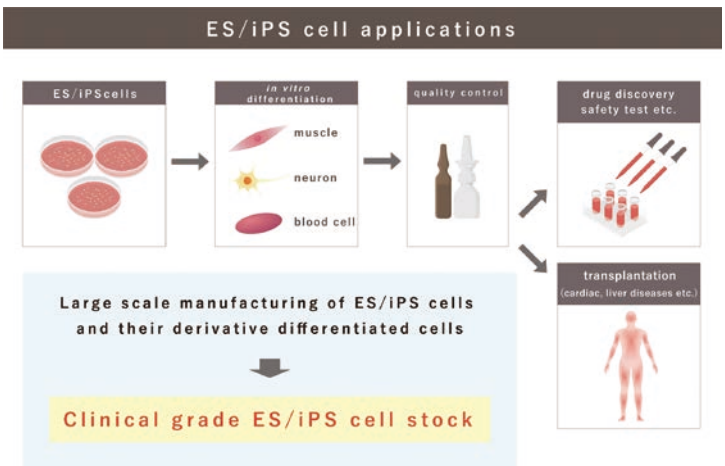
Our mission

The Center for Human ES Cell Research was newly established in April 2020 with the mission of promoting the establishment and distribution of human embryonic stem (ES) cell lines and the advancement of applied studies on them. ES cells, like induced pluripotent stem (iPS) cells, are a type of pluripotent stem cell, and human ES cells precede human iPS cells in the history of their first establishment. Two institutes in Japan are approved for the generation of human ES cell lines: the National Center for Child Health and Development and our institute. Currently, we are manufacturing human ES cell lines for clinical use in our MHLW-approved cell processing facility.

Regarding the importance of human ES cells in academic research and their potential benefits in clinical applications, a robust and stable supply of high-quality human ES cells is essential for the advancement of regenerative medicine as well as basic research. To realize the clinical application of human ES cells, we strengthen our current facility of ES cell production and, through further cooperation with other research organizations and hospitals inside and outside of Japan, we accelerate the progression of stem cell research and regenerative medicine.

History

Institute for Life and Medical Sciences first succeeded in establishing human ES cell lines in 2002, and since 2017, directed by the former laboratory of Embryonic Stem Cell Research, has been serving as the supplier of clinical-grade human ES cell lines in Japan (as of April 2020). To enhance our capability and performance in the research and development of human ES cells for clinical use, the facility underwent a reorganization in 2020, and the Center for Human ES Cell Research was newly founded.



The Center for Human ES Cell Research comprises two divisions, namely, the division of clinical basis for ES cell research and the division of basic technology development for ES cell research. The division of Clinical Basis for ES Cell Research consists of two groups: the Laboratory of Embryonic Stem Cell Research, which is responsible for the establishment and distribution of human ES cell lines, and the Laboratory of Embryonic Stem Cell Application, which takes charge of quality control of and comparative genome/ epigenome analyses of human ES cell lines. The Division of Basic Technology Development for ES Cell Research consists of three groups, which aim for research and development, with mid-to long-term vision, intended for clinical applications of human ES cells: the Laboratory of Organoids Technology, the Laboratory of Regenerative Immune Cell Therapy and the laboratory of ES cell differentiation. Together, our center works toward the establishment of an international and stable research facility for human ES cell distribution, as well as the development of basic technologies required for its clinical application, such as quality control and cell/organoid culturing methods.

Center for Human ES Cell Research

Division of Clinical Basis for ES Cell Research

Lab. of Embryonic Stem Cell Research	Associate professor Kawase (full time) Program-Specific Assist. Prof. Takada (full time)	・Establishment and distribution of hES cell lines ・Library construction of hES cell lines
Lab. of Embryonic Stem Cell Application	Associate professor Chuma (concurrent)	・Quality control of hES cell lines ・Comparative analyses of genome/epigenome regulation

Division of Basic Technology Development for ES Cell Research

Lab. of Organoids Technology	Professor Eiraku (Center Director/concurrent) Associate professor Ohgushi (concurrent)	・Generation of organoids from hES cells ・Regenerative medicine & drug discovery by organoids
Lab. of Regenerative Immune Cell Therapy	Professor Kawamoto (concurrent) Program-Specific Assist. Prof. Konishi (concurrent)	・Regeneration of T cells from hES cells ・Cancer immunotherapy by regenerative T cells
Lab. of ES Cell Differentiation	Professor Yusa (concurrent)	・Analyses of hES cell differentiation and lineage commitment ・Development of hES cell differentiation methods

Division of Clinical Basis for ES Cell Research

Lab. of Embryonic Stem Cell Research

▶ Lab URL
https://www2.infront.kyoto-u.ac.jp/es01/englishtop.htm

LiMe Bldg. No.5



Associate Professor

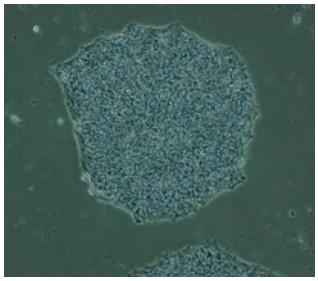
KAWASE, Eihachiro



Assistant Professor (*) | TAKADA, Kei

*Program-Specific

Human ES cell lines are expected to have great potential in medical research and applications such as cell transplantation therapy and drug discovery. We have established human ES cell lines with high efficiency and analyzed their characteristics in detail. The established human ES cells have been distributed to more than 50 research projects in Japan and have produced many research results. We are also researching the molecular mechanisms of self-renewal and differentiation of human ES cells and developing technologies for the genetic manipulation of human ES cells. We have constructed a cell processing facility (CPF) and have successfully generated human ES cell lines for clinical use.

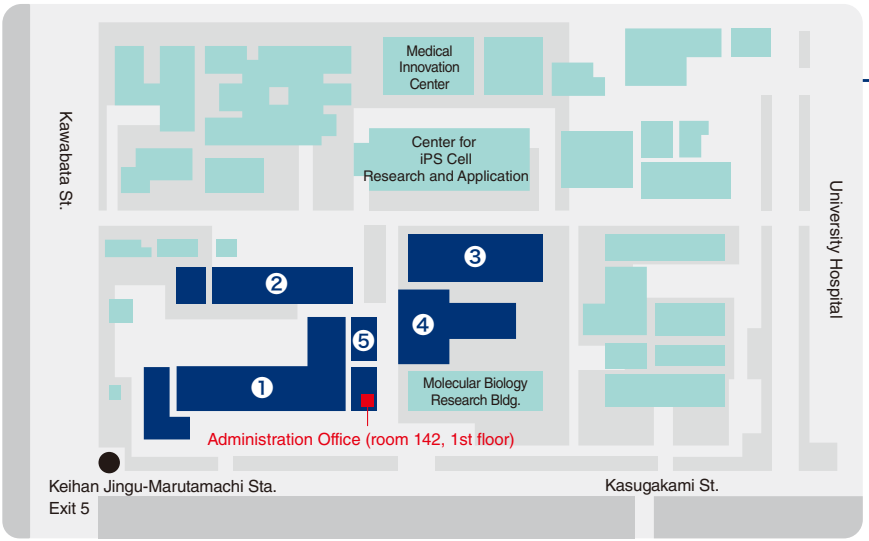


Human Embryonic Stem Cells



Clinical-grade hESC Processing Facility

Map & Access





① South Research Bldg. No.1 /
Institute for Life and Medical Sciences (LiMe) Bldg. No.1
② Institute for Life and Medical Sciences (LiMe) Bldg. No.2
③ Institute for Life and Medical Sciences (LiMe) Bldg. No.3
④ Institute for Life and Medical Sciences (LiMe) Bldg. No.4
⑤ Institute for Life and Medical Sciences (LiMe) Bldg. No.5

Institute for Life and Medical Sciences,
Kyoto University
53 Shogoin Kawahara-cho, Sakyo-ku, Kyoto 606-8507 JAPAN
TEL: +81-75-751-3802

[Access to LiMe]

- From Kansai International Airport (KIX) by Train
  Take JR Kansai-Airport Express “HARUKA” to Kyoto Station.
  It takes about 80 minutes.
- From Kyoto Station by Taxi It takes 20 minutes and costs 2,000 yen, approximately.
- From Kyoto Station by City Bus Take a No. 206 bus bound for “Higashiyama St. and Kitaoji Bus Terminal”, and get off at “Kumano Jinja-mae”. Walk two blocks to the west. It takes 5 minutes.
- From Kyoto Station by Subway Take Subway Karasuma Line and get off at “Marutamachi”. Walk east for about 20 minutes.

Life and Medical Sciences Research Fund

Uncovering the secrets of vital activity to shape the future of medical sciences

The Institute for Life and Medical Sciences (LiMe) aims to explore new academic fields. The institute is known for previous brilliant research findings in medical sciences, including discovering the human leukemia virus and regulatory T cells.

By promoting integrated research activities that combine virology, immunology, genetics, the study of stem cells, structural science, and mathematical science, we intend to develop researchers and entrepreneurs with broad perspectives and the ability to get things done. This fund will help us take the lead in medical sciences and biostudies in Japan and the world. We aim to eradicate viral diseases and put regenerative medicine to practical use.

You can make a donation through credit card or other means.
For more details, please visit the Kyoto University Fund website.
https://fund.kyoto-u.ac.jp/en/contribution/infront/

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