Contact Us

Academic Affairs・Admission Information

Graduate Courses

Graduate School of Medicine/Medicine・Medical Science/
Kyoto-McGill International Collaborative Program in Genomic Medicine

Office of Student Affairs Division,
Office of Student Affairs Section, Graduate School of Medicine
E-mail：kyoumu-in@mail2.adm.kyoto-u.ac.jp

Faculty of Medicine/Medicine

Office of Student Affairs Division,
Office of Student Affairs Section, Faculty of Medicine
E-mail：med-kyoumu@mail2.adm.kyoto-u.ac.jp

Graduate School of Medicine/Faculty of Medicine

Human Health Sciences・Graduate School of Medicine/School of Human Health Sciences
Office of Student Affairs Division, Office of Student Affairs Section, School of Human Health Sciences
E-mail：060-992hs-kyomu@mail2.adm.kyoto-u.ac.jp

If you are unsure which office to contact, please contact
the General Affairs Section, General Affairs and Planning Division.

General Affairs Section, General Affairs and Planning Division
060soumu@mail2.adm.kyoto-u.ac.jp

Graduate School of Medicine and Faculty of Medicine
Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, JAPAN

March 2025

Graduate School of Medicine, Kyoto University 2024

2024
Graduate School of Medicine, Kyoto University

Message from the Dean of the Graduate School of Medicine

The Graduate School of Medicine of Kyoto University is one of the largest graduate schools of medicine in Japan. It comprises five departments: Medicine, Medical Science, Public Health, Human Health Sciences, and the Kyoto-McGill International Collaborative School in Genomic Medicine. Our research encompasses all areas of medicine, healthcare, and human health and wellbeing, including basic medicine, clinical sciences, social medicine, and medical technology.
In addition, the graduate school works together with many research institutes, such as the Center for iPS Cell Research and Application (CiRA), and the Institute for Life and Medical Sciences (LiMe).

The mission of the graduate school is to create innovative knowledge in the fields of medicine and healthcare and constantly share this knowledge with society, thereby contributing to the improvement of human health and wellbeing, and also to foster global leaders who can drive such contribution. To that end, it is essential that many energetic students with different backgrounds, not only those from medical undergraduate courses, but also those from non-medical undergraduate courses, gather and work together from around the world through friendly rivalry toward pioneering new academic fields. Such interdisciplinary integration is becoming increasingly important today. We believe that the cultivation of human resources who can promote such research is the key to the development of medical and bioscientific research for the future.

A unique characteristic of the Graduate School of Medicine is that it offers educational courses in which laboratories whose research fields are close to each other cooperate to instruct students. The curricula comprise approximately ten fields of research, including cancer, neuroscience, and immunity. All enrolled students select a course in accordance with their own interests regardless of their department and specialty and even regardless of the category, such as basic medicine, clinical sciences and social medicine. This system enables students to pursue their research from an extensive perspective through regular presentations and discussions. The system also allows the Graduate School' s faculty members to participate in courses in accordance with their own interests and expertise, enabling them to share information with colleagues from other laboratories and promote new avenues of collaborative research. In addition to the benefits provided by this educational system, each laboratory offers students with thorough one-on-one individual research guidance. Consequently, students can acquire a broad perspective and research skills. Furthermore, many classes, including those in the educational courses, are provided in English. This means that we have a research and educational setting that enables students to pioneer new areas of research through collaboration and integration between diverse cutting-edge research fields. In addition, we launched the Medical Innovation Program in 2018. By establishing an advanced industry-academia education and research framework that covers everything from basic research to implementation of research results by society, we strive to foster human resources who can generate innovation in the medical and healthcare fields in the future. Some of our activities were restricted by the COVID-19 pandemic starting in early 2020. Now that the pandemic is under control, we would like to further improve our activities by making full use of a wide variety of communication tools, including IT.

The Graduate School of Medicine is planning to revise its curricula to facilitate more effective utilization of research resources and to enable research guidance and collaborative research to be conducted flexibly, unrestricted by departmental divisions.

As you may know, the Graduate School of Medicine has produced numerous world-class human resources and disseminated some remarkable research achievements. We sincerely hope to welcome many students to the graduate school to join us as we pioneer scholarship for a new era.

Dean
Tadashi Isa

CONTENTS

Basic Medicine

Biological Sciences

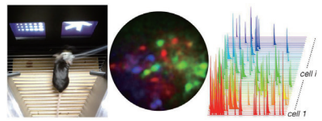
M.D., Ph.D. Professor
Dai Watanabe

Understanding the brain is one of the greatest frontiers in life sciences and medicine. While neuroscience has advanced rapidly over the past decades, the fundamental nature of brain function and the mind remains elusive. Overcoming difficulties and breaking new ground requires youthful passion and imagination. Our lab actively welcomes young students. We inspire each other and challenge to uncover the mysteries of the brain and mind.

The brain is the most complex structure in the universe, operating as a sophisticated system that allows us to perceive the external world, predict future, and make decisions under uncertainty. These cognitive processes emerge from intricate interactions between neurons, which possess specialized structures and functions: they connect through synapses, and transmit information via electrical activity. Furthermore, their connectivity and activity dynamically adapt in response to experience, learning, or injury, maintaining both flexibility and stability in brain function.
To understand the brain and mind, we study neuronal connectivity, activity, and plasticity—mechanisms underlying higher cognitive functions such as language and hypothesis-based decision making. Additionally, we explore impairment in these functions to help address neuropsychiatric diseases, which present major medical challenges.

Dai Watanabe
Satoshi Yawata, Chika Nishimura, Hiroki Yagi

Laboratory members



Live cell imaging in a freely behaving animal

Anatomy and Cell Biology

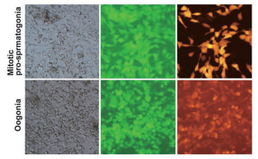
M.D., Ph.D. Professor
Mitinori Saitou

The human body consists of a variety of cell types with distinct characters. An essential information code that defines a cell' s unique character is the epigenome, which refers to the whole-genome assembly of epigenetic modifications of chromatin. We are studying the mechanism of germ cell development, which, among all the cell types in the body, shows one of the most dynamic regulations of the epigenome to acquire totipotency, thereby aiming to understand the regulatory basis for many distinct cellular characters and to control them appropriately in vitro.

The germ-cell lineage ensures the creation of new individuals, perpetuating the genetic and epigenetic information across the generations. We have been investigating the mechanism for germ-cell development, and have shown that mouse embryonic stem cells (mESCs)/induced pluripotent stem cells (miPSCs) are induced into primordial germ cell-like cells (mPGCLCs) with a robust capacity for both spermatogenesis and oogenesis and for contributing to offspring. These works have served as a basis for elucidating key mechanisms during germ-cell development such as epigenetic reprogramming, and meiotic entry.
By investigating the development of cynomolgus monkeys , we have defined a developmental coordinate of pluripotency among mice, monkeys, and humans, identified the origin of the primate germ-cell lineage in the amnion, and have elucidated the X-chromosome dosage compensation program in primates.

Mitinori Saitou, Hiroshi Ohta, Tomonori Nakamura, Ikuhiro Okamoto, Ken Mizuta, Yukihiro Yabuta

Accordingly, we have succeeded in inducing human iPSCs (hiPSCs) into human PGCLCs (hPGCLCs) and elucidated the evolutionarily divergent mechanism of human germ-cell specification. Furthermore, we have demonstrated an ex vivo reconstitution of fetal oocyte development in humans and monkeys. More recently, we have established a robust strategy for inducing epigenetic reprogramming and differentiation of hPGCLCs into mitotic pro-spermatogonia or oogonia, coupled with their extensive amplification (~>10^{10}-fold). These studies have established a foundation for human in vitro gametogenesis. We are aiming to advance it further to delineate the mechanism of human germ-cell development and to create a basis for new possibilities in reproductive medicine.



Mitotic pro-spermatogonia and oogonia differentiated from hPGCLCs

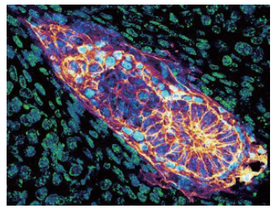
Developmental Biology

M.D., Ph.D. Professor
Takashi Hiiragi

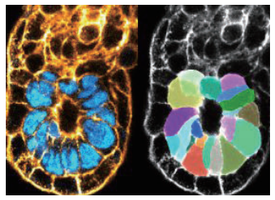
The Hiiragi laboratory studies robustness in development and aims to understand design principles of living systems. Self-organisation is a defining feature of living systems and entails interplay between molecular, cellular and mechanical signals across various spatio-temporal scales. Using early mammalian embryos as a model, we adopt a variety of methods including molecular and cell biology, biophysics and theory, to investigate how forms and patterns emerge from a mass of cells.

Mammalian eggs lack polarity and symmetry is broken during early embryogenesis. Our studies revealed that morphogenesis and gene expression are highly variable between cells and embryos during this period. Understanding how embryos robustly develop despite such variability remains a fundamental question in biology. We established a multi-disciplinary framework integrating biology and physics, which showed that feedback between cell and tissue mechanics, polarity, and fate robustly controls shape and pattern of the embryo. Building on this and using our ex vivo systems that recapitulate mouse peri-implantation embryogenesis, we will integrate the self-organisation mechanism into the context of tissue-tissue and embryo-uterus interactions. In particular, we will dissect cell and tissue growth dynamics, with the goal of understanding how embryo size is sensed, and how this feeds back to control cellular growth dynamics.

Takashi Hiiragi, Takafumi Ichikawa



Mouse embryo implanting into the uterine tissue



Cellular dynamics revealed by AI-based image analysis

Basic Medicine

Molecular and Cellular Physiology

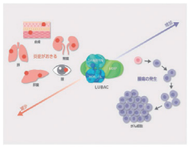
M.D., Ph.D. Professor
Kazuhiro Iwai

Diseases like cancer and neurodegenerative disorders are caused by cellular dysfunction. Our lab studies cellular processes to understand complex life phenomena and diseases. We focus on ubiquitin modification, NF-κB activation, cell death regulation, and ferroptosis. Our research aims to uncover the causes of inflammatory diseases and cancer, and to develop new treatments for those diseases.

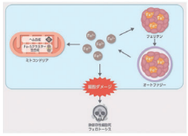
We focus on two main themes. First, we study the LUBAC complex, which synthesizes linear ubiquitin chains. We showed that linear chains activate the transcription factor NF-κB and inhibit programmed cell death. Additionally, we demonstrated that the dysregulated production of linear chain leads to cancer and immune disorders. Currently, we are analyzing the role of linear chains in the development and pathology of these diseases.
Second, we investigate iron metabolism. Iron is crucial for oxygen transport and ATP production but can also be toxic. Recently, ferroptosis, a form of cell death induced by iron, has gained attention due to its links to cancer and ischemic diseases. We are exploring the mechanisms of iron-induced ferroptosis, considering its connections to aging and disease.
Our lab also educates medical students and guides graduate research, fostering interdisciplinary collaboration.

Kazuhiro Iwai, Izumi Yanatori, Hiroaki Fujita, Yusuke Toda

Laboratory members



Role of linear ubiquitin chains in chronic inflammation and canser



Analysis of intracellular iron dynamics and ferroptosis

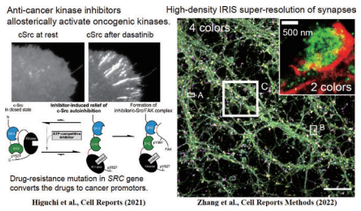
Cell Pharmacology

M.D., Ph.D. Professor
Naoki Watanabe

Our laboratory aims at bridging the gap between molecular and cellular activities employing live-cell fluorescence single-molecule (SiMS) microscopy since 2002. We have also invented next-generation super-resolution microscopy (IRIS), which enables simultaneous Hi-Fi visualization of an unlimited number of molecules in cells and tissues. By real-time and high-resolution monitoring of individual molecules using advanced optical techniques, our laboratory unveils mechanotransduction, structure remodeling and disease/drug-driven dysregulated cell signaling at the molecular level.

Why not watching it directly? This is what we often feel while reading papers from other laboratories. Dynamic cell morphological changes play an important role in cancer invasion, immune cell migration, neural plasticity and so on. Drugs may alter the activity of target molecules and modulate cell conditions in seconds. In dynamic systems, the true mechanism of action of molecules cannot be dissected only by looking at phenotypes. There are tons of molecules intertwined with each other even in a single cell. Current ongoing projects are
- Protein dynamics, unfolding and complex formation in mechanical and receptor signaling
- Processive actin polymerization by Formins and their role in chirality and cellular stress
- Drug repositioning with paradoxical activation of kinase signaling by target-based drugs
- Applying unlimited multiplexing super-resolution microscopy IRIS to biology and diagnosis

Naoki Watanabe,
Sawako Yamashiro,
Akitoshi Miyamoto



Pathology and Tumor Biology

M.D., Ph.D. Professor
Seishi Ogawa

Diseases are fundamentally human phenotypes arising from interactions between genetics and the environment, deeply rooted in the genetic diversity of human populations. Variations in specific genes influence individual responses, driving disease onset. To understand and overcome diseases, it is crucial to explore the molecular mechanisms of genetic factors, environmental influences, and their interactions. Our department focuses on unraveling the genetic and molecular basis of diseases, particularly cancer.

Cancer arises from genetic abnormalities, yet its underlying complexity defies simple explanation. As cells accumulate mutations, they evolve into a heterogeneous population through clonal selection. While recent advancements in sequencing technologies have significantly broadened our knowledge of cancer mutations, the precise functions of these mutations, the dynamics of clonal selection within environments like immune responses, and the mechanisms that drive cellular diversity remain largely unexplored. Additionally, the process by which these cells acquire defining “cancerous” traits is still shrouded in mystery.

Seishi Ogawa,
Masahiro Nakagawa,
Yotaro Ochi,
Ryunosuke Saiki

In our department, we are committed to pushing the boundaries of cancer research, inviting individuals with expertise in cutting-edge genomics, informatics, and molecular biology, irrespective of clinical experience or prior specialization. Our mission is to serve as a springboard for cultivating researchers who will excel and make meaningful contributions both nationally and internationally.

Basic Medicine

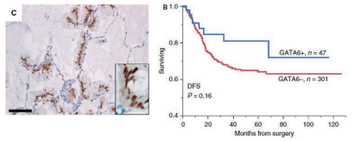
Diagnostic Pathology

M.D. Professor
Hironori Haga

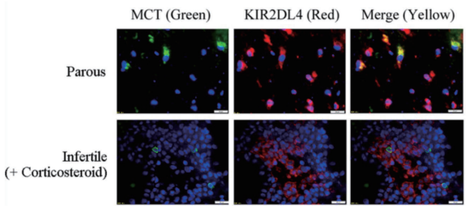
Diagnostic pathology is a medical specialty focused on diagnosing diseases, primarily through light microscopic examination of tissues or cells. Although our study mainly emphasizes histomorphology based on formalin-fixed, paraffin-embedded tissues, it always requires the integration of molecular tests and clinicopathologic correlation. Techniques in immunohistochemistry and in situ hybridization are rapidly advancing, helping us to understand disease mechanisms and to determine the appropriate treatment for patients.

Our current research fields include 1) brain tumors, gynecologic and urogenital cancers, 2) the pathology of interstitial pneumonia, 3) allograft rejection after organ transplant pathology, and other clinicopathologic studies across various organs. For clinicopathologic studies, we also have access to an in-house diagnostic database, image analysis using virtual microscopy, and the tissue microarray technique.

Hironori Haga,
Masakazu Fujimoto,
Yasuhide Takeuchi,
Yuki Teramoto,
Hiroaki Ito,
Kentaro Tsuji,
Yoshiki Iemura



1.Expression of GATA-binding factor 6 (GATA6) and prognosis of lung cancer



2.Loss of killer immunoglobulin-like receptor (KIR) 2DL4 in the placenta is associated with infertility

Microbiology

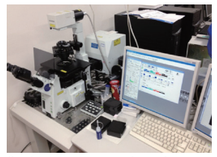
D.D.S., Ph.D. Professor
Ichiro Nakagawa

Our purpose of study is to reveal how the bacterial pathogens acquire the pathogenesis and evolve through the genomic analysis. And we try to find new prophylactics and therapies for infections through the kinetic analysis in animal cell at the molecular level.

We mainly study about evolution of pathogenic bacteria with hybrid approach using bioinformatics and validation experiments. In addition, we study how immune system reject bacterial infection using cell lines and animal models. We have many research topics including followings: 1. Roles of microbe for human homeostasis using metagenomic data of microbiome. 2. Association study of human health and microbiome. 3. Comparative (meta) genomic analysis and experimental validation for understanding bacterial evolution and diversification. 4. Artificial mix or stimulation of indigenous bacteria for development of new medical treatment of human diseases. Anyone who have interests in our research topics is welcome. We educate students in research, reading of papers and discussion to become a principal investigator in future.

Ichiro Nakagawa ,
Takashi Nozawa, Kazunori Murase, Atsuko Nozawa

Mass storage in our laboratory. To maintain the system is critical for bioinformatics.



Confocal laser scanning microscopy in our laboratory. This equipment is essential for our autophagy studies.

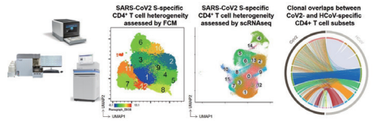
Immunology

M.D., Ph.D. Professor
Hideki Ueno

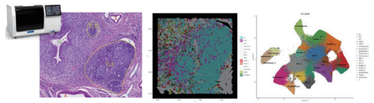
Human Immunology
The immune system is crucial for defending our bodies against pathogens, but it requires precise regulation. Disruptions in normal immune function can lead to various diseases. Our laboratory specializes in human immunology research using human specimens. We aim to define the "norms" of immune cells in healthy individuals and their "alterations" in disease states. We seek to elucidate disease pathogenesis and develop innovative therapeutic strategies.

Our laboratory is dedicated to elucidating the mechanisms of immune responses in humans. To this end, human samples are indispensable for our research. We collect a wide array of tissue specimens from both healthy individuals and patients, in collaboration with clinical departments at Kyoto University Hospital and other institutions. Utilizing state-of-the-art technologies and sophisticated analytical pipelines, we integrate multi-omics approaches and spatial analysis to characterize immune cells within human tissues. Our current research focuses on infectious diseases, vaccine responses, liver immunology and pathogenesis, cancer immunology, autoimmune disorders, allergies, and inflammatory neurological diseases.

Hideki Ueno,
Hiroyuki Yoshitomi,
Yoshitaka Honda



Diversity of SARS-CoV-2 spike protein-specific CD4+ T cell subsets in COVID-19 using 5-laser Cytek Aurora FCM and 10X Genomics 5' scRNAseq. Analysis of TCR clonal overlap between two samples is shown on the right panel.



Spatial analysis of immune cells at the single-cell level in human liver diseases using 10X Genomics Xenium. T cells and B cells form large clusters, and some B cells differentiate into antibody-producing cells.

Basic Medicine

Forensic Medicine

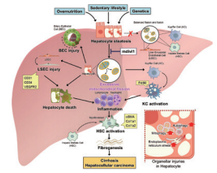
M.D., Ph.D. Professor
Yoko Nishitani

Forensic Medicine is the medical specialty for the investigation of deaths, including the accidents, assaults, homicides, and sudden deaths. Our main research themes have been focused on the mechanisms of organ injuries induced via external factors for reduction the preventable deaths. We have performed approximately 120 autopsies per year. We also collaborate with clinicians in the diagnosis of postmortem images and sudden infant deaths in forensic practice.

Our ongoing research is how external factors such as poisoning, trauma, and daily lifestyle behavior cause organ damages. We believe that we can reduce future preventable deaths by reducing the adverse effects of these external factors on the organs of the body. We have several research animal and cell line models in our department. Metabolic dysfunction associated steatotic liver disease (MASLD) is one of the lifestyle-related diseases. It is still unclear how MASLD relates with other organ injuries, therefore we prepare MASH (metabolic dysfunction associated steatohepatitis) model with specific diet to understand the pathology and mitochondrial morphology in the liver and other organs. We have also focused on the trauma that leads to life-threatening events. We have used a traumatic head injury model and a hemorrhagic shock model to elucidate the molecular mechanisms of organ damages.

Yoko Nishitani, Masashi Miyao, Chihiro Kawai
Shota Furukawa

As other health problems, we have investigated the toxic organ injuries via alcohol and drugs. We welcome researchers with a great interest in forensic medicine, death investigation, and forensic pathology.



Our research model

Lab members

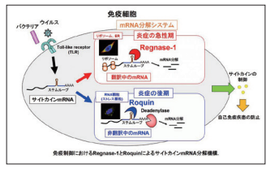
Medical Chemistry

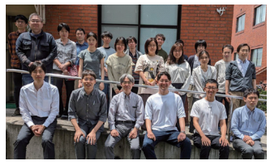
M.D., Ph.D. Professor
Osamu Takeuchi

Immune responses are tightly regulated within the body to efficiently eliminate infectious pathogens while preventing the development of immune disorders caused by excessive immune activation. We try to understand the mechanisms that maintain the balance of immune responses, particularly focusing on RNA regulation. By integrating insights obtained from molecular biology techniques and organism-level analyses using mouse models, we aim to develop innovative therapeutic strategies for immune-related diseases.

Microbial infections are recognized by innate immune receptors, including Toll-like receptors (TLRs), which trigger cytokine production and initiate immune responses. Further, inflammation is closely linked to not only infectious diseases but also autoimmune disorders, cancer, and metabolic syndromes. Our laboratory investigates the molecular mechanisms regulating inflammation through both innate and adaptive immunity, with a focus on the post-transcriptional regulation of inflammation-related gene expression in immune cells.
We identified Regnase-1, a molecule critical for degrading cytokine mRNAs, and demonstrated its essential role in preventing inflammatory diseases. Despite this progress, RNA regulatory mechanisms in immunity remain largely unexplored. We aim to uncover novel RNA-mediated pathways of immune regulation.
Our lab trains students and researchers in immunology and molecular biology, fostering logical reasoning and discussion skills through active research participation.

Osamu Takeuchi, Takuya Uehata, Takashi Mino
Masanori Yoshinaga, Hidetaka Miyauchi





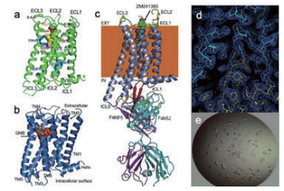
Cell Biology

Ph.D. Professor
So Iwata

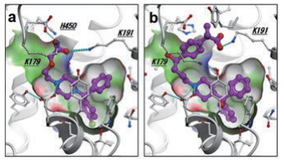
Microscopically, the fundamental processes of important biological phenomena, such as homeostasis and pathogenesis, are based on physical quantities such as biomolecular structure and intermolecular interactions. We are focusing on the structures of membrane proteins and their complexes, which are the targets of many pharmaceuticals. We are also studying the rational molecular design of new pharmaceuticals and the simulation of molecular structures and are exploring the principles of cellular function.

Membrane proteins play key roles in cellular functions such as signal transduction, molecular transport, and bioenergetics in biological membranes and are important targets for drug discovery. Systematic elucidation of the three-dimensional structures of membrane proteins such as G protein-coupled receptors (GPCRs), transporters, channels, and membrane enzymes will not only deepen our knowledge of molecular and cellular biology, but also enable us to efficiently explore lead compounds for drug discovery through “structure-based drug design” . However, it remains difficult to elucidate the crystal structures of human and mammalian membrane proteins at high resolution. We are developing and improving techniques for mass production, crystallization, and structure determination of membrane proteins, and are analyzing the three-dimensional structures of various membrane proteins using X-ray crystallography and electron microscopy.

So Iwata, Norimichi Nomura,
Hidetsugu Asada, Makoto Adachi, Dohyun Im



X-ray crystallography of human G protein-coupled receptor (GPCR). (a) Histamine H1 receptor (H1R). (b) M2 muscarinic acetylcholine receptor. (c) A2a adenosine receptor. (d) An electron density map of GPCR. (e) Crystals of GPCR.



Docking simulation of histamin H1 receptor and second-generation antihistamines. (a) with levocetirizine (b) with fexofenadine

Basic Medicine

Molecular Oncology

M.D., Ph.D. Professor
Yasuyuki Fujita

At the initial stage of carcinogenesis, what happens when transformation occurs in single cells within epithelia? Using newly established mammalian epithelial cell lines and mouse model systems, we have demonstrated that normal epithelial cells and the newly emerging transformed cells often compete with each other for survival, a process called cell competition. Consequently, transformed cells are eliminated from epithelial tissues. These results imply that normal epithelial cells are able to eliminate the surrounding transformed cells; this concept potentially leads to a novel type of cancer preventive medicine.

Our studies have revealed that cell competition occurs at the interface between normal and transformed epithelial cells. Consequently, transformed cells often become losers and are eliminated from epithelial tissues via apical extrusion or cell death. During the process of cell competition, normal cells recognize the presence of neighboring transformed cells and actively eliminate them from the cell society. This indicates that normal epithelia have anti-tumor activity that does not involve immune systems. We term this phenomenon EDAC (Epithelial Defense Against Cancer). The next question is how epithelial cells recognize the differences from each other. Using various screening approaches, we are trying to identify molecules that are involved in intercellular recognition machinery.
The lab members acquire techniques of cell biology, biochemistry and mouse genetics. Through the various intra- or inter-lab meetings, presentation and scientific communication skills are trained. We aim to issue world-leading next generation scientists.

Yasuyuki Fujita,
Kazuhito Sai
Miho Sekai,
Nami Sugiyama

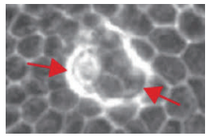


Figure 1 (Red arrows) Apically extruded transformed cells through cell competition with the surrounding normal cells.

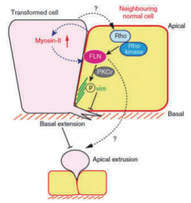


Figure 2 Molecular mechanisms of EDAC (Epithelial Defense Against Cancer)

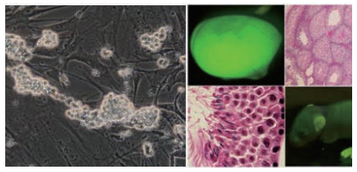
Molecular Genetics

M.D., Ph.D. Professor
Takashi Shinohara

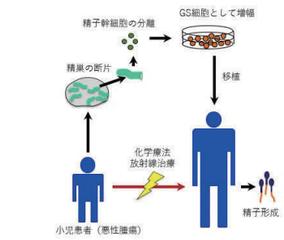
Germ cells are the most selfish cells in the body, as they use somatic cells to propagate the individual's genetic information. Among them, the only cells capable of self-renewal are spermatogonial stem cells (SSCs). We are focusing on SSCs to understand the mechanisms by which individuals transmit their genetic information to the next generation, and applying the knowledge gained from this to developmental engineering technologies and medical treatments.

We have established a long-term culture system (GSCs) for expanding SSCs in vitro. Currently, embryonic stem cells (ESCs) are widely used for genome function analysis, but ESCs capable of producing offspring have only been obtained from mice and rats. Consequently, despite the sequencing of the genomes of many organisms, functional genome analysis at the individual level remains extremely difficult. GSCs are expected to be useful not only for gene modification in animals but also as cells with potential applications, such as restoring fertility in pediatric cancer patients rendered infertile by cancer treatments and overcoming ethical issues associated with genetic editing of human embryos. If sperm formation from GSCs becomes possible in vitro, it will allow for the shortening of generations, ushering in an era where mammalian genomes can be manipulated as freely as yeast.

Takashi Shinohara,
Takehiro Miyazaki
Yusuke Shiromoto,
Mito Kanatsu-Shinohara



1) Growth of GS cells



2) Growth of mGS cells

Integrated Neuroanatomy and Neuroimaging

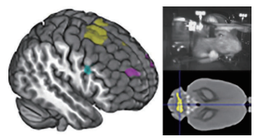
M.D., Ph.D. Professor
Takashi Hanakawa

The noninvasive measurement of the human brain allows us to understand electrochemical characteristics in healthy and diseased brains from multiple perspectives. However, a knowledge gap exists between noninvasive brain research and traditional neuroanatomy and neuropathology. We develop integrative neuroanatomy and neuroimaging technology in the human brain to fill this gap. The provided knowledge network will help us understand the human brain and overcome neurological and psychiatric disorders.

Information processing in the human brain is achieved by neural networks of more than several hundred trillion synapses. To understand functions emerging from such a complex system, we must understand the system's behavior from multilayered levels. We aim to develop technology that links measurements of human brain structure from microscopic to macroscopic levels and those of neural dynamics from milliseconds to years. To address the temporal domain, we have developed a method to combine EEG-based brain-machine interface (BMI) with functional MRI (Fig. 1). We also found macroscopic neuroplasticity where MRI signals change after learning. The neural mechanisms behind this phenomenon remain uncertain (Fig. 2). Hence, we are developing methods to explain MRI signals with molecular, histological, and pathological information. This technology will help advance both neuroscience research and medical education.

Takashi Hanakawa, Tatsuya Umeda
Kenji Yoshinaga, Yoshifumi Mori, Hiroki Togo,
Kenji Yamaguchi

(Fig. 1)Simultaneous brain-machine interface and fMRI (Kasahara et al. 2022)



(Fig. 2) Macroscopic structural neuroplastic changes in humans(Hosoda et al.2013, 2020)and rodents (in preparation)

Basic Medicine

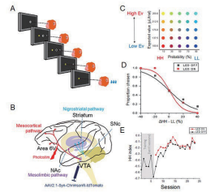
Physiology and Neurobiology

M.D., Ph.D. Professor
Tadashi Isa

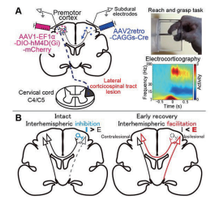
Our group aims at elucidating the neural circuit mechanisms for control of dexterous motor actions and their recovery after the neural injuries and cognitive functions such as decision making and motivation, emotion, attention, associative learning and consciousness and their disorders. We are conducting the researches in various animal models for this goal, applying multidisciplinary methods, such as electrophysiology, psychophysics, neuroimaging, genome edited animals, viral vectors, and computational modeling.

The brain's control of sensory, motor, and cognitive functions is achieved through complex, multi-layered neural circuits. Understanding brain function as a system requires generating hypotheses based on circuit structure, manipulating key components in a targeted manner, and validating these hypotheses causally through analyses of cognitive and behavioral effects. Advances in neuroscience, including optogenetics and chemogenetics, have enabled manipulation of specific cells and circuits in model animals like mice, zebrafish, and fruit flies. However, selective circuit manipulation in primates, with their large brains and the difficulty of genetic modification, has remained challenging. Using viral vectors, we have achieved optogenetic and chemogenetic manipulation of specific circuits in macaques, uncovering mechanisms critical for decision-making and motor circuit recovery. Moving forward, we aim to extend this approach to primate models of psychiatric disorders to elucidate pathophysiology and develop novel therapeutic strategies.

Tadashi Isa, Takayasu Higo, Masaharu Kinoshita,
Reona Yamaguchi, Richard Veale, Chih-Yang Chen,
Masahiro Mitsuhashi



(Figure 1) Optogenetic manipulation of the dopaminergic pathway from the ventral tegmental area (VTA) to the frontal cortex area 6V altered risk-return decisions in monkeys. (Sasaki et al., Science, 2024)



(Figure 2) Chemogenetic manipulation of the interhemispheric pathway proved the pathway's contribution to motor recovery following spinal cord injury. (Mitsuhashi et al., Nature communications, 2024)

Systems Neuropharmacology

M.D., Ph.D. Professor
Yasunori Hayashi

Every day, we form new memories—some of which last a lifetime. What mechanisms allow these memories to persist in our brains for decades? Our laboratory is dedicated to understanding this fundamental question, with a particular focus on the hippocampus, a brain region essential for memory formation.

Research has shown that individuals with hippocampal damage lose the ability to form new memories, highlighting its crucial role in learning. A key discovery in hippocampal research was long-term potentiation (LTP), first identified by Bliss and Lømo about 50 years ago. LTP is a phenomenon in which short, intense stimulation strengthens synaptic responses over a prolonged period. Since drugs that block LTP also impair memory formation, and learning itself enhances synaptic responses similarly to LTP, this process is widely considered a cellular mechanism of memory.
By using LTP as a model, our laboratory aims to uncover the molecular mechanisms underlying memory formation. To achieve this, we employ a range of techniques, including molecular biology, electrophysiology, animal behavioral experiments, and imaging. Through our research, we seek to deepen our understanding of how memories are formed and maintained in the brain.

Yasunori Hayashi, Tomohisa Hosokawa,
Steven Middleton, Nozomi Asaoka,
Misa Arizono

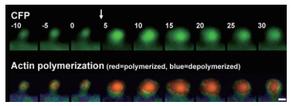


Figure 1. Visualization of synaptic plasticity processes. FRET was used to visualize the actin polymerization state. LTP was induced at the arrow. Scale bar is 0.5 μm and time stamp in minutes.

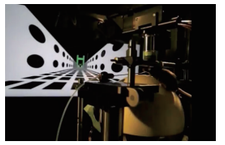


Figure 2. Visualization of formation of cell assembly during memory formation in hippocampus.
The mouse runs on a Styrofoam sphere and a virtual reality space updated as it moves.
Neuronal activity in the hippocampus is observed using a two-photon microscopy.

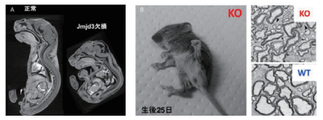
Laboratory Animal Science

Ph.D. Professor
Masahide Asano

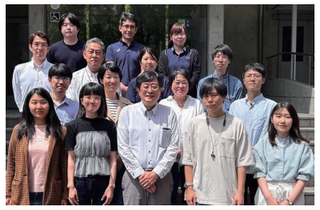
Animal experiments are an essential method for medical biology research. Using genetic modification techniques, we analyze gene function and develop disease models in mice and rats. Our focus areas include glycobiology, epigenetics, developmental biology, neurological diseases, and novel cancer therapies using the degron system. We produce genetically engineered rodents and manage one of the world’ s largest rat resources (NBRP-Rat). Motivated graduate students are encouraged to join our research.

Mice are widely used in research due to their small size, short generation cycle, and advanced genetic modification techniques, while rats are valuable for their physiological similarity to humans and suitable body size for manipulation. Using both species, we advance laboratory animal science to support medical biology through reverse genetics using genome editing and forward genetics using rat resource-based approaches. Cellular regulatory mechanisms beyond genetic code are important for complicated central nervous system and development. Specifically, using genetically engineered mice, we study the roles of glycans in cell-cell interactions and epigenetic regulation where acquired cellular information is passed to future generations. We are also developing novel cancer therapies using the degron system to control protein degradation artificially. Our facility hosts the NBRP-Rat, a largest rat resource center in the world, supporting diverse research efforts.

Masahide Asano, Chie Naruse, Asahi Haijima,
Tomoko Matsuzaki, Kotaro Morita



(A) Jmjd3, a histone demethylase, regulates expression of Hox gene family and Jmjd3 KO mice show kyphosis and rib dysplasia. (B) Ganglioside-deficient mice, deficient in galactosyltransferases (β4GalT-5 and -6), die before weaning with growth retardation and ataxia. (C) Abnormal formation of spinal cord axons and myelin.



Laboratory members

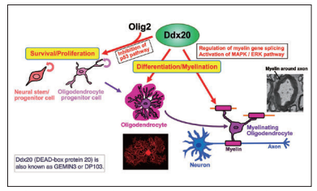
Anatomy and Neurobiology

M.D., Ph.D. Professor
Hirohide Takebayashi

Our research focuses on the development, plasticity, and age-related changes in the nervous system, a complex and delicate organ. Specifically, we aim to elucidate the pathogenesis of neurological diseases and develop treatments, focusing on the involvement of glial cells. In medical school education, we lead courses on human systemic anatomy at the Center for Anatomical Studies and oversee clinical anatomy training conducted at the Clinical Anatomy Laboratory (CAL).

The brain is an organ that is the source of intelligence and behavior unique to humans. Our primary research interest lies in understanding the mechanisms underlying the development, plasticity, and age-related changes of the nervous system. We have a particular focus on oligodendrocytes because our group is one of the groups that identified Olig transcription factors essential for oligodendrocyte development. We are also investigating to clarify the molecular and cellular mechanisms of neurological diseases with glial cell abnormality and neurological diseases that exhibit involuntary movements for developing treatments. In addition to our research activities, we provide systematic anatomy education at the medical school and support the implementation of clinical anatomy at CAL. Through surgical training programs, we will help young surgeons improve their skills and contribute to improving the quality of medical care.

Hirohide Takebayashi



Ddx20-mediated regulation of oligodendrocyte development and differentiation

Center for Anatomical Studies

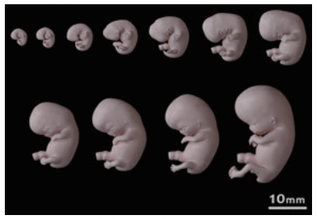
Congenital Anomaly

M.D. Professor
Hironori Haga

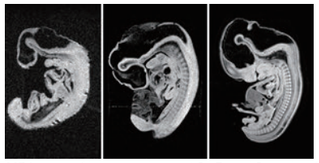
Approximately 3% of newborns have congenital abnormalities. Many congenital abnormalities arise from a complex interaction of genetics and environmental factors, but only a portion of them have had their causes and mechanisms of onset clarified. Our center possesses the most extensive collection of human embryos globally and promotes comprehensive research to elucidate the etiology and pathogenesis mechanisms of congenital abnormalities and their prevention.

The center, which evolved from the Department of Anatomy, is responsible for teaching gross anatomy in undergraduate education. We also accept students in Master's and Doctoral programs. Our center has a collection of over 44,000 human embryo specimens, unparalleled in quality and quantity worldwide. The vast majority of these specimens are from the organogenesis period, which occurs three to eight weeks after fertilization. Additionally, the collection frequently includes abnormal cases, and through research on the early pathological development of congenital abnormalities, we aim to elucidate the etiology of various congenital disorders. Our center is one of the world's leading centers for human embryology and congenital anomaly research, collaborating with many researchers both within and outside the university.

Hironori Haga,
Shigehito Yamada



Computer graphic images of human embryonic development between the 4th and 8th weeks following fertilization



MR images of human embryos at 6-, 7- and 8-weeks of gestation

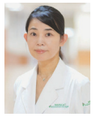
Human Disease Genomics

Ph.D. Professor
Fumihiko Matsuda

We conduct multi-omics studies of multigenetic disorders using genome, proteome and metabolome analysis technologies to elucidate their pathology and develop treatments. We aim to construct an integrative database of such information with detailed patients' clinical information to enable the prediction, diagnosis, and best possible treatment and preventative intervention for each patient. Examples of diseases include multigenetic rare diseases, such as pulmonary hypertension, pulmonary fibrosis, IgG4-related disease, primary sclerosing cholangitis (PSC), and HTLV-1-associated myelopathy (HSM/TSP), caused by HTLV-1 infection. We also promote the Nagahama Study, Japan's first large-scale community-based genome cohort project. We are conducting prospective analyses of aging and age-related conditions using statistical genetics pipelines developed in-house to interpret the results.
The center has been actively engaged in research collaborations with overseas institutions. We established the International Joint Ph.D. Program in Genomic Medicine with McGill University in Canada, an educational program to foster world-leading life data scientists in genomic medicine. We also have a long-standing cooperation with Institut Pasteur, a world-leading institute in infectious diseases. We serve as a counterpart laboratory at Kyoto University for Institut Pasteur du Japan, established in June 2024.

Fumihiko Matsuda
Takahisa Kawaguchi

Medical Education



M.D., Ph.D. Professor
Hitomi Kataoka

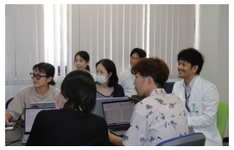
Medical education examines the processes of learning and development among both students and healthcare providers, including instructors. In addition to the internal factors that influence learning, our research also considers the relationships between learners and their environment. Specifically, our laboratory focuses on learner-centered and patient-centered healthcare as well as diversity and inclusion. The University and medical field are the key settings in which we conducted our research.

In the realm of medical education research, we have conducted extensive studies on a variety of topics, including the empathy of medical students and doctors toward patients, the burnout of medical students and young doctors in the COVID-19 pandemic, and the careers of medical students in the COVID-19 pandemic. Additionally, Professor Kataoka' s research on empathy, which is her life work, is considered one of the leading studies in Japan. Recently, we expanded our research to include topics such as medical student motivation, mindfulness-based learner support, the effects of Kampo education, and the trustworthiness of the patient-physician relationship.
In terms of medical education, we are committed to supporting female doctors, enhancing medical students' careers, introducing humanities to Japan, providing exercises for dealing with patients in distress, using effective reflection models, developing a medical interview AI chatbot, creating virtual training for medical practice, and collaborating with undergraduate students to develop a BOT for medical interview practice.

Our ultimate goal is to contribute to patients and society by advancing the research and practice of medical students and professional medical education.

Hitomi Kataoka, Tomoko Miyoshi, Masashi Ikuno
Masayuki Yamada, Akiko Tokinobu,
Yasuhiko Konishi

Classroom Scene: Professionalism



Research meeting

Immunopharmacology

M.D., Ph.D. Professor
Dean Thumkeo

The immune system evolved primarily to defend against infections, but recent breakthroughs in cancer immunology have revealed its broader potential. Our lab explores this by studying immune cell functions, aiming to develop novel cancer therapies and pioneer advancements in tissue regeneration.

Our research focuses on developing therapies for currently incurable diseases by harnessing the immune system. This requires a deep understanding of immune mechanisms and disease pathologies. Our key research areas include, investigating cancer immune evasion mechanisms and exploring the role of immune responses in skin regeneration. In cancer research, we study the diverse immune cells infiltrating tumors, which shape the tumor-specific immune microenvironment. Using scRNA-seq, we have characterized immune microenvironments in both mouse and human cancers.
A unique feature of our lab is the seamless integration of wet-lab experiments and computational analyses, supported by a diverse team with varied expertise. With nearly 30 years of experience in Japan, alongside time in the U.S. and Thailand, I am dedicated to creating an international, collaborative environment. Through research activities, I aim to develop the next generation of scientists with broad perspectives.

Thumkeo Dean,
Prasongtanakij Somsak

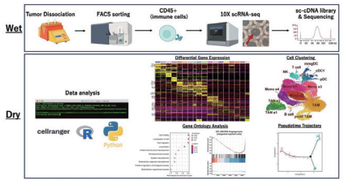


Figure 1: One of the key features of our lab is the seamless integration of wet experiments & analyses

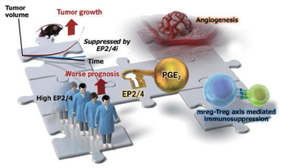


Figure 2: Pharmacological basis of PGE_2-EP2/4 signaling blockage in canser

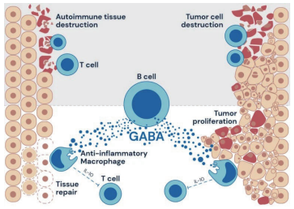
Integrated High-Order Regulatory Systems

M.D., Ph.D. Professor
Sidonia FAGARASAN

Our understanding of the immune system has developed beyond fighting infection to encompass a global role in homeostasis. To achieve this, the immune system must not only react to pathogens: it must also engage in a continuous dialog with the body' s organ systems and commensals. Our goal is to discover the cellular and molecular mechanisms that integrate input from metabolites, neurotransmitters, and immune signaling pathways and to harness these to enhance immunotherapy.

Homeostasis enables tissues to adapt their functions to environmental stimuli, optimizing overall fitness. This involves extracellular signals and intracellular pathways to regulate immune responses in health and disease. To study these processes in our lab, you will learn how to use experimental systems of modern immunology and integrative multi-omics datasets, and the advanced analytical techniques required to interpret them. Because we seek to improve immunotherapy for cancer and other diseases, in our lab you will also learn and apply approaches to study the regulation of immunity and homeostasis in the context of several important real-world factors that impact treatment success: factors like ageing, obesity, diet, metabolic syndromes, and gender. By joining our lab, you will also benefit from interactions with clinicians, bioinformaticians, technological platform experts, and many others, along with a vibrant educational and scientific environment.

Sidonia FAGARASAN,
Masaki TAJIMA,
Akihiro SHIMBA



The immune-regulation mechanism by B cell-derived GABA

Laboratory photo

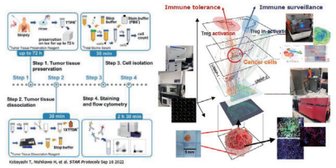
Cancer Immune Multicellular System Regulation

M.D., Ph.D. Professor
Hiroyoshi Nishikawa

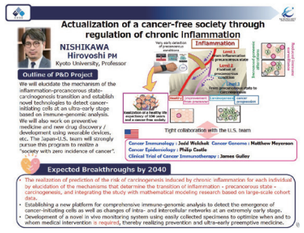
We have developed an original method to analyze the tumor microenvironment. Since the immune system is a high-dimensional biological system that is affected by genetic and environmental diversity, we extract elements involved in immune response from comprehensive analysis of cancer patients and verify the universal significance of each element in a mouse model. We then aim at elucidating the pathophysiology of cancer .

Individual differences in the therapeutic efficacy of cancer immunotherapy have revealed that the reactivation of antitumor immunity is influenced by various factors, including environmental factors and genetic diversity on both the cancer side and the host side. We will explore the key regulatory mechanisms of immune tolerance and immune surveillance by integrating immunology, genomic medicine, metabolism, and bioinformatics. Then, we can capture microcellular dynamics from the molecular expression and spatio-temporal dynamic changes of individual immune cells and link the changes in intercellular networks to understanding from a macrobiological perspective. We also employ genetically-engineered mice to explove each immune cells. In addition, through the AMED Moonshot Project, we will elucidate the dynamics of immune responses during the process in which normal cells acquire somatic mutations and become “cancerous” due to chronic inflammation, and extend our reseach to preventive medicine.

Hiroyoshi Nishikawa



The system and equipment for conducting research on the analysis of cancer cells and immune cells at the single cell level (immunogenomic analysis).



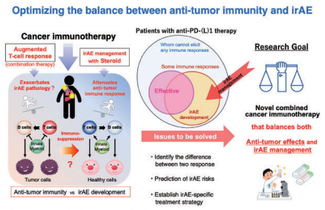
Summary of the AMED Moonshot Project, which aims at achieving a cancer-free society through cancer prevention.

Clinical Immunology and Cancer Immunotherapy

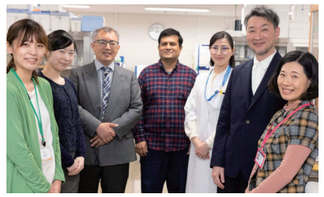
Not all cancer patients respond well to cancer immunotherapy. Furthermore, this therapy sometimes causes immune-related adverse events (irAEs) with various organ damages. Due to the risk of life-threatening events, the therapy is forced to be discontinued. In our research division, we are conducting researches to elucidate how the autoimmune irAE responses develop and should be controlled, for improving the efficacy and the versatility of cancer immunotherapy.

Cancer immunotherapy with anti-PD-(L)1 antibodies has brought about a paradigm shift in cancer treatment, but the prediction and management of irAEs remains a challenge for improvement of its effectiveness and versatility. While excessive immunosuppression for controlling irAE symptoms may attenuate the therapeutic efficacy, immune-potentiating approaches increase the risk of irAEs. Therefore, irAE-specific management strategies need to be developed to solve this conflicting issue. Our division is conducting researches to elucidate mechanisms underlying the irAE development, with the aim of establishing strategies that optimize a balance between anti-tumor effects and irAE management from both basic research and clinical perspective. For responding the needs of clinical practice, we have established a platform “irAE Unit” to support the patients’ safety in collaboration with departments involved in cancer treatment in Kyoto University Hospital, and work on the analyses of clinical data and patient specimens.

Hirotake Tsukamoto, Kosaku Murakami



Research aiming to optimize the balance between anti-tumor immunity and irAE

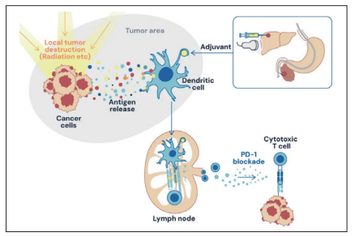


Cancer Immunotherapy

As a clinician with extensive experience in treating malignant digestive diseases, I have conducted research elucidating the host innate immune response to cancer. The goal of our division is to translate the basic research findings into clinical practice and develop new cancer immunotherapies that enhance PD-1 blockade by leveraging innate immunity. We also participate in other projects to advance the clinical aspects of cancer immunology research at Kyoto University.

Cancer immunity is initiated at the tumor site through innate immune activation and cancer antigen release. In situ vaccines, which stimulate innate immunity and promote cancer antigen release at the tumor site, induce cancer immunity mostly upstream. They are expected to synergize with checkpoint inhibitors, induce long-lasting memory responses with minimized adverse effects, and utilize patient-specific cancer antigens thereby enabling personalized vaccination. Advances in medical devices have made therapeutic intervention feasible, supporting the clinical application of in situ vaccines. The primary goal of our division is to develop in situ vaccines that maximize cancer immune activation through a two-pronged approach, by injecting innate immunity-activating adjuvants and enhancing tumor destruction to release patient’ s own tumor antigens. This strategy, applied in both therapeutic and neoadjuvant settings, is expected to synergize with PD-1 blockade, leading to the development of cutting-edge cancer immunotherapies.

Ken Takahashi
Maram, Hussein zaky Zahra



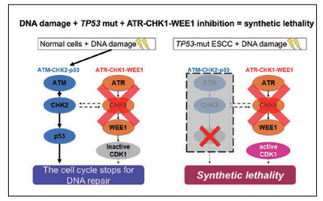
Concept of our division: Maximize in situ vaccines through innate immunity activation and tumor destruction at the tumor site, thereby enhancing PD-1 blockade therapy.

Clinical Pharmacology and Cancer Immunotherapy

Our team is engaged in the exploration and development of novel therapies that target specific molecules and harness the immune system. These treatments aim to exploit the vulnerabilities in cancer cells caused by genetic alterations, such as mutations in the KRAS and TP53 genes. Our objective is to develop personalized, effective, and safe treatments to fully eradicate difficult-to-treat cancers, including inoperable gastrointestinal malignancies. We are focusing our efforts on creating tailored therapeutic approaches for each patient.

Cancer cells undergo diverse and complex genetic alterations. Comprehensive genetic analysis has revealed the frequency, mechanisms, and significance of these changes. Our laboratory aims to develop therapies targeting cancer cells while minimizing harm to normal cells, focusing on treatments that target genetic alterations in cancer cells. We research the roles of "oncogenes" like KRAS and "tumor suppressor genes" such as TP53 and assess inhibitors targeting proteins associated with these genes using cancer and normal cells from humans and mice. We use gene modification techniques and screening methods, including compound and genetic screening, to explore and validate findings. We welcome researchers and graduate students from both Japan and abroad, aiming to nurture researchers capable of making global contributions. Please feel free to contact us for more information.

Osamu Kikuchi,
Bayarbat Tsevegjav



Synthetic lethal antitumor effects targeting p53 mutations.

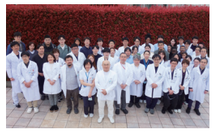
Hematology

M.D., Ph.D. Professor
Akifumi Takaori-Kondo

Hematology is a unique field where clinical medicine and basic research are closely associated, enabling rapid translation of technological advances into disease understanding and innovative therapies. Following the principle "From bedside to bench. From bench to bedside," we are committed to excellence in medical care, research, and education. Our ultimate mission is to cure refractory hematologic diseases through dedication and innovation in every aspect of our work.

Our research focuses on "curing" hematologic malignancies and infectious diseases through bidirectional approaches, i.e., from bedside to bench and from bench to bedside. We integrate basic science and clinical medicine in hematology, immunology, and virology. Our key research areas include: (1) pathophysiology and treatment of hematologic malignancies like leukemia, MDS, lymphoma, myeloma, and ATL; (2) oncogenic mechanisms driven by APOBEC3-induced genome mutagenesis and defective DNA repair in cancer; (3) application of iPS cell technology to hematologic disorders and regenerative blood medicine; (4) infectious disease pathophysiology, including HIV, and host defense mechanisms; (5) dendritic cells and tumor immunotherapy; and (6) hematopoietic stem cell transplantation and cellular immunotherapy, including CAR T-cell therapy. Through these studies, we strive to elucidate disease mechanisms, develop novel diagnostics and treatments, and translate discoveries into clinical practice.

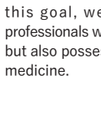
Akifumi Takaori-Kondo, Kouhei Yamashita
Kotaro Shirakawa, Junya Kanda, Toshio Kitawaki
Kazuhisa Chonabayashi, Takashi Sakamoto
Hiroshi Arima, Tadahiko Matsumoto
Chisaki Mizumoto, Kenichi Ishiyama
Noriyoshi Yoshinaga, Hiroyuki Matsui
Yasuyuki Arai, Tomoyasu Jo



Department members (Apr 2024)

Clinical conference

Cardiovascular Medicine



M.D., Ph.D. Professor
Koh Ono

The Department of Cardiovascular Medicine at Kyoto University deals with diseases such as angina pectoris, myocardial infarction, valvular disease, heart failure, arteriosclerosis, aneurysms, and arrhythmia, offering 24/7 medical care to deal with frequent emergency cases. In research, we aim to create new value from Kyoto to the world through analysis that balances basic and clinical research.

In basic research, we conduct highly original, world-leading research using new research methods that apply molecular biology, physiology, and genetics to solve questions obtained in clinical practice. Specifically, our research includes physiological functions of the heart and blood vessels, investigations into the pathogenesis of diseases, development of preventive and diagnostic methods, and translational research aimed at the development of therapeutic methods. We are eager to have young researchers and people from different fields participate in our research. In clinical research, we promote research that builds clinical evidence. Large-scale multicenter trials are underway in collaboration with many affiliated hospitals. We have also established a course for young physicians to learn statistical methods in depth.
For more information on the specifics of ongoing research, please visit the Department's home page.

Koh Ono, Takahiro Horie, Takeru Makiyama,
Kazuya Nagao, Kyohei Yamaji, Tomohiro Nishino,
Hiroki Shiomi, Yugo Yamashita, Kenji Nakatsuma,
Yuta Tsujisaka, Hideyuki Kinoshita,
Shin Watanabe, Takao Kato, Erika Yamamoto,
Shushi Nishiwaki, Osamu Baba、Eri Kato

Group photo of department members

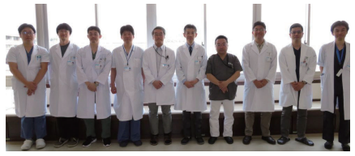
Gastroenterology and Hepatology

M.D., Ph.D. Professor
Hiroshi Seno

The Department of Gastroenterology is a relatively new department, established in 1996. Since its inception, members have got together with a strong interest in gastroenterology from diverse backgrounds. All members aim to share clinical and basic cutting-edge conducted in collaboration with affiliated hospitals. To achieve this goal, we seek to cultivate bilingual professionals who are not only excellent clinicians but also possess a deep understanding of basic medicine.

We address a broad scope of clinical responsibilities, covering the upper and lower gastrointestinal tract and hepato-biliary-pancreatic systems, ranging from benign to malignant diseases. By integrating clinical and basic approaches, we focus on elucidating mechanisms of various diseases and developing new diagnostic and therapeutic strategies. Our research highlights novel treatments for inflammatory bowel disease, insights into IgG4-related disease, therapeutic procedures for digestive organ cancers, genetic and epigenetic analyses of carcinogenesis, and regenerative medicine, etc.. Furthermore, we aim to nurture innovative individuals capable of independent exploration in basic and clinical fields. The department also fosters a collaborative environment to promote steady scientific progress.

Hiroshi Seno
Akihisa Fukuda
Shuji Yamamoto, Atsushi Takai, Masahiro Shiokawa, Yuki Nakanishi, Takahiro Utsumi



Members of the laboratory.

Respiratory Medicine

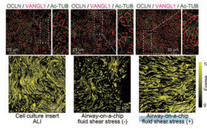
M.D., Ph.D. Professor
Toyohiro Hirai

Respiratory medicine encompasses a wide range of diseases, including cancer, infections, airway diseases, interstitial lung diseases, and sleep disorders. Multiple respiratory diseases and comorbidities often coexist. This complexity arises from the lungs' unique nature, which continuously change their structure and interact with both external and internal environments through breathing and blood circulation. Our goal is to advance respiratory medicine by integrating medical biology with insights from science and engineering.

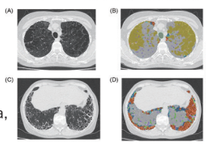
Our department is engaged in clinical, basic, and interdisciplinary research, alongside clinical practice and education. We collaborate with basic medical science departments and researchers from various disciplines and faculties.

- Airway Diseases: We study COPD, asthma, chronic cough through structure-function analysis, imaging, and pathophysiology.
- Interstitial Lung Diseases: Our research explores pulmonary fibrosis from genetic, molecular, and structural perspectives.
- Lung Cancer: We conduct clinical and basic research on lung cancer, focusing on drug resistance mechanisms.
- Respiratory Infections: We perform multicenter studies and molecular epidemiology research focused on COVID-19, community-acquired pneumonia, pneumococcal pneumonia, and nontuberculous mycobacteria.
- Disease Models: We investigate respiratory disease mechanisms and drug discovery using small animal models and molecular biology techniques.
- iPS Cells: In collaboration with the Goto Laboratory at CiRA, we explore iPS cell applications for understanding respiratory diseases and advancing clinical applications.

Toyohiro Hirai, Isao Ito, Atsuyasu Sato, Hiroaki Ozasa, Naoya Tanabe, Kohei Ikezoe, Yoshinari Nakatsuka, Hironori Yoshida, Yohei Korogi, Hitomi Ajimizu, Seiichiro Imai

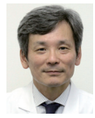


1.Alignment of planar cell polarity (VANGL1, red in upper figure) and coordinated ciliary beating with unidirectional mucociliary flow (yellow in lower figure) in iPSC-derived multiciliated airway cells driven by fluid shear stress in an airway-on-a-chip model. Sone N, et al. Sci Transl Med. 2021;13 (601), eabb1298.



2. Visualization and quantification of lung parenchymal lesions using the AI-based quantitative CT system. Handa T, et al. Ann Am Thorac Soc. 2022;19(3):399-406.

Rheumatology and Clinical Immunology



M.D., Ph.D. Professor
Akio Morinobu

The Division of Rheumatology & Clinical Immunology focuses on clinical practice and research in immunologic diseases such as rheumatic diseases. Treatment in this area has has evolved dramatically, but the mechanisms of autoimmunity are still not fully understood. Our goal is to elucidate rheumatologic questions using methods from immunology, life sciences, and data science, and to apply the results to clinical practice.

We conduct the following research to elucidate the etiology and pathology of rheumatic diseases and to develop new diagnostic and therapeutic modalities
1. We have reported that LUBAC and PLD4 are disease susceptibility genes for SLE. We are currently investigating their relationship to the pathology of SLE and their potential application in treatment.
2. We have generated human IgG4 knock-in mice and clarified their significance in vivo.
3. We have discovered a new autoantibody in idiopathic interstitial pneumonia. We are also searching for and identifying the epitope of anti-MDA5 antibodies.
4. We conducted a clinical trial of enhanced immunosuppressive therapy for dermatomyositis with interstitial pneumonia positive for anti-MDA5 antibodies. We are also developing and studying mouse models of this disease.
5. We are conducting cohort studies in rheumatoid arthritis and SLE and analyzing various clinical outcomes.

Akio Morinobu, Hajime Yoshifuji, Ran Nakajima,
Shuji Akizuki, Hideaki Tsuji, Ryosuke Hiwa,
Mirei Shirakashi

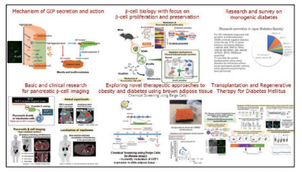
Diabetes, Endocrinology and Nutrition

M.D., Ph.D. Professor
Daisuke Yabe

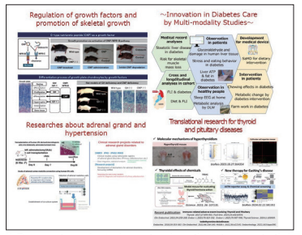
We aim to advance next-generation treatments for diabetes, endocrine disorders, and metabolism-related diseases like obesity and sarcopenia through basic, clinical, and data science research. Welcoming physicians, dietitians, and researchers, we foster collaboration to explore new frontiers. Additionally, we prioritize nurturing young clinicians and dietitians, equipping them to think scientifically and apply their expertise in practice, ensuring they contribute meaningfully to healthcare innovation and patient care.

We explore the pathophysiology of diabetes, endocrine disorders, and metabolism-related diseases to develop new treatments, pharmaceuticals, and devices. Our research has contributed to the clinical use of incretins in diabetes care and shows promise for obesity treatment. Key areas include cell and gene therapy, such as iPS-derived pancreatic β-cells for transplantation, studies on monogenic diabetes, rare endocrine disorders, and translational research on thyroid, adrenal, and pituitary diseases. We also pursue cross-disciplinary nutrition research. In our graduate program, students collaborate with supervisors and postdoctoral fellows to conduct research, honing scientific thinking, practical application, and communication skills. This four-year training provides a strong foundation for physicians and dietitians, equipping them for impactful careers in healthcare and research.

Daisuke Yabe,
Daisuke Taura, Yoshihito Fujita, Kaori Ikeda
Junji Fujikura,Ichiro Yamauchi, Yohei Ueda,
Takaaki Murakami, Eri Ikeguchi, Takuro Hakata, Hiroyuki Fujimoto
Mayumi Inoue,Tomoko Kuwahara, Makiko Tatsumi, Sachiko Kawashima



I.Research projects in diabetes and metabolic disorders



II.Research projects in endocrine disorders and clinical nutrition

Primary Care & Emergency Medicine

M.D., Ph.D. Professor
Shigeru Ohtsuru

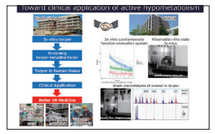
Our department, founded in 2006, drives advanced emergency care at Kyoto University Hospital. Designated as a disaster base and critical care center, we handle 6,000+ emergency cases annually. With Japan’ s aging society, frequent disasters, and pandemics, emergency medicine must evolve. Our diverse experts unite as ONE TEAM to develop a pioneering emergency department.

Kyoto University Hospital integrates advanced treatment, research, and education on a broad emergency care foundation, fostering a strong emergency medicine culture for young doctors and students. We continuously redefine the role of emergency physicians, cultivating next-generation leaders in emergency and disaster medicine with Kyoto University’s unique vision.
Our research promotes interdisciplinary collaboration across academic and policy fields. In February 2016, we established the Kyoto iMED Disaster Research Group, a cross-disciplinary, multi-professional team. In 2019, Kyoto University’ s Medical School, Hospital, and Disaster Prevention Research Institute launched the Regional Healthcare BCP Collaboration Research Unit, advancing disaster-related projects. As disaster

Shigeru Ohtsuru, Tomoyuki Yunoki, Ken Shinozuka, Hiroyuki Yamada, Naoto Jingami, Yudai Takatani, Takuma Minami, Tomoharu Mori, Yoshitaka Ishiguro, Kyo Inoue, Takahiko Tsutsumi , Yohei Kakuda, Koji Tarumoto

medicine remains an emerging global field, we aim to lead as a pioneer in medical disaster preparedness.
Since 2018, we have collaborated with RIKEN’ s hibernation research team to explore induced metabolic suppression for clinical use. This innovation could revolutionize emergency medicine by enhancing organ protection and long-term preservation.

On the rooftop heliport



Application of active low metabolism in emergency medicine based on the elucidation of the hibernation mechanism

Nephrology

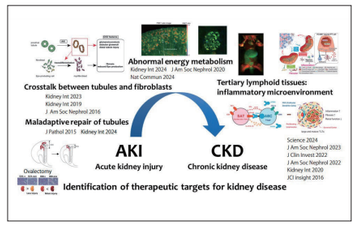
M.D., Ph.D. Professor
Motoko Yanagita

The department aims to ‘make kidney disease a curable disease’ by developing new treatment methods through research into the pathophysiology of kidney disease. In our practice, we try to provide the best and most up-to-date medical care available, as well as comprehensive treatment of the many diseases that patients with kidney disease suffer from. We educate young doctors to become nephrologists with high clinical skills and internationally competitive researchers who can contribute to nephrology.

We are currently conducting both basic and clinical studies. In basic research, we aim to elucidate the mechanisms of human kidney disease using state-of-the-art technologies and to develop novel therapeutic strategies.
Specifically, we are conducting studies to (1) elucidate the delayed repair mechanisms associated with tissue aging and (2) to visualize the spatiotemporal dynamics of energy metabolism in kidney disease. Ultimately, we aim to identify novel therapeutic targets and establish novel therapeutics for human kidney diseases. In clinical research, through the utilization of real-world

Motoko Yanagita, Shinya Yamamoto
Keiichi Kaneko, Shigenori Yamamoto,
Yuichiro Kitai, Sayaka Sugioka,
Takahisa Yoshikawa, Ryo Yamada,
Keisuke Taniguchi, Naoya Toriu, Youngna Kang

data analysis and artificial intelligence, we are working on new areas, such as (1) onconephrology, (2) pathological diagnosis using artificial intelligence, and (3) prediction of acute kidney injury using electronic medical records. The department aims to train physician scientists who can acquire a deep understanding of the basic and clinical aspects of the disease and clarify questions obtained in clinical practice through their own research skills.



Medical Oncology

M.D., Ph.D. Professor
Manabu Muto

Department of Medical Oncology was established in September 2012. We support the functional operation of the Cancer Center in academia, and are responsible for 1) the practice and education of anticancer chemotherapy including cancer precision medicine, 2) clinical trials, 3) basic research, 4) translational oncology to apply basic research to clinical practice, and 5) Clinical Bioresource and Real World Data projects that lead to the next-generation medical development.

In our department, a wide variety of cancer researches are ongoing such as elucidating carcinogenic mechanisms, developing new diagnostic modality and anticancer treatments, and clinical application of precision medicine. We are particularly interested in elucidating the molecular-level carcinogenic mechanism of esophageal squamous cell carcinoma by alcohol. Regarding the treatments, we are developing new concepts-based curative cancer treatments using both immune checkpoint inhibitors and nonsurgical modalities in investigator-initiated clinical trials. We have shown remarkable presence for leading the precision medicine in Japan. We also have projects of translational researches contributing to the early clinical

Manabu Muto, Shigemi Matsumoto,
Junichi Matsubara, Shinya Ohashi, Atsushi Yamada,
Akira Yokoyama, Chikatoshi Katada, Ryo Sakamoto,
Motoo Nomura, Yukiko Mori, Takahiro Horimatsu, Masahiro Yoshioka, Masashi Tamaoki,
Nobuko Kawaguchi, Tomohiro Kondo, Takashi Nomizo, Shigeki Kataoka

development and projects for consortium of new medical real-world data (RWD) platform. Graduate school students and senior residents in our department can choose their favorite fields of research and receive specialized education.

Group photo of classroom members

Dermatology

M.D., Ph.D. Professor
Kenji Kabashima

Traditional dermatology relied heavily on visual diagnosis and experience-based medicine. However, advances in medical science have ushered in an era of novel treatments, such as molecular-targeted drugs based on disease mechanisms. Understanding science is now essential for grasping drug pharmacology and predicting side effects accurately. Flexibility and core competencies are required to adapt to these changes. We aim to nurture top physician-scientists and establish a leading hub for advanced medical research and innovation.

Our department focuses on research in skin immunity and allergy, particularly on atopic dermatitis. Using immunological techniques, genetically modified mice, and in vivo imaging with two-photon microscopy, we analyze cellular dynamics to uncover disease mechanisms and translate findings into clinical applications. Research extends to areas such as pruritus neurophysiology, melanoma pathogenesis, and tumor immunity. We emphasize bridging clinical observations with research to improve diagnosis, pathogenesis understanding, and treatment. At Kyoto University, a tradition of valuing academic freedom fosters diversity and originality, shaping our department's inclusive and innovative culture. We prioritize respecting individual autonomy and embracing diversity to create a supportive environment that encourages creativity and collaboration. This mission drives us to contribute to the advancement of dermatology and to train future leaders capable of addressing complex clinical and scientific challenges.

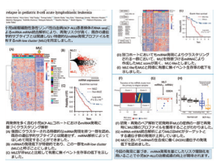
Kenji Kabashima
Akihiko Kitoh, Yuichiro Endo
Akinori Kawakami, Toshiya Miyake, Hiroyuki Irie, Tomoko Hirano
Naotomo Kambe
Takashi Nomura, Saeko Nakajima, Satoshi Nakamizo
Toshiaki Kogame
Mami Shibuya

Pediatrics

M.D. Professor
Junko Takita

Development is central to pediatrics, as many childhood diseases stem from developmental abnormalities. Our department integrates fundamental research and clinical practice to understand these mechanisms and develop innovative treatments. We emphasize holistic care, treating each child as an individual and providing comprehensive support. By advancing both research and clinical excellence, we aim to lead in pediatric care and safeguard the health and happiness of all children.

Our department places great importance on advancing translational research to bridge basic science and clinical medicine, enabling the delivery of higher-quality care. To achieve this, we conduct comprehensive analyses, including genomic and epigenomic studies, to unravel disease mechanisms and develop novel therapies. Additionally, leveraging iPS cell-based technologies, we aim to understand the pathogenesis of intractable congenital diseases and establish foundations for regenerative medicine. Since many congenital disorders result from functional disruptions of genes essential during development, these studies are vital not only for advancing pediatric medicine but also for contributing to the broader field of life sciences. We believe that the mutual reinforcement of research and clinical practice is indispensable for medical progress. Thus, we are dedicated to nurturing physician-scientists who can excel in both domains.



Junko Takita
Masahiko Kawai, Katsutsugu Umeda, Shiro Baba,
Kazushi Izawa, Itaru Kato, Takuya Hirata,
Atsushi Yokoyama, Satoshi Saida, Eitaro Hiejima,
Kougoro Iwanaga, Takeshi Yoshida, Seiichi Tomotaki,
Yukako Maeda, Hirofumi Shibata, Hiroko Tomotaki,
Takenori Suga, Hirohito Kubota, Naoko Yano
Hiroshi Nihira, Ryosuke Araki, Ryo Akazawa, Kentaro Akagi

Radiation Oncology and Image-Applied Therapy

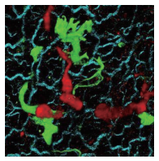
M.D., Ph.D. Professor
Takashi Mizowaki

We are developing innovative radiotherapy technology to eradicate cancers. In molecular biological research, we investigate causes for radioresistances and create methods to overcome them by analyzing DNA, RNA, proteins, etc. In physical engineering research, we are driving forward high-precision radiotherapy such as IMRT, stereotactic radiotherapy, and four-dimensional radiotherapy. We welcome the participation of physicians, biologists, and physical engineers who are interested in these translational approaches to cancer therapy.

Biological approach
We are promoting basic cancer research, focusing on radiosensitizers, elucidation of mechanisms underlying tumor radio-resistance, neutrophil extracellular traps (NETs), and omics analysis using clinical specimens. Additionally, we collaborate with Radiation Biology Center on hypoxia and with the Institute for Integrated Radiation and Nuclear Science on BNCT and immune-radiotherapy.

Physical engineering approach
We are developing a high-precision image-guided radiotherapy system (OXRAY) in collaboration with a domestic company and advancing the development of innovative irradiation techniques, such as high-precision radiotherapy and innovative beam delivery techniques, including dynamic tumor-tracking and Dynamic SwingArc irradiation. Our final goal is to perform personalized radiotherapy based on molecular tracking radiotherapy, which fuses biological approaches with physical techniques.

Clinical research
We aim to apply results from radiobiological and physical research to clinical practice. We are conducting clinical trials on multidisciplinary treatment, which combines high-precision radiotherapy with surgery/chemotherapy.



Neutrophil extracellular traps (NETs, shown in green) triggered by intravascular redox imbalance entrap circulating tumor cells (shown in red) at the lungs and promote pulmonary metastasis.

High-precision image-guided radiation therapy device (OXRAY)

Takashi Mizowaki
Michio Yoshimura
Katsuyuki Sakanaka, Yusuke Iizuka
Aya Nakajima, Ryota Nakashima, Megumi Uto, Yuka Ono, Rihito Aizawa
Noriko Kishi, Hiraku Iramina, Hideaki Hirashima, Takanori Adachi, Yukako Kishigami

Clinical Sciences

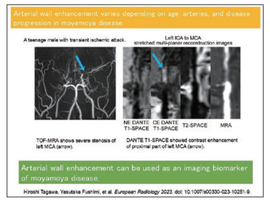
Diagnostic Imaging and Nuclear Medicine

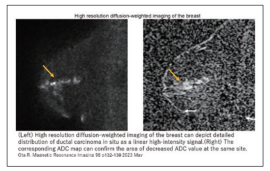
M.D., Ph.D. Professor
Yuji Nakamoto

The Department of Diagnostic Imaging and Nuclear Medicine significantly contributes to healthcare by employing various imaging modalities, including CT, MRI, ultrasound, nuclear medicine, and angiography. Our radiologists play a pivotal role in multidisciplinary medical care, working closely with various specialized departments to deliver comprehensive, whole-body care. Additionally, our department not only provides critical diagnostic imaging but also offers image-guided minimally invasive treatments.

Our research activities are centered around four main areas: 1) the development of innovative imaging diagnostic devices and procedures, 2) clinical research aimed at establishing new imaging methods and gaining insights into pathological conditions, 3) biological and histopathological studies grounded in imaging diagnostics, and 4) the advancement of image-guided minimally invasive treatment techniques. Our research encompasses a wide spectrum, fostering collaboration with clinical departments, basic medical sciences, engineering, and pharmaceutical sciences. In education, we are dedicated to contributing through diagnostic imaging training for fellows, trainees, and residents across various specialties. We offer a specialized training program that enables fellows to follow their chosen career paths upon completion.

Through these endeavors, our department plays a vital role in clinical practice and in the advancement of imaging research and education.





Yuji Nakamoto, Hiroyoshi Isoda, Yasutaka Fushimi, Koji Fujimoto, Masako Kataoka, Koya Nakatani, Kanae Miyake, Masahiro Yakami, Ryo Sakamoto, Tsuyoshi Ohno, Yasuyuki Onishi, Hironori Shimizu, Satoshi Nakajima, Sho Koyasu, Yuki Himoto, Akihiko Sakata, Tomomi Nobashi, Ryusuke Nakamoto, Sachi Okuchi, Sayo Otani, Takayuki Yamamoto, Hirotsugu Nakai, Yuka Matsumoto

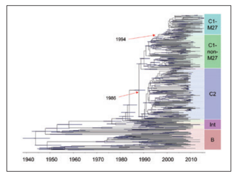
Clinical Laboratory Medicine

M.D., Ph.D. Professor
Miki Nagao

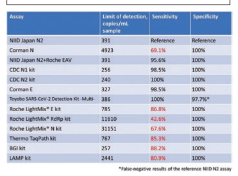
The growing global concern over emerging/reemerging infectious diseases and aging society highlights the importance of accurate diagnostics and effective treatment strategies. At the Department of Clinical Laboratory Medicine, we are dedicated to developing advanced diagnostic technologies, establishing evidence-based treatment methods, and conducting internationally recognized research in clinical laboratory medicine.

In collaboration with Kyoto University Hospital (KUH), industry partners, research institutes, and public health stakeholders, we aim to address clinical needs by innovating diagnostic tools and enhancing various treatment strategies. Additionally, our infection control team at KUH plays an active role in diagnosing and planning treatment for critically ill patients with infections, achieving improved clinical outcomes.
We also place a high priority on education, offering intensive, evidence-based training programs for both undergraduate and postgraduate students. Through small-group instruction, we strive to cultivate future leaders capable of bridging the gap between clinical needs and research, ultimately translating discoveries into tangible societal benefits.
By integrating diagnostic innovation, infection control, and education, our department is committed to reducing the global burden of infectious diseases and difficult-to-treat illness, advancing public health, and developing solutions that ensure better outcomes for patients worldwide.

Miki Nagao
Yasufumi Matsumura
Masaki Yamamoto
Yasuyuki Arai
Tomoyasu Jo
Kiyohide Usami
Yasuhiro Tsuchido
Koh Shinohara
Yusuke Tsuda
Yutaro Miyoshi



Time-scaled phylogeny of multi-drug resistant Escherichia coli ST131 genomes



Assay	Limit of detection, copies/mL sample	Sensitivity	Specificity
NIID Japan N2	391	Reference	Reference
Corman N	4923	69.1%	100%
NIID Japan N2+Roche EAV	391	95.6%	100%
CDC N1 kit	256	98.5%	100%
CDC N2 kit	240	100%	100%
Corman E	327	98.5%	100%
Toyobo SARS-CoV-2 Detection Kit -Multi-	386	100%	97.7%*
Roche LightMix® E kit	785	86.8%	100%
Roche LightMix® RdRp kit	11610	42.6%	100%
Roche LightMix® N kit	31151	67.6%	100%
Thermo TaqPath kit	767	85.3%	100%
BGI kit	257	88.2%	100%
LAMP kit	2441	80.9%	100%

*False-negative results of the reference NIID N2 assay

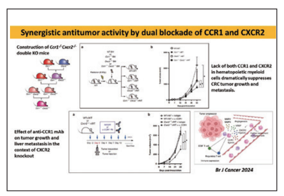
Diagnostic performance of SARS-CoV-2 detection assays

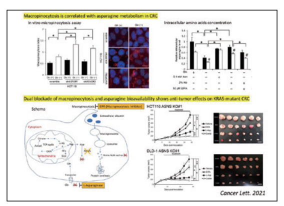
Gastrointestinal Surgery

M.D., Ph.D. Professor
Kazutaka Obama

Our division performs highly precise minimally invasive surgery for gastrointestinal cancers. To practice surgery that is truly beneficial to patients, we emphasize the process of resolving clinical questions scientifically, and plan and promote many clinical research projects. We also conduct basic research on the pathogenesis of gastrointestinal cancers and the development of new treatments and technologies. Through these research and clinical activities, we educate young surgeons with a broad perspective.

Major research topics are as follows; 1)molecular biological analysis of gastrointestinal carcinomas including stem cell biology, 2)physiological assessment of postoperative gastrointestinal function, 3)development of AI models to unveil and understand more detailed surgical anatomy, 4) development of novel surgical procedures and surgical instruments, 5)multi-institutional clinical trials to evaluate outcomes of the surgical treatments.
Endoscopic surgery has provided the clear, magnified view and contributed to disclose the meticulous surgical anatomy. The precise recognition of surgical anatomy is absolutely mandatory to perform accurate and safe minimally invasive surgery. In addition, firm basic research will provide a scientific rationale for surgical treatment. A new surgical therapy must be further evaluated in well-designed clinical studies.
It is critical for surgical trainees to study surgical science as well as to obtain a good surgical skill. Our program provides both of these in the finest quality.





Kazutaka Obama
Koya Hida, Shigeru Tsunoda, Shigeo Hisamori, Yoshiro Itatani, Nobuaki Hoshino, Masahiro Maeda, Masazumi Sakaguchi, Keiko Kasahara, Ryosuke Okamura, Shintaro Okumura, Takehito Yamamoto, Takashi Sakamoto, Yu Yoshida

Clinical Sciences

Hepato-Biliary-Pancreatic Surgery and Transplantation

M.D., Ph.D. Professor
Etsuro Hatano

We specialize in surgery for hepatobiliary and pancreatic diseases. For advanced cancers that are considered inoperable elsewhere, we provide optimal treatments with advanced techniques. Minimally invasive options, including laparoscopic and robotic surgery, are offered for standard procedures. As a leading liver transplant center, we handle numerous cases of end-stage liver disease and liver cancer, including transplants for perihilar-cholangiocarcinoma. Our mission is to support patients with skill, knowledge, and heart.

We conduct extensive research in oncology and regenerative/transplant medicine in the hepatobiliary and pancreatic fields, focusing on clinical applications.
1.Hepatobiliary Field
- Development of novel bile duct reconstruction methods using artificial materials
- Creation of transplantable artificial organs using decellularized tissue
- Integrated analysis of genomic and clinicopathological features of primary liver cancer
- Research on the mechanisms and countermeasures for chemotherapy-induced liver injury
- Studies on fibrosis, regeneration, and fibroblast function in cancer

2.Pancreatic Field
- Investigation of severe pancreatic fistula mechanisms
- Development of pancreatic islet isolation, preservation, and transplantation techniques

3.Liver Transplantation Field
- Exploration of immune tolerance mechanisms
- Development of improved graft preservation methods using hydrogen and perfusion techniques
- Research on overcoming small-for-size graft syndrome using xenogeneic models

4.Medical-Engineering Collaboration
- Development of devices enabling real-time fluorescence-guided surgery

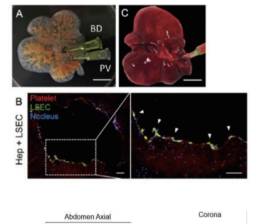


Figure 1. Hybrid artificial liver.
(A) A hybrid artificial liver in which hepatocytes (Hep) and liver sinusoidal endothelial cells (LSEC) are recellularized on a decellularized liver scaffold. The recellularization of LSECs suppressed thrombus formation (B), enabling extracorporeal blood circulation for more than ten hours (C).

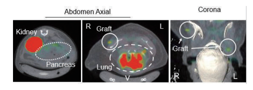


Figure 2. Basic and clinical studies of islet transplantation for insulin-dependent diabetes mellitus.Evaluation of a new islet graft site (subcutaneous) using PET: We demonstrated islet (cell) graft engraftment in the subcutaneous region and presented a new imaging method for islet graft evaluation.

Etsuro Hatano, Takamichi Ishii, Takashi Ito, Yoichiro Uchida, Kazuyuki Nagai, Takayuki Anazawa, Eri Ogawa, Tatsuya Okamoto, Satoshi Ogiso, Shoichi Kageyama, Hirofumi Hirao, Katsunori Sakamoto, Kentaro Kadono, Shinya Okumura, Takahiro Nishio, Hidenobu Kojima, Tomoaki Yoh, Hiroto Nishino, Kei Yamane, Elena Yukie Uebayashi

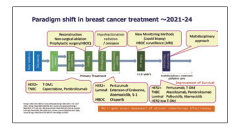
Breast Surgery

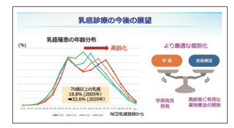
M.D., Ph.D. Professor
Norikazu Masuda

The incidence of breast cancer in Japan has been increasing.
Our goal is to prevent and optimize breast cancer treatment, minimizing invasiveness, keeping higher quality of life, developing new diagnostic and treatment methods, and establishing systems for personalized approach. We are conducting basic and clinical research in collaboration with specialists across various disciplines to develop an integrated, next-generation medical approach that covers the entire process from diagnosis to treatment.

Our research focuses on developing optimal and novel treatment and diagnostic methods tailored to the characteristics of breast cancer and the conditions of the host, with the goal of personalizing treatment and minimizing toxicity. To achieve this, we are establishing a database that integrates breast cancer biospecimen collections with linked clinical information. Our research spans multiple domains, including fundamental studies on the tumor microenvironment—such as analyses of genomics, epigenomics, and immune responses—epidemiological research, and clinical studies aimed at developing new treatment strategies.
In personalized medicine, accurately predicting treatment outcomes and prognosis while continuously monitoring disease progression and the patient's overall health is essential. We aim to integrate insights from basic research with clinical experience gained through the development and application of preoperative drug therapies. Our efforts also include the development and optimization of new local therapies, diagnostic applications of photoacoustic imaging technology, identification of novel biomarkers and tumor immunological markers, advancements in circulating tumor cell analysis, and the creation of risk models for breast cancer development alongside prevention and awareness initiatives. Additionally, we are working on strategies to mitigate the side effects of drug therapies.
Through the education of medical students, residents, fellows, and graduate students, we strive to cultivate professionals who can provide compassionate and reliable healthcare tailored to each patient. Furthermore, we aim to nurture individuals capable of innovating cutting-edge treatment strategies based on molecular oncology, while demonstrating adaptability, rational decision-making, and the ability to contribute on both societal and international levels.

Norikazu Masuda
Masahiro Kawashima
Nobuko Kawaguchi
Ayane Yamaguchi
Hanako Shimizu
Kei Ishii
Yukiko Fukui





Anesthesia

M.D., Ph.D. Professor
Moritoki Egi

Anesthesiology, as a field of whole body management, aims to protect patients from invasions such as surgery, infection, and trauma. The clinical activities of our department are broadly categorized into three areas: anesthesia for surgery, intensive care, and pain management. The ultimate goal is to elucidate the mechanisms of the body' s response to these invasions and develop systemic management and treatment methods that control excessive biological reactions to invasions.

Our department' s research focus is to elucidate and regulate the body's responses to various invasions and the underlying mechanisms. Currently, we are investigating a range of perioperative topics, including the effects of anesthetics on the muscles, the impact of perioperative factors—such as anesthetics—on platelet function and blood coagulation, and the molecular mechanisms by which opioid receptors produce ligand-specific, diverse signaling pathways.
Our department offers comprehensive education in anesthesiology, intensive care medicine, and pain management to undergraduate students through a combination of lectures and hands-on clinical practice. Graduate students actively engage in research under the mentorship of our faculty members. For post-graduate education, we provide specialized training for early-career residents and physicians aiming to become anesthesiology specialists. This program is designed to equip participants with the advanced knowledge and skills needed to become experts in these fields.

Clinical anesthesia in the operating theater
Using transesophageal echocardiography, staffs of the department of anesthesia evaluate cardiac function and perform anesthetic management. They also communicate with surgeons, nurses and clinical engineers in the operating theater to maintain whole body condition including hemodynamics, respiratory care.and metabolism.

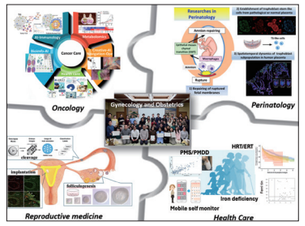
Moritoki Egi, Toshiyuki Mizota, Shinichi Kai, Shuji Kawamoto, Hideya Seo, Karin Kato, Satoshi Kimura, Kenichiro Tatsumi, Shino Matsukawa, Kazuya Hashimoto, Chikashi Takeda, Akiko Hirotsu, Atsuko Shiraki, Mariko Miyao, Eriko Kusudo, Kentaro Miyoshi, Ayumi Kobori, Jumpei Kohara, Issei Minamisako, Shuji Uda, Satoki Shimada, Akito Mizuno, Yuji Yoshida

Gynecology and Obstetrics

M.D., Ph.D. Professor
Masaki Mandai

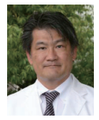
In our obstetrics and gynecology department, we manage both physiological and psychological problems throughout a woman' s life, including pregnancy and pelvic organ diseases. Obstetricians and gynecologists specialize in pathophysiology related to these areas. Our department provides training for residents, covering female pathophysiology as well as basic knowledge in primary care and emergency obstetric and gynecological care. Our research focuses on perinatology, gynecological oncology, and reproductive pathophysiology, addressing key issues in women's health.

Our department is organized into four clinical and research units: Oncology, Perinatology, Reproductive medicine, and Health care.
・Oncology unit: We specialize in minimally invasive surgery (laparoscopic and robotic) for gynecologic diseases. Our research utilizes omics analysis to explore new cancer healthcare tools, including dietary interventions and tumor immunosuppressive mechanisms with AI technologies.
・Perinatology unit: We study fetal membrane repair and iPS cell-based stem cell research from early pregnancy and full-term placenta.
・Reproductive medicine unit: We conduct immunotherapy for recurrent implantation failure, PGT-A, and onco-fertility treatments for children and AYAs patients. We investigate embryo implantation, oocyte development, and embryo culture optimization.
・Health care unit: We are developing self-care support apps and researching the factors that affect women's mental health, such as iron deficiency.



Masaki Mandai
Junzo Hamanishi
Ken Yamaguchi, Haruta Mogami, Yoshitsugu Chigusa
Miho Egawa、koji Yamanoi、Mana Taki、Ryusuke Murakami 、Asuka Okunomiya、Masumi Sunada、Rin Mizuno
Maya Komatsu、Yoshimi Kitawaki、Masahito Takakura、Yukiko Okada、Eriko Yausda、Tsutomu Ohara

Urology

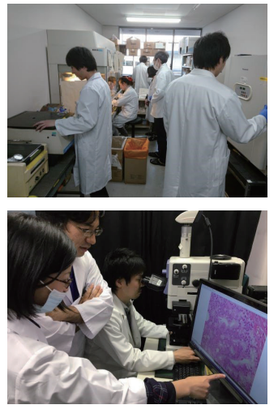


M.D., Ph.D. Professor
Takashi Kobayashi

The Department of Urology at Kyoto University has advanced treatments for malignant tumors, kidney transplantation, and minimally invasive therapies. By closely integrating clinical and research divisions, we balance translational research addressing clinical needs with fundamental life science exploration. Our primary goal is to cultivate "urology professionals," emphasizing the development of scientific and academic perspectives essential for surgeon-scientists.

Our department hosts approximately 15 graduate students who focus entirely on research with minimal clinical duties. Research topics include urological oncology, kidney transplantation, surgical techniques, and voiding physiology, utilizing advanced technologies, such as next-generation sequencing, cell analysis, mouse models, and computer science, to address clinical questions and molecular mechanisms.
We used abundant clinical specimens from patients to support our work, with notable achievements in patient-derived xenograft (PDX) research, establishing global leadership in this field. Despite these challenges, we foster creativity and share the joy of uncovering new discoveries, thus driving our daily efforts.

Takashi Kobayashi, Ryoichi Saito, Takayuki Goto, Kimihiko Masui, Yuki Kita, Takayuki Sumiyoshi, Kaoru Murakami, Kei Mizuno, Toru Sakatani



Scenes of Graduate School Research Life

Cardiovascular Surgery

M.D., Ph.D. Professor
Kenji Minatoya

Our department provides surgical treatment for a wide range of cardiovascular diseases in adults and children (congenital, aortic, ischemic, valvular disease, arrhythmia). We actively perform advanced surgical procedures and implement the latest treatments. Furthermore, we engage in exploratory medicine that aims to translate findings into clinical practice through collaboration with research institutions such as the Institute for Life and Medical Sciences, Center for iPS Cell Research and Application, and RIKEN.

■Research
We are conducting surgical research for cases where conventional surgery is not sufficiently effective. Our main ongoing projects include the development of treatment alternatives using iPS cell-derived myocardial sheets, experiments to suppress cardiopulmonary bypass side effects using a rat cardiopulmonary bypass model, research on microRNA suppression of neovascular proliferative lesions, and the development of decellularized vascular grafts. In addition, we are conducting registry research with Kyoto University related facilities.

Kenji Minatoya, Tadashi Ikeda,
Hidetoshi Masumoto, Takehiko Matsuo,
Takahide Takeda, Fumie Takai,
Masahide Kawatou, Kazuyoshi Kanno,
Hirokatsu Kira, Kazuhiro Takatoku

■Education
Our focus is to provide excellent education for medical students and young doctors, emphasizing the development of strong communication skills while offering young trainees ample opportunities to perform surgery. Additionally, regular questionnaire surveys are conducted to confirm the training content and achievement level of young doctors.

Our staff

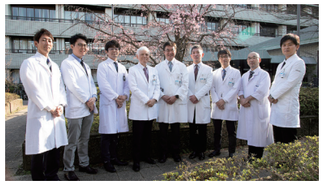
A: Five-layered iPS cell-derived cardiac tissue sheet transplantation experiment in a myocardial infarction pig model
B: Rat Cardiopulmonary bypass model

Thoracic Surgery

M.D., Ph.D. Professor
Hiroshi Date

The Department of Thoracic Surgery at Kyoto University was founded in 1941. Minimally invasive surgery has become standard approach for lung cancer. We have performed 368 lung transplants till August 2024. Thoracic surgeons trained in our department are practicing in affiliated hospitals, mainly in the western part of Japan. Our group performed over 9,000 cases of thoracic surgery, accounting for about 10% of all cases in Japan.

Our research covers a wide range of interests, including lung cancer, lung transplantation, and regenerative medicine. For lung cancer research, the EMT mechanism has been extensively studied in our laboratory. We have developed an RFID (radiofrequency identification) system that can be used to localize undetectable small lung nodules. We have developed the ET-Kyoto solution for lung preservation, which is now clinically used in various institutions. We are also conducting studies on lung transplantation using donors after cardiac death, employing an ex-vivo lung perfusion animal model. We were the first in the world to successfully perform an inverted lobar lung transplantation, ABO blood type incompatible transplant, and combined lung and liver transplant. The Department of Thoracic Surgery provides education and treatment for a full range of complex general thoracic problems, including diagnoses, examinations, and both surgical and non-surgical therapies.



Hiroshi Date, Toshi Menju, Daisuke Nakajima, Yojiro Yutaka

Plastic and Reconstructive Surgery

M.D., Ph.D. Professor
Naoki Morimoto

The Department of Plastic and Reconstructive Surgery of Kyoto University was the second plastic surgery department established in a national university in Japan in 1977. Our department treats congenital anomalies or reconstructs tissue defects or injuries, and improves the appearance and scars. We often collaborate with other departments and use state-of-the-art techniques ranging from highly difficult surgeries such as microsurgery, laser therapy, drug therapy, and regenerative treatment using cells.

Our department conducts research that is close to clinical practice, including research on the development of congenital anomalies in the maxillofacial region such as cleft lip and palate and microtia, microcirculation research on flaps used in reconstructive surgery, skin regeneration research including artificial and cultured skin, wound healing. In the field of skin regeneration, we are developing new materials in collaboration with basic research laboratories and industrial companies. For example, the artificial dermis that retains and releases cell growth factor, which we developed and conducted a physician-led clinical trial at Kyoto University Hospital in 2010, was approved as a new medical device in 2018. We are currently developing novel cultured skin, skin regeneration therapy for congenital giant pigmented nevi, and other therapies desired in clinical practice.

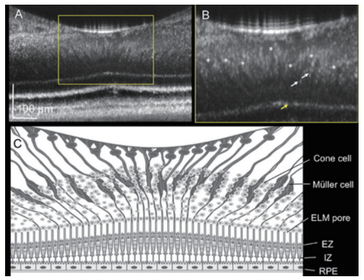
Naoki MORIMOTO
Yasuhiko TABATA
Susumu SAITO
Michiharu SAKAMOTO
Itaru TSUGE
Motoki KATSUBE
Hiroki YAMANAKA
Yasuhiro KATAYAMA
Eiichi SAWARAGI

Ophthalmology and Visual Sciences

M.D., Ph.D. Professor
Akitaka Tsujikawa

Our department studies the complex structure of the eye to understand ocular disease mechanisms and develop treatments. We prioritize merging clinical insights with advanced research, and welcome individuals eager to explore ophthalmic diseases more profoundly.

Our department explores all aspects of vision with the aim of preserving visual function through clinical and basic research. With a focus on chorioretinal diseases, we studied the mechanisms of conditions such as age-related macular degeneration and diabetic retinopathy, while advancing regenerative therapies using stem cells and gene therapy. Novel treatments for glaucoma and retinitis pigmentosa are key areas of research. By collaborating with industry, we developed next-generation fundus imaging devices, facilitating photoreceptor visualization and providing deeper insights into chorioretinal disease pathology. Globally recognized for its excellence, our work is frequently published in leading journals. We believe that rigorous research sharpens scientific thinking and clinical intuition, empowering clinicians to achieve breakthroughs. Many talented professionals have emerged from our department, contributing to cutting-edge ophthalmology and establishing a strong reputation in this field.



Foveal microstructure using adaptive optics technology.

Akitaka Tsujikawa, Sotaro Ooto, Tomoaki Murakami, Manabu Miyata, Yuki Muraoka, Masahiro Miyake, Masayuki Hata, Kenji Ishihara, Kenji Suda, Ayako Takahashi, Shogo Numa, Naoko Ueda, Shin Kadomoto, Eri Nakano, Yuki Mori, Kazuya Morino

Otolaryngology-Head and Neck Surgery

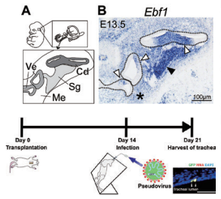
M.D., Ph.D. Professor
Koichi Omori

Otolaryngology–Head and Neck Surgery treats various disorders. Our research focuses onsensory organs (auditory, vestibular, olfactory, gustatory) and aero digestive organs(respiration, swallowing, speech), which are essential for communication and life functions.
We research sensorineural hearing loss treatments, including regenerating sensory cells and the eardrum, as well as inner ear drug delivery systems (DDS).
For laryngotrachealregeneration, we developed artificial trachea and conducted an investigator initiated clinicaltrial for practical application of artificial trachea. We also conduct airway regeneration using iPS cell-derived ciliary cells and chondrocytes.

■ Research Group for Inner Ear
Most of sensorineural hearing loss and equilibrium disorders are caused by damage to the inner ear, which never regenerates after birth. Our group aims to achieve functional regeneration of the inner ear by elucidating developmental and regenerative mechanisms 1)2), and to develop a novel therapy for the inner ear dysfunction. Hearing loss is known to affect brain functions related to communication. We are conducting various clinical studies, aiming to clarify the changes in brain function caused by hearing loss and to use these findings for trearment 3).

■ Research Group for Head and Neck
When the larynx or trachea sustains significant injury, it can cause functional impairments,leading to symptoms like hoarseness or difficulty breathing. We are developing treatments using tissue engineering, such as artificial tracheas, and researching the regeneration of epithelial and cartilage tissues in the trachea using human iPS cells 4)5). Our work also includes studies on SARS-CoV-2 airway infection and the development of AI-based voice analysis tools. We actively collaborate with other laboratories to generate new insights across different research areas.

Koichi Omori, Yo Kishimoto, Atsushi Suehiro,
Keigo Honda, Tsuyoshi Kojima, Koji Nishimura,
Kiyomi Hamaguchi, Hiroshi Yamazaki,
Yosuke Tona, Yoshitaka Kawai, Shintaro Fujimura,
Chiaki Suzuki, Mami Matsunaga, Shinji Kaba,
Ken Iwanaga, Yuji Kitada, Hiroe Ohnishi



Flg. 1.
The schematic (A) and ISH (B) of Ebf1 in the inner ear of E13.5 mice. Ebf1 is expressed in the sensory epithelium in both the cochlea (Co) and vestibule (Ve) (white arrowheads) , the spiral ganglion (Sg, black arrowhead) and surrounding mesenchymal tissues of the inner ear (Me, asterisk). (1, Kagoshima, J Neurosci, 2024).

Flg. 2.
Schematic of a study transplanting human iPS cell-derived airway epithelial cells into rats and infecting them with SARS-CoV-2 pseudovirus.

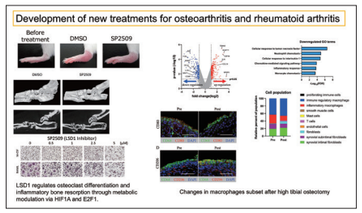
Orthopaedic Surgery

M.D., Ph.D. Professor
Shuichi Matsuda

Orthopaedic surgeons treat diseases and injuries of the musculo-skeletal system. Many experience knee, shoulder, or back pain in their lifetime, while fractures like femoral or vertebral are a leading cause of elderly immobility. Overcoming these disabilities enhances individual happiness and societal welfare. Our goal is to help everyone maintain unrestricted movement throughout life.

The Biomaterials group has developed various orthopaedic implants, including bioactive and antibacterial metal ones, some already used clinically. The Biomechanics group focuses on creating a new knee prosthesis through computer simulation and analyzing spine biomechanics. The Tumor group investigates molecular mechanisms behind bone and soft tissue tumors and their clinical applications. Regenerative therapy for musculoskeletal tissue is advancing in collaboration with the Center for iPS Cell Research, with a clinical trial for cartilage regeneration using iPS cell technology underway. The Cartilage Metabolism/Rheumatology group studies joint destruction in osteoarthritis and rheumatoid arthritis, aiming to develop new therapies with other departments. The Peripheral Nerve group works on nerve regeneration, including clinical use of nerve conduits made from autologous cells with 3D printing technology. Together, these groups drive innovation in orthopaedic and regenerative medicine.

Shuichi Matsuda, Bungo Otsuki,
Shinichi Kuriyama, Yutaka Kuroda, Kohei Nishitani
Toshiyuki Kawai, Takashi Noguchi, Takayoshi Shimizu, Yaichiro Okuzu, Takashi Sono,
Akio Sakamoto, Shinichiro Nakamura, Yugo Morita, Koichi Murata, Takayuki Fujii, Ryosuke Ikeguchi



Oral and Maxillofacial Surgery

D.D.S.,Ph.D. Professor
Makoto Hirota

Goal of this department is to study the morphology, function and pathology of the oral and maxillofacial region and develops human resources who can logically put theory into practice. We do practice regional medical care and conduct research to develop advanced medical care and devices to contribute research results to clinical oral surgery by using genetic analysis, bioengineering using biomaterials and CAD/CAM, AI technology, and epidemiological research.

We mainly conduct research on jaws. In jaw deformities, we conduct research on the control of endochondral ossification to maxillofacial morphology to elucidate the onset mechanism, and in clinical research we work on developing
accurate surgery using CAD/CAM. In research on osteonecrosis and osteomyelitis of the jaw, we conduct clinical research on onset and related factors and basic research using an analysis of oral microbiota in the patients with osteonecrosis of the jaw. In dental implant research, we apply ultraviolet irradiation to titanium surfaces to enhance adhesion to osteoblasts and bone integration. We are also conducting prospective cohort studies to identify genetic and environmental factors that are related to oral diseases and systemic diseases. Through these studies, we are also focusing on nurturing human resources who are familiar with medical safety and research ethics.

Makoto Hirota, Akihiko Yamaguchi,
Takuma Watanabe, Sayaka Mishima,
Shigeki Yamanaka, Atsue Yamazaki,
Shizuko Fukuhara, Marina Kashiwagi

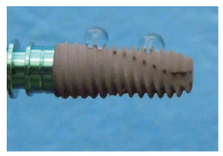


Figure 1
A freshly opened as-made dental implant. The gray part is embedded in the bone. The surface has been acid-etched to improve osseointegration. The surface is hydrophobic, so droplet forms when water is put on it.

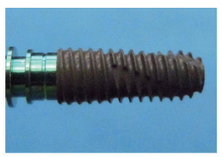


Figure 2
A dental implant treated with ultraviolet light. The implant has become superhydrophilic, so no droplet forms and the entire surface is wet. It is believed to have improved blood affinity, which promotes bone formation on the surface and osseointegration.

Neurology

M.D., Ph.D. Professor
Riki Matsumoto

Guided by our principle, "World Class Care and Research," we are dedicated to understand and protect the Brain to cure neurological disorders from the perspective of clinical neuroscience. We provide state-of-the-art medical care to patients with neurological diseases, investigate the pathophysiology of conditions such as Alzheimer's disease, cerebrovascular disorders, epilepsy, Parkinson' s disease, amyotrophic lateral sclerosis, and neuroimmune diseases, develop new treatments, and foster the next generation of leading neurologists.

Our department conducts world-class research through three key laboratories. The Neuropathology Lab investigates neurodegenerative diseases, dementia, and cerebrovascular disorders using autopsy brains, immunohistochemical and biochemical studies, animal models, and human anatomical and functional imaging techniques. The Clinical Neurophysiology Lab have been promoting a variety of cutting-edge systems neuroscience research by applying various analytical methods such as connectome analysis and machine learning to EEG and neuroimaging, aiming to uncover mechanisms of epilepsy, dementia, and movement disorders. The Molecular Neuroscience Lab explores neurodegenerative disease mechanisms and therapies, focusing on Alzheimer's, Parkinson's, and multiple system atrophy, emphasizing protein aggregation and cell-to-cell transmission as key pathological processes.
In education, our department is staffed by neurologists with deep expertise in neuroscience who provide both pre- and post-graduate clinical education for medical students and hands-on training for medical research students.

Riki Matsumoto
Akira Kuzuya, Takakuni Maki
Takashi Ayaki, Katsuya Kobayashi,
Etsuro Nakanishi, Sakiho Ueda

Kyoto University Neurology Retreat 2024

Neurosurgery

M.D., Ph.D. Professor
Yoshiki Arakawa

Neurosurgery focuses on diagnosing and treating disorders of the brain, spinal cord, and peripheral nerves. Our department emphasizes scientific clinical practices, innovative treatments, and evidence generation through high-quality clinical trials. Collaborative research initiatives enhance these efforts, aiming to develop neurosurgeons with advanced expertise. Through these scientific approaches, our goal is to cultivate neurosurgeons with advanced knowledge and skills in the fields of neurosurgery.

In clinical research, we contribute significantly to national studies, providing robust evidence. Basic research explores molecular mechanisms of neurological disorders, innovative immunotherapies for malignant brain tumors, and cutting-edge imaging technologies like 3/7-tesla MRI and magnetoencephalography (MEG). We also focus on intraoperative brain functional mapping and regenerative treatments for Parkinson's disease and brain ischemia using stem cell technologies.Our educational program prepares neurosurgeons with advanced skills and leadership qualities. Trainees gain hands-on clinical and laboratory experience, rapidly mastering microsurgery and endovascular techniques. Opportunities for specialized training in subspecialties like spine surgery, pediatric neurosurgery, and endovascular surgery are available at affiliated hospitals.

Yoshiki Arakawa
Takayuki Kikuchi, Chiaki Sakai, Yohei Mineharu,
Takeshi Funaki, Masakazu Okawa
Masahiro Tanji, Masahiro Sawada
Noritaka Sano, Hideo Chihara
Taichi Ikedo, Shigeki Takada, Etsuko Yamamoto

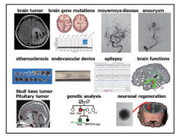


Figure 1.
The subjects of our projects

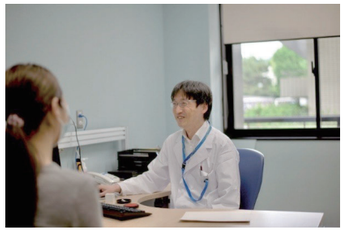
Figure 2.
Members of the department in 2024

Psychiatry

M.D., Professor
Toshiya Murai

Established in 1902, our department has played a central role in psychiatric clinical practice and research in Japan. Continuing our long tradition and flexible adoption of new research methods and clinical findings, we continue to strive to be the best clinical, educational, and research center in all aspects of psychiatry.

The elucidation of the pathophysiology of psychiatric disorders through the combination of neuroimaging techniques and cognitive psychological methods is a major focus of our department's research. Current research interests include schizophrenia, depression (especially the effects of therapeutic interventions), cognitive and behavioral disorders following brain injury (higher brain dysfunction), behavioral addictions (e.g., gambling), lifestyle and psychiatric syndromes, eating disorders (neural basis, treatment), and child/adolescent psychiatry. Research is conducted on core psychiatric issues, such as emotion and sociality, and on effective treatments from a variety of approaches.



Toshiya Murai
Hironobu Fujiwara, Taro Suwa, Manabu Kubota, Yujiro Yoshihara, Masanori Isobe,
Kosuke Tsurumi, Haruka Kozuki, Hiromichi Inaba, Hirotsugu Kawashima,
Yusuke Kyuragi, Senkei Ueno, Keima Tose

Medical Informatics

Ph.D. Professor
Tomohiro Kuroda

Medical informatics is an academic field that aims to acquire informational knowledge and develop information technology that supports the effectiveness and efficiency of medicine and healthcare, and to unravel healthcare, a human social activity, from the perspective of the generation, transmission, transformation, accumulation, and use of information. In the era of rapid technological advancements, we need individuals who identify real-world challenges and collaborate to shape the future of healthcare.

This department focuses on developing innovative medical information solutions through collaborative research with clinicians, medical researchers, and information scientists. Our goal is to create an information infrastructure, analyze clinical information from the real world, and realize practical information support. Their research encompasses various areas, including:

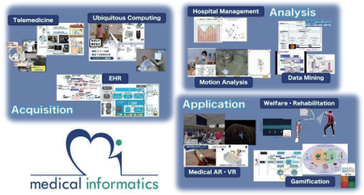
i) Developing information infrastructure and analyzing real-world clinical data.

ii) Utilizing AI, machine learning, IoT, and VR/AR/MR technologies for medical applications.

iii) Supporting clinical practice such as diagnosis, education, surgery, remote care, and hospital management analysis using information technology.

iv) Educating future leaders in medical information technology through graduate programs and international collaborations.

Our department aims to create a new model of medicine in the information age by addressing societal needs and fostering interdisciplinary collaboration.



Tomohiro Kuroda,
Yukiko Mori, Akira Yutani, Kazumasa Kishimoto, Kenichi Saitou, Keita Fukuyama, Eishun Sudo, Goshiro Yamamoto, Chang Liu, Masahiro Yakami, Ganta Kato, Hiroshi Tamura, Hiroaki Ueshima

Clinical Pharmacology and Therapeutics

Ph.D. Professor
Tomohiro Terada

Our laboratory aims to enhance pharmaceutical care by 1) promoting individualized and optimized drug therapy (Drug Fostering and Evolution), 2) identifying disease and adverse drug reaction mechanisms to develop new therapies (Drug Development), and 3) disseminating evidence on pharmacist services. Through "Reverse Translational Research (Fig.1)," we are convinced that the logical thinking and sense acquired through research will enable us to break new ground as clinical pharmacists.

[Research]
We are promoting the following clinical problem-solving research (Fig. 2).
1.Establishment of individualized pharmacotherapy for high-alert medication such as immunosuppressive drugs
2.Research on the effectiveness and safety of drugs using data science
3.Development of novel drug therapies for intractable diseases
4.Pharmaceutical research on inhalation drug delivery
5.Reverse translational research aiming for prevention and treatment of adverse drug events
6.Research on the optimal usage of pharmaceuticals and evaluation of pharmacist practices

Tomohiro Terada
Shunsaku Nakagawa, Daiki Hira, Yuki Shigetsura, Natsuki Imayoshi, Yurie Katsube, Keiko Ikuta, Yuki Kunitsu

We are conducting clinical research using medical record databases and devising patient-specific dosage design methods based on pharmacokinetic models.

[Education]
Graduate students of the Graduate School of Medicine and Graduate School of Pharmaceutical Sciences work on the above issues with doctors and pharmacists.
We look forward to those who want to pursue the science of "Pharmacotherapy" and create new evidence for pharmacists' work.

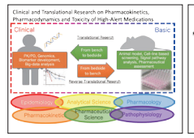


Figure 1.
Overviews of Research Activities in the Clinical Pharmacology and Therapeutics

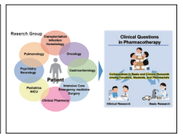


Figure 2.
Basic and Clinical Research to address Clinical Questions related to Pharmacotherapy

Patient Safety

M.D., Ph.D. Professor
Yumi Matsumura

The World Health Organization estimates that one in ten hospitalized patients suffers from medical harm. The Department of Patient Safety was established in June 2017 and is mainly engaged in the following research activities with the aim of minimizing preventable patient harm.

1. Countermeasures against human error
2. Improvement of an increasingly complex and sophisticated medical care delivery system
3. Promotion of communication between patients and medical professionals

1. Identification of rational and effective verification methods
① Comparison of the effectiveness of double checks and single checks regarding medication safety
In Ward 2 of our hospital, we discontinued double checks during preparation of injectable drugs, introduced single checks, and evaluated safety, except for some high-risk drugs. As a result, there was no change in the number of incident reports or severity when switching from double checks to single checks.

Yumi Matsumura
Takashi Yamamoto, Karin Kato, Mariko Morishita

2. Establishment of an effective management system to reduce adverse events caused by high-risk drugs and medical devices
・Frequency of fatal adverse events caused by symptoms specific to molecular targeted drugs and effectiveness of countermeasures

3. Medical accident investigation system
・The value of introducing an information disclosure system in the medical accident investigation system

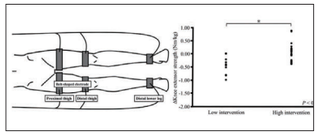
Rehabilitation Medicine

M.D., Ph.D. Professor
Ryosuke Ikeguchi

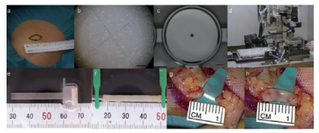
Rehabilitation enables patients with physical disabilities to lead meaningful lives once again, both physically and mentally. While modern medicine is highly specialized in treating specific organs with a high level of expertise, rehabilitation medicine takes a holistic approach. It uses medical tools to diagnose and evaluate dysfunctions in the nervous, muscular, and skeletal systems caused by various diseases, providing treatment to help patients achieve a better quality of life.

The Department of Rehabilitation Medicine treats a wide variety of diseases and is one of the hospital' s busiest departments in terms of patient volume. We verify and report the effectiveness of rehabilitation for many conditions using extensive data. For cerebrovascular disease, we have demonstrated the usefulness of walking training with the robot suit HAL. In the context of musculoskeletal diseases, we have reported on the evaluation of skeletal muscle computed tomography**1** images in relation to physical function. In cancer rehabilitation, we have identified prognostic factors for patients with bone metastases based on their activities of daily living at the time of hospitalization. In basic science, we have investigated peripheral nerve regeneration using a Bio 3D printer and conducted an investigator-initiated clinical trial**2**.

Ryosuke Ikeguchi
Naoya Tanabe
Tomoki Aoyama



Effect of belt electrode skeletal muscle electrical stimulation during early hematopoietic post-transplantation



Bio 3D nerve conduit manufacturing and transplantation

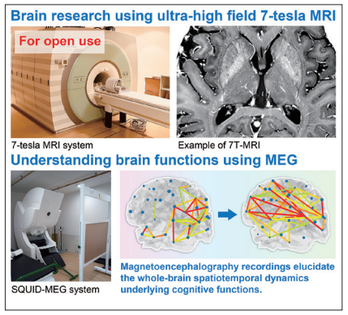
Human Brain Research

M.D., Ph.D. Director
Takashi Hanakawa

The Human Brain Research Center (HBRC) investigates the structures, functions, neurotransmitters, and mechanisms of recovery of the human brain using cutting-edge, noninvasive brain imaging and stimulation techniques. A human 7 Tesla MRI system—one of fewer than 140 worldwide (only 6 in Japan)—has been installed here, envisioning clinical application. We combine brain stimulation and rehabilitation tasks to enhance brain plasticity and improve recovery efficiency.

The human brain is the most developed and complicated intelligence system that nature has made. Considering its complexity, brain research should comprehensively measure dynamic neural networking activities rather than being limited to a reductionistic, hierarchical perspective. Put differently, we aim to understand the brain as an integrated system and advance clinical medicine and patient care. While modern neuroscience has advanced in animal studies of genes, cells, and tissues, translation into improved medical care for neurological and psychiatric disorders remains limited. We use 7-T MRI, magnetoencephalography (MEG), and high-resolution EEG for evaluation of essential brain functions and their alterations, and transcranial magnetic stimulation (TMS) and direct current stimulation (tDCS) for functional recovery. We offer a comprehensive graduate program by collaborating with various medical departments related to brain diseases, both within and outside the university.

Takashi Hanakawa
Naoya Oishi
Madoka Matsumoto
Ryuta Aoki
Dinh Ha Duy Thuy
Shin-ichi Urayama



Biomedical Statistics and Bioinformatics

Ph.D. Professor
Satoshi Morita

Current efforts of our department include taking advantage of huge and intricate information of biomarkers for predicting treatment effects. In response to this move, we are diving in new researches that synthesize biomedical-statistics and bioinformatics. Our primary goal is supporting the development of new individualized therapies. In addition, we aim to provide medical researchers with a research environment for multi-purpose, multi-faceted information analysis using a comprehensive database consisting of data from basic research to clinical trials.

Our research interests are on study designs and data analysis of early to late phase clinical trials. In biomedical statistics, we are mainly focusing on developing new Bayesian approaches. In bioinformatics, we aim to propose novel statistical methods to develop effect prediction models, that is, we are performing collaborative research projects to find useful markers to predict the treatment effect. Furthermore, we are also interested in patient-reported outcome researches, e.g., quality of life assessment of cancer patients. Our department is supporting PhD and Master students who are willing to work on these research themes.

Satoshi Morita
Harue Tada
You Hidaka
Kentaro Ueno, Aki Kubota
Tomohide Iwao, Zixuan Yao
Yumiko Ibi

Early Clinical Development

M.D., Ph.D. Professor
Takako Eguchi Nakajima

Established in April 2020 within Ki-CONNECT, the Department of Early Clinical Development serves as a bridge between preclinical research and early clinical trials through translational research and Phase 0/1 trials.
The department provides training in early clinical development, focusing on clinical trials targeting cancer, rare diseases, and healthy volunteers, including iPS cell transplantation.
This program offers hands-on experience to cultivate expertise in early-stage medical innovations.

The Department of Early Clinical Development consists of physicians with extensive experience in planning and conducting translational research and early clinical trials, including investigator-initiated studies.
In collaboration with internal researchers, iACT, KUMBLE, and iCAP, the department supports research focused on clinical development while independently conducting translational studies and early clinical trials.
Additionally, it provides education aimed at training physicians capable of leading global early clinical development through practical experience in research design and clinical practice.
Clinically, the department delivers comprehensive care for various diseases, with a particular emphasis on cancer and intractable diseases.

Takako Nakajima
Takeshi Sawada
Yutaka Shimazu
Shojiro Inano
Chiaki Suzuki
Ayako Yokomizo

It also plays a pivotal role in training physicians to manage unforeseen adverse events in first-in-human trials.
By engaging patients and healthy volunteers in innovative clinical trials, the department strives to contribute to the advancement of medicine.
The department welcomes both new graduates and experienced professionals from clinical and research fields, encouraging inquiries via email or phone.

Ki-CONNECT Grand opening in Apr 2020

Department of Early Clinical Development

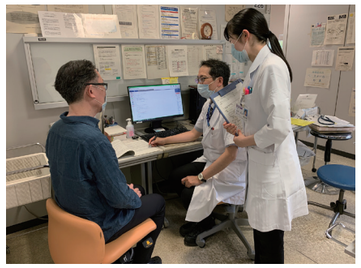
Clinical Research Facilitation

M.D., Ph.D. Professor
Yoji Nagai

It is the clinical research that moves the basic research achievements to new medical technologies, where academia’ s commitment is increasingly expected. Also, clinical researches are indispensable for the optimization of current medical technologies, which may be realized through scientifically and ethically righteous methods. Thus, this department was started in 2021, to facilitate clinical researches that lead to improved therapeutic outcomes, based on the principle of clinical science. Thus, to work with us, proactive younger minds are required, to pursue the realization of next-generation medical technologies.

Clinical researches play a crucial role for the development of future medicine and optimization of current medicine. Indeed, no matter how good ideas are born in the clinic, they do not lead to the therapeutic improvements, unless they are substantiated by clinical researches. Particularly, researches with interventions are the human projects supported by the dedication of patients, the prerequisite of which is human right protection. Also, because the results are directly reflected in medicine, clinical researches must not be harmful both to the current and future patients, which are ensured by the scientific validity and data credibility. Inversely, unreliable or fake results will mislead people, posing serious threats to the public welfare. Then, each research must be implemented through scientifically and ethically righteous methodologies, requiring interdisciplinary approaches based on the principle of clinical science. Thus, we are dedicated to the cultivation of scientific principles underpinning the processes, as well as to the facilitation of individual clinical researches.

Takao Kato, Kaori Ikeda, Yasuko Kimura



Advancing Translational Science

M.D., Ph.D. Professor
Sumimasa Nagai

Department for Advancing Translational Science is constituted of staff members of Department of Medical Development, Institute for Advancement of Clinical and Translational Science (iACT), Kyoto University Hospital. We collaborate with internal departments and external institutions to support researchers developing drugs, medical devices, diagnostics, and regenerative medical products. We comprehensively support researchers by planning development strategy and managing patents, technology transfer, and regulatory affairs.

Our research field in Graduate School of Medicine is unique in terms of specialty in translational science.
We define translational science as research activity whose goal is to translate results of basic research into clinical application as drugs, medical devices, in vitro diagnostics, or regenerative medical products.
In Japan, there are few experts who can understand the value of basic research, unmet medical needs, and regulatory affairs and who can sufficiently support researchers.

Sumimasa Nagai
Hiroyuki Nakahira
Ryo Nishino
Kayo Hattori
Mika Ushimaru, Erika Yamamoto, Kumiko Tatsumi

We provide on-the-job training, seminars, and lectures to produce many experts who can promote and support innovative translational science.
Regulatory science plays an important role in development of new medical products as well as the advancement of patient safety.
We conduct regulatory science research to propose better pharmaceutical regulations that can promote translational science adequately.

Healthcare Epidemiology

M.D., Ph.D. Professor
Yosuke Yamamoto

We have conducted clinical epidemiology research to solve various questions related to medical care and health issues (e.g., clinical questions that medical professionals have in the practice). Especially we have focused on research using patient-reported outcomes (PRO), including quality of life (QOL). We have extensive experience in developing and validating health-related QOL scales / PRO assessment tools.

1. Research area
We have consistently conducted clinical epidemiology research based on QOL. Especially, we investigated how to measure QOL more easily and with less burden for responders.
• Research to measure patient QOL and PRO and utilize it in medical care
• Research on development and validation of clinical prediction models
• Research to describe the actual practice of diseases and medical care
• Research to elucidate the relationship between factors (including QOL) and outcomes: including real-world database research

Yosuke Yamamoto
Yusuke Ogawa
Yoshie Yamada
Takahiro Itaya

2.Education
The courses currently provided by Department of Healthcare Epidemiology in graduate school education are as follows.
• Epidemiology II
• QOL・PRO assessment
• Special seminar on Study design 1/2
• Special seminar on data analysis
• Systematic Reviews

Pharmacoepidemiology

M.D., Ph.D. Professor
Koji Kawakami

We perform clinical epidemiology and pharmacoepidemiology studies in all clinical areas utilizing various large scale Japanese-based medical or health checkup databases. We conduct clinical research by turning various questions in medical practice (clinical questions) into researchable designs (research questions). The purpose of research projects is to identify the outcomes and safety of drug, surgery, medical device, and therapeutic regimen.

Under the mentorship of our faculty members who are well versed in clinical epidemiology and biostatistics, graduate students conduct clinical research to solve clinical questions using various real-world medical data, and epidemiological research using school health checkup data provided by the local municipalities. We build and utilize the databases (DB): electronic medical record DB (14 million patients), school health checkup data (124 municipalities). And we also utilize the databases: medical claims receipt DB (20 million patients), Diagnosis Procedure Combination (DPC) (38 million patients), and so on. Our lab members, graduate students and faculty members, include professionals from a broad range of medical and health-related fields, including various specialties of medicine, nursing, and pharmacy. They are composed of MD (70%), pharmacists (20%), and statisticians and other professionals (10%). Our laboratory has produced 9 professors, 2 associate professors, and many leaders including a director of large hospitals and of national centers.

Koji Kawakami, Yoko Nakao, Toshiki Fukasawa, Megumi Yuno, Kayoko Mizuno, Atsushi Takayama, Takanori Yanai, Shiho Koizumi

Pharmacoepidemiology laboratory orientation (April 2024)

(Left figure) Local municipalities participated in the school health check-up analyses program
(Right figure) Medical institutions participated in the electronic medical record analyses program

Genomic Epidemiology

Ph.D. Professor
Fumihiko Matsuda

We conduct multi-omics studies of multigenetic disorders using genome, proteome and metabolome analysis technologies to elucidate their pathology and develop treatments. We aim to construct an integrative database of such information with detailed patients' clinical information to enable the prediction, diagnosis, and best possible treatment and preventative intervention for each patient. Examples of diseases include multigenetic rare diseases, such as pulmonary hypertension, pulmonary fibrosis, IgG4-related disease, primary sclerosing cholangitis (PSC), and HTLV-1-associated myelopathy (HSM/TSP), caused by HTLV-1 infection. We also promote the Nagahama Study, Japan's first large-scale community-based genome cohort project. We are conducting prospective analyses of aging and age-related conditions using statistical genetics pipelines developed in-house to interpret the results.
The center has been actively engaged in research collaborations with overseas institutions. We established the International Joint Ph.D. Program in Genomic Medicine with McGill University in Canada, an educational program to foster world-leading life data scientists in genomic medicine. We also have a long-standing cooperation with Institut Pasteur, a world-leading institute in infectious diseases. We serve as a counterpart laboratory at Kyoto University for Institut Pasteur du Japan, established in June 2024.

Fumihiko Matsuda

Master program for Clinical Research (MCR) Course

The Master Program for Clinical Research (MCR) is a one-year special program for clinical physicians belonging to the Kyoto University (KU) Graduate School of Medicine. The MCR is the first-fledged educational program in Japan, enabling physicians to learn the basics of clinical research and various methods, carry out their research, and publish articles. We welcome over two years of experienced physicians and dentists with Japanese medical licenses.

The MCR curriculum requires the completion of 30 credits within one year. The program is designed to enable students to systematically learn the fundamentals of clinical research (theory, knowledge, methods, practical skills). It also emphasizes learning practical skills such as formulating plans, conducting research, and analyzing data. Students are required to attend classes for one year and can choose several KU School of Public Health (SPH) lectures in addition to the MCR core curriculum. Moreover, students who have completed equivalent courses before enrollment may be exempt from certain classes, with the possibility of transferring up to half of the required credits.

Koji Kawakami, Takeo Nakayama ,
Yuichi Imanaka,
Naoki Kondo , Taku Iwami ,
Yosuke Yamamoto

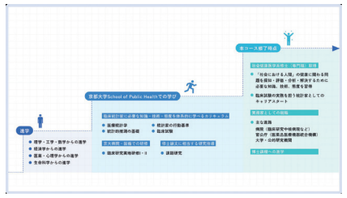
Clinical Biostatistics Course

M.D., Ph.D. Professor
Shiro Tanaka

Clinical Biostatistics Course is a course on biostatistics conducted by Department of Clinical Biostatistics and Department of Biostatistics. This course is intended for graduates from any fields, i.e. mathematics, physics, economics, life science and medicine. Medical knowledge is not a prerequisite.

Clinical Biostatistics Course is a two-year Professional Degree Course (=master course) established in Kyoto University School of Public health (SPH). Master of Public Health (MPH [professional degree]) will be awarded in completing the course. This course provides students with, not only mandatory subjects such as basic statistics and clinical biostatistics classes, but also on-the-job training at Kyoto University Hospital and National Cerebral and Cardiovascular Center which gives students opportunities to experience the practice of academic clinical trials. This course is funded by the Japan Agency for Medical Research and Development (AMED).

Shiro Tanaka, Takashi Omori, Yumi Takagi



Healthcare Economics and Quality Management ／ Health Security System

M.D., Dr.Med.Sc., M.P.H.,
Ph.D. Professor
Yuichi Imanaka

Our mission is to improve the quality-efficiency-equity and the resilience of health and healthcare systems, by means of research, development, education and relevant professional activities. To solve problems and create values in health, healthcare systems and communities in this super-ageing and depopulating society and in the world, we fully interact with practice and policy fields and innovatively apply multi- and inter-disciplinary solutions utilizing quantitative and qualitative sciences and technologies.

■Research & Development
To produce academic research outputs contributing to health systems improvement through establishing more productive work systems and more effective collaborative networks; To develop "soft technologies" to be actually and effectively implemented in the health policies and systems - Examples: healthcare Big Data analytics and visualization, performance assessment and improvement, policy and economic evaluations, development of systems for quality/efficiency assessment, human resource development systems, etc.

■Capacity Building
We nurture and produce highly professional leaders in this emerging field of healthcare quality, economics, and crisis management & policy. We emphasize the interaction of research with health systems and policies and development/implementation for the real-world application. Project-based activities are included which develop effectively the skills, capacities and competencies for one's highly professional career.

Yuichi Imanaka
Noriko Sasaki
Susumu Kunisawa
Daisuke Takada
Etsu Goto

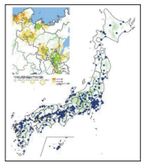


Fig.1
We assess and contribute to the national and local policies through development and analysis of the national, the regional and clinical databases integrating health, health care, long-term care, socioeconomics.

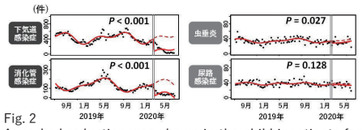


Fig. 2
A marked reduction was shown in the child inpatients for non-COVID-19 acute infections in the early pandemic, school-closure period (March - June 2020) in Japan, particularly in respiratory and gastrointestinal infection groups.

Healthcare Ethics

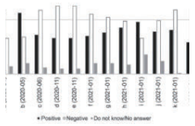
M.P.H, Ph.D., Professor
Yusuke Inoue

Our department engages in research and education at the intersection of healthcare, research and development, and public health. We welcome passionate individuals interested in exploring medical decision-making, bioethical issues, and healthcare policy development to create positive societal change.

In today's landscape, ethics has emerged as a crucial (and challenging!) consideration across multiple domains - from clinical practice to research settings, public communication, and policy-making. This extends to corporate activities and industry-academia partnerships, where ethical considerations continue to gain importance. Our approach is interdisciplinary, grounded in humanities and social sciences, focusing on empirical understanding of ethical challenges.
Our key research areas encompass:
1. Ethics of medical science and advanced medical care
2. Public health and epidemiological ethics
3. Medical data and human tissue management ethics
4. Evolution of healthcare ethics and systems
Our educational program includes core courses in medical ethics, specialized lectures, and university-wide open courses. We serve both ethics researchers and healthcare professionals, providing specialized research training while maintaining strong industry collaborations for practical ethics education.

Yusuke Inoue
Atsushi Kogetsu
Kazuo Hayashi

Developing and writing educational materials on medical and research ethics



Punitive sentiments towards COVID-19 rule-breakers during the pandemic

Medical Genetics

We conduct research on issues related to genetic medicine, medical genetics, and genetic counseling. Our work includes studies on hereditary diseases, genetic education to enhance literacy, and ethical challenges in prenatal and preimplantation genetic testing. We also train professionals through the Genetic Counselor Course and collaborate with the Clinical Genetics Unit at the Kyoto University Hospital, where we play a key role in clinical and educational research activities.

Our research addresses issues in genetic medicine, genetic counseling, and hereditary diseases. We conduct studies on the effects of genetic diagnoses and tests on patients and families, aiming to enhance the quality of genetic counseling and genetic medical services. To enhance genetic literacy, we provide lectures, experiments, and workshops for students and the public, supported by related research. Additionally, we investigate current practices and ethical issues in prenatal and preimplantation genetic testing. Alongside research, we actively train professionals through the Genetic Counselor Course, offering foundational lectures, role-play exercises, counseling practicums, and research supervision in collaboration with Clinical Genetics Unit, Kyoto University Hospital. These efforts aim to address societal challenges, advance professional training, and improve understanding in genetic medicine and counseling.

Masanobu Ogawa
Hidenori Kawasaki
Masako Torishima
Akiko Yoshida

Health Informatics

M.D., Ph.D. Professor
Takeo Nakayama

Information is defined as "something that reduces uncertainty in decision-making". This field focuses on utilizing information to solve health and medical care challenges, transcending traditional boundaries. We conduct research and education in Evidence-based Healthcare, information literacy, e-health, health communication, and information ethics. Our goal is to develop a favorable environment through the creation, communication, and use of information.

Research
Engaging in diverse research focused on creating, communicating, and using information and evidence. Activities include epidemiological and clinical trials research, upholding information ethics like informed consent and data protection, and evaluating academic information. Efforts in communication encompass systematic reviews, clinical guidelines, building databases, and developing decision support tools. Additionally, the research promotes the use of health and medical information literacy in shared decision-making. Engaging in diverse research from the perspectives of creating, communicating, and using information and evidence. This includes conducting epidemiological research including clinical trials, information ethics such as informed consent and personal data protection, and academic information evaluation; communicating through systematic reviews, clinical practice guidelines, database construction, and developing decision support tools; and using health and medical information literacy and research in shared decision-making.

Takeo Nakayama, Yoshitaka Nishikawa,
Ayako Kohno, Mayumi Toyama

Education
1.Epidemiology I
2. Literature Search
3. Critical Appraisal
4.Health Informatics I
5. Health Informatics II
6. Special Topics in EBM and Clinical Practice Guidelines
7. Advancement in Health Science Research
8. Health Design Theory and Practice
9. Introduction to Qualitative Research
10. Risk Communication in Public Health Emergencies

With freshpeople, April 2024.

The 30th Annual Scientific Meeting of the Japan Epidemiological Association

Medical Communication

The main scope of the Department of Medical Communication, which has started at Kyoto University since 2008, is "Bridging Medicine and Society through Communication." Medical communication covers doctor-patient communication, but it has a bloader perspective. We welcome not only medical students, but also students who are interested in sociology, communication studies, and disability studies.

■Education: The following three classes are offered. 1. Introduction to Medical Communication. 2. Medical Sociology 3. Advanced Qualitative Research methods.

■Research: The faculty member (Iwakuma) is interested in the following themes:
1) Quantitative text analysis
2) Research on peer support and social support
3) Research on health communication
・Employment of cancer survivors
・Working hours of working physicians and gender awareness
・Interprofessional collaboration and medical safety
4) Research on minorities and people with disabilities
・Epidemiological studies on people with spinal cord injuries
・Aging of people with disabilities
5) Research using Mixed Research Methods This is a research method that combines qualitative and quantitative research, multiplies the strengths of different research methods, and compensates for their weaknesses, thereby providing a more multifaceted view of complex health communication phenomena.

Miho Iwakuma

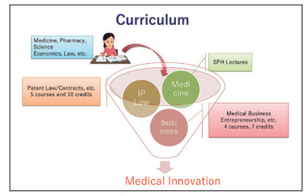
Management of Technology and Intellectual Property

Ph.D. Professor
Chikako Saotome

The creation of innovative medicines and medical devices originated in Japan is demanded to improve Japanese economic competitiveness and human health. The transfer of universities' basic research results to businesses is important for realizing medical innovation. We are pioneers in the management of technology in life science in Japan and aim to foster managers of intellectual property and entrepreneurs to promote technology transfer.

Knowledge of medical science, intellectual property law, and business in life sciences is required for the discovery, management, and application of intellectual property. Lectures on medical science were provided by the Kyoto University Medical School. The department provides students with basic knowledge and practices regarding intellectual property laws, especially patent laws. We also give lectures on the life sciences industry, such as technology management and entrepreneurship. Our research themes in the second semester are the management of technology and intellectual property in life sciences. Thus far, we have researched technology transfer, such as collaborative research. We also research the intellectual property of medicine, medical devices, regenerative medicine, and life science businesses, such as biotech companies.

Chikako Saotome, Yutaka Teranishi, Hiroshi Suzuki,
Yurie Nakaya, Taro Yamaguchi



Curriculum in the Department of Management of Technology and Intellectual Property

Group photo at the 20th anniversary

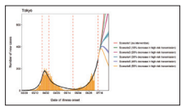
Health and Environmental Sciences

M.D., Ph.D. Professor
Hiroshi Nishiura

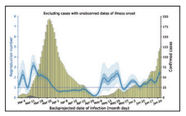
Among many disciplines of hygiene, we excel into infectious diseases. The team is a mixture of the variety of people with different backgrounds and also a mixture of different nationalities. Physicians, veterinarians, public health experts and other medical experts are mixed with mathematicians, statisticians, biologists, informaticians, politicians and those from other disciplines. They sometimes use completely different languages, but we enjoy that type of chaotic daily life.

Our lab excels into mathematical modeling of infectious diseases, especially statistical analysis of empirically observed data. More specifically, our research subjects are enumerated in the following. (1) Real time analysis and forecasting of emerging and re-emerging infectious disease epidemics, (2) Statistical estimation of incidence and prevalence, (3) Inference of diagnostic coverage, (4) Epidemiological studies of vaccine preventable diseases, (5) Modeling studies of interface between humans and environment: human-animal interface, zoonosis and environmental exposure, (6) Quantification of the natural history: transmission potential, case fatality risk, incubation period, generation time and their determinants, (7) Development of novel likelihood and new methodologies. We also work on the analysis of human demographic data and epidemiology/inference of non-communicable diseases. Regardless of mathematical techniques, we aim to achieve modeling studies that can answer pressing scientific or policy-relevant questions.

Hiroshi Nishiura
Kouji Harada, Yuta Okada,
Tetsuro Kobayashi, Katsuma Hayashi



Epidemiological projections of novel coronavirus infection (COVID-19) in Tokyo, 2020. Orange bars represent observed epidemic curve with known date of illness onset, and black curve shows the fitted model. Depending on different levels of intervention, resulting trajectories would vary.



Estimated effective reproduction number of novel coronavirus infection (COVID-19) in Tokyo, 2020. Yellow bars show non-parametrically back-projected date of infections. Blue line and shades show the posterior median and 95% credible intervals of the effective reproduction number, showing how many secondary cases on average were produced by a single primary case on each day.

Health Promotion and Human Behavior

Professor Toshiaki Furukawa retired in March 2024, and a new chair has not yet been appointed. As a result, new student admissions are currently on hold. Updates will be announced once admissions resume. We welcome those interested in generating evidence for clinical challenges, learning clinical research methodology, or applying EBM in practice.

Our research integrates Clinical Epidemiology (EBM) and Cognitive Behavioral Therapy (CBT) to modify health-related behaviors and cognition through evidence-based approaches.

・Clinical Epidemiology & Meta-Epidemiology
We conduct research on RCTs, meta-analysis, and meta-epidemiology, including publication/reporting bias and abstract spin effects on clinicians. Additional studies focus on diagnostic research, such as high-sensitivity troponin for acute coronary syndrome, and bridging evidence with clinical practice.

・Cognitive Behavioral Therapy (CBT) Research
We develop digital CBT using a smartphone, studying its effects on depression, resilience, and mental well-being. Additionally, we apply CBT to physical illnesses, such as breast cancer, atopic dermatitis, and irritable bowel syndrome.
Our goal is to advance evidence-based medicine and psychotherapy, improving clinical outcomes and public health.

Aran Tajika
Rie Toyomoto

Preventive Services

M.D., Ph.D. Professor
Taku Iwami

The Department of Preventive services aim to resolve "practical clinical questions" across all stages of disease, from health promotion to emergency resuscitation for cardiac arrest, generating evidence that directly impacts clinical practices. We emphasize collaborative learning and research without hierarchical distinctions between faculty and students, striving to approach truth through proper methodologies. We welcome those who value clinical perspectives and wish to engage in research addressing challenges in clinical settings.

Research Policies:
・Faculty and students collaborate equally with sincerity in academic endeavors.
・Emphasis on the "field," ensuring evidence is both derived from and returned to real-world settings.
・Collaboration across professions and domains, prioritizing teamwork.
Educational Policies:
Students experience in all stages of clinical research, from planning to publication, supported by intensive faculty mentoring and weekly conferences. Additionally, initiatives to communicate research outcomes to society are encouraged and supported.
Key Research Areas:
・Studies on health promotion and preventive medicine.
・Addressing clinical questions related to diseases.
・Research on emergency care and resuscitation.
Representative studies include evaluating the nationwide impact of AED dissemination, advocating for compression-only CPR, assessing the effectiveness of verbal guidance in CPR, comparing traditional and herbal remedies for colds, and verifying the effectiveness of residential health programs using propensity score matching. The division actively contributes to public health education, clinical researcher training (MCR program), and implementation science in collaboration with Public Health Implementation Studies.

Taku Iwami, Yukiko Tateyama, Norihiro Nishioka, Yohei Okada, Masato Namba

We conducted a population-based cohort study of out-of-hospital cardiac arrests in Osaka, Japan and demonstrated the effectiveness of chest compression-only CPR (CCCPR). Circulation. 2007;116:2900-2907.

The poster of randomized controlled trial to compare the effectiveness of Kakkonto, a Japanese herbal medicine, to a western-style medicine among common cold patients. Intern Med. 2014;53:949-56.

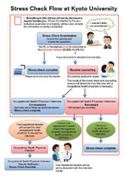
Occupational Medicine

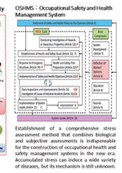
M.D., Ph.D. Professor
Yu Sakagami

Occupational medicine has played a significant role alongside the nation and society during periods of transformation. The term “Kosei：welfare” originates from the “Shisyo Gokyo” , signifying a state where people can lead healthy and fulfilling lives. In this field, we seek individuals who aspire to become specialists in occupational medicine in the future, those interested in researching the balance between treatment and work as a sub-specialty, and those aiming to conduct comprehensive studies on mental and physical stress.

All faculty members in this field are active occupational physicians and health management professionals at Kyoto University, working daily on the frontlines of occupational medicine. Leveraging the advantages of this dynamic field, education and research in occupational and environmental health are actively pursued. For example, during revisions to laws related to occupational health, all members can attend real-time lectures and seminars on the changes. Additionally, occupational medicine training sessions are held throughout the year, offering participants the opportunity to deeply study the latest developments and hot topics in the field. We promote research themes that contribute to the enhancement of health and welfare. These include social medical studies aimed at supporting the balance between treatment and employment, comprehensive research on preventing heatstroke in response to global warming, and the development of occupational safety and health management systems based on stress and anti-fatigue medicine. Occupational Medicine is recommended for those who wish to take on leadership roles as occupational physicians or health management professionals, those who want to add occupational medicine as a sub-specialty to their field of expertise, and those aiming to pursue comprehensive stress research that could lead to policy implementation.

Yu Sakagami
Satoe Okabayashi, Koji Kitagori





Establishment of a comprehensive stress assessment method that combines biological and subjective assessments is indispensable for the construction of occupational health and safety management systems in the new era. Accumulated stress can induce a wide variety of diseases, but its mechanism is still unknown.

Social Epidemiology

M.D., Ph.D. Professor
Naoki Kondo

Health is influenced by social factors like income, occupation, and connections with others, as well as the broader environment. Social epidemiology studies social determinants of health (SDH) and health disparities, collaborating with disciplines such as sociology, economics, and policy studies. It aims to develop and implement services that create a society where everyone can achieve health naturally, ultimately enhancing well-being.

In 2024, the Department of Social Impact Assessment was established to strengthen implementation research.
Key Research Projects
1.Japan Gerontological Evaluation Study (JAGES):
A study on older adults’ SDH, involving approximately two hundred thousand participants from 70 Japanese municipalities and two overseas countries.
2.Social and Cultural Prescribing Research:
Developing mechanisms for inclusive communities addressing isolation and poverty, with initiatives like the JST-RISTEX “Hybrid Care Network” and the “Art Communication Co-Creation Hub,” implemented in fields such as Yabu City, Hyogo Prefecture.
3.Behavioral Science-Based Services for Health Improvement:
Examples include workplace health initiatives like “Health Check Championships” (developed with the Hakuhodo DY Holdings).
4.Precision Public Health:
Creating data systems to propose tailored measures using diverse datasets based on individuals’ and socio-environmental attributes.
Education:
Courses offered include “Social Epidemiology,” “Research Methods in Social Epidemiology,” and “Public Health Strategies.”

Naoki Kondo
Kosuke Inoue, Daisuke Takagi,
Daisuke Nishioka,
Maho Haseda,
Yukiko Honda, Haruna Kawachi,
Nana Ishimura

Environmental Ecology

D.V.M., Ph.D. Professor
Wataru Yamazaki

Pathogenic microorganisms, which exist in various forms in the environment, including those that exist in animals, cause infectious diseases, the spread of these diseases also has significant societal impacts, leading to various transformations. Much remains unknown about how these pathogens arise in the environment. Our research employs an ecological approach to analyze the relationships between individual pathogens and the various factors associated with the diseases they cause.

Among the many environmental pathogens, those carried by animals pose particularly critical risks to human health. Humans domesticated wild cattle around 10,000 years ago, reaping benefits such as high-quality animal protein and reduced labor. However, cattle serve as healthy carriers of enterohemorrhagic Escherichia coli O157, which can harm human health through beef consumption. Currently, we collaborate with researchers in Asia, Africa, and Europe to focus on human gastrointestinal infections and zoonotic diseases. Our work aims to develop reliable testing methods that meet international standards and apply them to epidemiological research. Through this, we strive to elucidate the environmental ecology of various pathogens, control infectious diseases, and ensure food safety. Additionally, we approach the societal and historical impacts of infectious diseases through interdisciplinary research.

Wataru Yamazaki
Center for Southeast Asian Studies

Fieldwork in Tanzania

Field Medicine

Field medicine is a field of research that tries to reconsider the nature of disease and ageing in relation to the natural environment and cultural background. The aim of this course is to contribute to people's health and world peace by examining health, disease and living conditions in different natural ecological environments, histories, cultures and social backgrounds by exploring how health can be rooted in the places where people live.

Our team has explored the nature of healthcare for elderly people living in the community, based in Kochi Prefecture, Japan, and Bhutan. In Bhutan, health check-ups for the elderly are now being conducted throughout the country as a national project. Legionnaires' disease has also been the subject of comprehensive research, beginning with case reports and including subsequent epidemiological studies, environmental studies, the relationship with global warming and historical considerations. When considering the causes of the illness of the patient in front of us and measures for prevention and treatment, there are many factors behind the illness, and solutions are often not possible if we remain within the framework of medical science. In this course, while attending to the suffering of people in the field, the questions that come up from within are given importance, and these questions are pursued.

Ryota Sakamoto

Environmental Health Nursing

Frontier Nursing Sciences

RN., Ph.D. Professor

Tomoko Wakamura

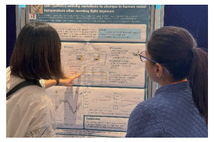
Florence Nightingale emphasized the environment's role in nursing (Notes on Nursing). Modern nursing builds on this by considering both physical and psychological environments. Nurses enhance patient care by arranging these environments, promoting health and satisfaction. Our research aims to contribute to this human-centered approach, and we are conducting research on how to improve well-being by applying circadian biology, or sleep-wake rhythms, to nursing techniques.

Research theme: Biological rhythms in nursing (health of shift workers)

We are testing our hypotheses using cohort studies (Nagahama Study) and laboratory experiments. Our labs can measure body temperature, heart rate variability, and hormone fluctuations, with facilities for extended stays. We have two laboratories, each with its own bathroom and toilet, and the lighting conditions can be adjusted. So, it is possible to investigate human reactions to the body clock. Few such facilities exist in Japan. We believe that the research results based on this specialized knowledge of biological rhythms can contribute to the promotion of people's health. The research results are reflected in education in a timely manner, and we aim to achieve a link between research and education. The research activities of team members, including undergraduate students, have received many awards at academic conferences and other events. In addition, to raise people's health awareness, we give lectures on sleep and biological rhythms at public schools ranging from elementary schools to community colleges.

Tomoko Wakamura

①Biological rhythm laboratory (left：dark light condition, right bright light condition)



②Poster presentation (11th Asian Sleep Research Society Congress and 8th Asian Forum on chronobiology in New Delhi on 2025)

Home Health Care and Dementia Research

Frontier Nursing Sciences

M.D., Ph.D. Professor

Ayae Kinoshita

We approach dementia from a medical and caregiving perspective, aiming to build a society where people with dementia can live comfortably.

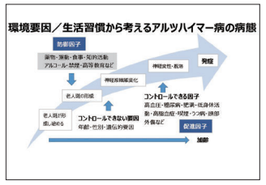
1. Lifestyle Intervention Research for Alzheimer's Disease

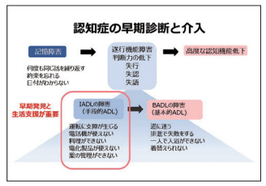
Alzheimer's disease is the leading cause of dementia. Recent research indicates that pathological changes in the brain begin more than 20 years before the onset of dementia symptoms. We are conducting evidence-based studies on lifestyle and environmental interventions to mitigate the onset and progression of these symptoms.

2. Research on Lifestyle Support for People with Dementia

We are developing tools for the early detection of cognitive decline and challenges in daily living. In addition, we are exploring user-friendly designs and interfaces for household appliances and pictograms in public spaces to ensure they are accessible and easily recognizable for individuals with dementia, enabling them to maintain independence for as long as possible after diagnosis.

Ayae Kinoshita
Mie Torii





Biomedical Data Intelligence

Frontier Nursing Sciences

Ph.D. Professor

Yasushi Okuno

In addition to experimental and theoretical science, simulation science and data-centric science are emerging globally. Our laboratory develops methods for medical big data analysis and AI using clinical data from Kyoto University Hospital, as well as simulation and AI drug discovery using the supercomputer “Fugaku”. Through these efforts, we aim to advance simulation and data science in practical healthcare and drug discovery applications.

Medical Big Data Analysis and Medical AI:

In collaboration with Kyoto University Hospital Cancer Center Biobank & Informatics for Cancer Project, our laboratory develops new methods for integrating and analyzing diverse biological data. We aim to create frameworks that enable clinical data to drive personalized medicine, translational clinical informatics, and healthcare development. Specifically, using AI and simulation techniques, we infer cancer patients' physical state, treatment efficacy, and drug adverse event predictions. We are also developing methods for novel biomarker identification and drug target discovery.

Simulation and AI Drug Discovery:

The pharmaceutical industry faces the challenge of developing new drugs efficiently and cost-effectively, leading to high expectations for in-silico drug discovery. With the availability of the “Fugaku” supercomputer, computational science and informatics for drug discovery have flourished. Our laboratory, through a consortium with pharmaceutical companies, IT firms, and academia, is developing cutting-edge drug discovery technologies using AI and “Fugaku”.

Yasushi Okuno
Ryosuke Kojima
Mitsugu Araki, Shigeyuki Matsumoto, Yohei Mineharu, Takao Otsuka, Eiichiro Uchino
Minoru Sakuragi
Yuji Okamoto, Hirohiko Kohjitani, Mai Nakazawa, Akihiko Ueda

Nursing Ethics

Frontier Nursing Sciences

Nursing ethics serves as a cornerstone for nurses, who constantly strive to determine "what kind of care is best for the individual." Our field explores the ethical challenges nurses face daily, organizes discussion frameworks, and pursues Person-Centered Care through our research. Our goal is to promote ethical nursing practices that contribute to the well-being of all individuals by fostering greater interest in ethics among all nurses.

Our research focuses on developing nursing support strategies and models to enhance well-being by respecting the preferences, needs, and values of individuals living with serious illnesses. We explore culturally appropriate ethical nursing practices through international and domestic collaborative studies.

In education, undergraduate courses cover clinical foundational nursing, nursing ethics, and practical training. Graduate education emphasizes ethical decision-making, advance care planning (ACP), serious illness conversations, end-of-life care ethics, holistic care, transplantation ethics, and research ethics. We aim to equip students with skills for both ethical practice and research.

Sayaka Takenouchi

Main research themes include:

•Developing and evaluating an ACP support model through physician-nurse collaboration for individuals with serious illnesses.
•Exploring Person-Centered Care approaches for individuals with dementia.
•Promoting multidisciplinary education in clinical ethics.
•Examining ethical issues in healthcare and life sciences research.

Nursing Science for Lifestyle-related Diseases

Clinical Nursing Sciences

RN., Ph.D. Professor

Kazuko Nin

We research ways to enhance the well-being of people managing long-term conditions like diabetes, cardiovascular disease, and autoimmune disorders. Our focus is on nursing care that supports individuals in living authentically, from the early stages illness to the end-of-life. Through education and research, we take a comprehensive approach, including self-management support, psychosocial care, and policy research, maximizing the expertise of nursing professionals to improve healthcare and quality of life.

We advance chronic care nursing by focusing on self-management support for individuals with chronic illnesses such as diabetes, obesity, cardiovascular diseases, autoimmune diseases, and fatty liver. Our goal is to help them understand their conditions, make informed decisions through self-monitoring, and maintain a fulfilling life.

We emphasize addressing clinical practice challenges and promoting collaborative research, selecting qualitative, quantitative, or experimental designs based on research needs. Our undergraduate, master's, and doctoral programs hold regular seminars, with the master's program offering training for Certified Nurse Specialists in Chronic Care Nursing. Graduate students with diverse clinical backgrounds explore nursing science from a broad perspective.

Kazuko Nin
Kanako Morinishi
Keiko Ishikawa

Through collaboration with St. Anthony's College of Nursing, we foster leadership in evidence-based nursing practice with an international outlook. Our graduates contribute to research, clinical practice, and corporate or entrepreneurial roles, driving innovation in healthcare.

Conference Presentation at EAST ASIAN FORUM OF NURSING SCHOLARS (EAFONS) 2024

"How High Does It Go? Your Blood Glucose Level" at the Open Campus

Critical Care Nursing

Clinical Nursing Sciences

Critical care nursing means providing the utmost care to severely ill patients in critical periods regardless of location, whether the ER, ICU, surgery ward or elsewhere. Life-threatening crises, however, can happen not only in hospital setting but anywhere, at any time, and to anybody in daily life. We focus on integrating prehospital and in-hospital care, aiming to apply effective practices in emergency settings and save as many lives as possible.

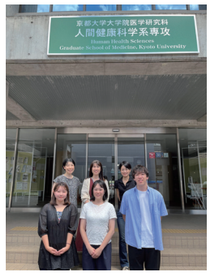
(1) Master and Doctor course

We conduct epidemiological research to advance emergency medical care and resuscitation science, focusing on CPR education and sudden cardiac death prevention. Using implementation science, we bridge the gap between evidence and practice, validating our findings in real-world settings. Our guiding principles include addressing clinical questions, collaborating with clinical settings, generating policy-relevant evidence, and sharing findings with the public and medical communities to enhance the impact and reliability of our research.

Chika Nishiyama
Yuri Sakaki
Mariko Asase

(2) Advanced Practice Researcher Training Program CNS Course

We aim to cultivate Certified Nurse Specialists (CNS) in Critical Care Nursing through clinical training at facilities providing advanced nursing care. Additionally, we guide the master's students in formulating research questions rooted in clinical inquiries and conducting research that improves patient outcomes through ongoing discussions.



Psychiatric and Mental Health Nursing

Clinical Nursing Sciences

Ph.D., RN, PHN, Professor

Rie Chiba

As the number of people with mental illness has been increasing, maintaining and recovering mental health has become an important social issue. Psychiatric and Mental health nursing is a field that focuses on people's minds, behaviors, and care to improve mental health. In our laboratory, we have been studying people of all ages, including those with mental illness. Please feel free to contact us.

In recent years, in addition to reducing symptoms and difficulties, the transformation by facing adverse experiences and the process of personal growth has been focused in the fields of nursing and psychology. In our laboratory, we have been working on research to create high-quality evidence to support people with mental health difficulties and their families. Through these research, we aim to contribute to an academic foundation for psychiatric mental health nursing and better care based on scientific evidence. We accept graduate students in this and other related fields, including international students. The classes for graduate students are held in English and Japanese. We also have Certified Nurse Specialist Course majoring in psychiatric and mental health nursing as an Advanced Practice Researcher Training Program.

Rie Chiba
Tomoko Yamanouchi, Masako Mitsui

Oncology Nursing and Palliative Care

Clinical Nursing Sciences

Ph.D., RN, Professor

Mika Miyashita

Palliative care nursing is an academic discipline that aims to create nursing care that prevents and alleviates physical, psychological, social and spiritual suffering and supports the lives of people of all ages who have experienced life-threatening illnesses such as cancer, and their families. Our goal is to contribute to improving people's quality of life through the development and societal implementation of nursing care that prevents and alleviates their total pain.

Research:
Our research focuses on cognitive dysfunction related to cancer, and we are also advancing international collaborative research with researchers in the United States. Our goal is to elucidate the mechanisms underlying the effects of cognitive training and promote their social implementation. Additionally, to enhance patient-healthcare provider communication in cancer care, we are developing a question prompt list and evaluating its effectiveness through a multicenter randomized controlled trial involving patients with hematologic malignancies. Furthermore, we are applying artificial intelligence technology to develop AI-based solutions for palliative care in cancer patients.

Mika Miyashita
Yuki Shirai
Kazuki Shimada
Takako Kuroda

Education:
At the undergraduate level, we provide lectures and practical training in palliative care nursing and geriatric nursing. At the graduate level, our focus is on fostering researchers specializing in palliative care nursing and oncology nursing. Additionally, we train oncology clinical nurse specialists within the master's program for advanced practice nursing.

Cognitive training device

Performing cognitive training

Child and Family Nursing

Family and Community Health Care

In the field of pediatric nursing, we explore ways to support children and their families, who are at various levels of health, from the neonatal period through adolescence and young adulthood, so that they can grow and develop in their own way. We consider ways to improve the quality of life of children who have received advanced medical care and have returned to their local communities, by improving the local community, home, and family environment.

In undergraduate education, we first understand the characteristics of children's growth and development at each stage of development, and then understand the living environment of children with diseases and disabilities and their families. Using this knowledge as a foundation, we think about how to support children's rights through practice and training.
In graduate school education, we aim to improve the quality of life of children and their families in all environments, from the hospital environment to community life, based on knowledge and theory related to pediatric nursing. Regardless of whether or not they have a disease or disability, we will explore ways to provide long-term, community-based support while taking into account the developmental process of children and their families.

Chieko Akuzawa
Kanako Kiyokawa

Joint seminar for graduate and undergraduate students

Kiken Yochi Training (Risk Prediction Training)

Perinatal Epidemiology

Family and Community Health Care

Ph.D., RN, RM, MN Professor

Marie Furuta

The field of perinatal epidemiology focuses on research and education to improve maternal and neonatal health, as well as women's health throughout their lives. This course also offers lectures and practical training for future midwives to support women and their families before, during, and after childbirth. We aim to contribute to society by providing quality birth care and exploring how midwifery can help address broader social issues.

The graduate program offers two courses: "Perinatal Epidemiology," which focuses on educating researchers, and "Advanced Practice Midwifery," which is designed for training future midwives. In the "Perinatal Epidemiology" course, students examine domestic and global perinatal healthcare issues and debates, in line with Kyoto University's mission to develop world-leading researchers. The course emphasises the development of research skills, particularly through epidemiological studies, to generate high-quality evidence for clinical guidelines and policy-making. In the "Advanced Practice Midwifery" course, students earn the required credits to be eligible for the national midwifery exam while acquiring the knowledge and skills to provide care for women with normal and high-risk pregnancies, childbirth, and childrearing. The course also covers care and management of midwifery clinic. Both courses emphasise evidence-based care and aim to develop professionals with an international perspective who can contribute to improving global perinatal healthcare.

Marie Furuta
Yuko Tokita
Chifumi Otaki
Keiko Doering

Practice of ultrasound diagnosis in midwifery

International Midwifery Practicum in Nepal

Innovative Public Health Nursing

Family and Community Health Care

The Innovative Public Health Nursing field focuses on educating and researching public health nursing at all levels of prevention to promote community health and well-being. It adopts a diverse, creative, and dynamic approach to address both current and emerging health needs in communities. Through research and the identification of best practices, we aim to develop practical theories and innovatively enhance nursing practice.

In undergraduate education, we teach all students in the Advanced Nursing Science course the fundamental concepts of public health nursing, focusing on the challenges faced by communities and systems that underlie individual issues. For students in the Public Health Nursing course, we provide more practical knowledge and skills that enable them to think and act flexibly in a changing society.
In graduate school, students acquire research and application skills that contribute to improving public health nursing practices. Our aim is to foster professionals who possess advanced practical and leadership skills and can promote interdisciplinary and innovative research.

Misa Shiomi
Rikuya Hosokawa
Kazuya Taira

Research themes include:
- Modeling community assessment for public health nurses and developing educational materials and programs
- Research on improving public health nurses' ability to implement projects and policies
- Research on creating healthy communities for people of all ages and health conditions.

Anatomy and Human Embryology

Advanced Physical Therapy

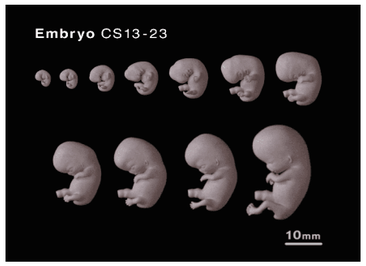
M.D., Ph.D. Professor

Shigehito Yamada

The field of study is composed of faculty members who specialize in anatomy, English education, and physical therapy in internal medicine.

Professor Yamada holds a dual position at the Congenital Anomalies Research Center. He is advancing research to understand the mechanisms behind congenital abnormalities through morphological studies utilizing a vast collection of human embryos. Associate Professor M. Hayashi is dedicated to enhancing English communication skills training and fostering cross-cultural competence among Japanese healthcare professionals. Assistant Professor K. Hayashi investigates movement and sensation, rehabilitation using animal disease models, and physical therapy in internal medicine.

Shigehito Yamada
Mihoko Hayashi
Kazuhiro Hayashi



Motor Function Analysis Neurorehabilitation Laboratory

Advanced Physical Therapy

P.T., Ph.D. Professor

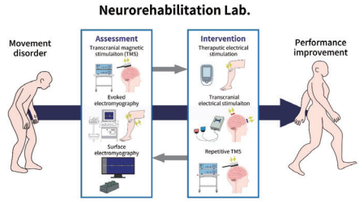
Tomofumi Yamaguchi

Neurorehabilitation integrates neuroscience, clinical neurophysiology, and rehabilitation medicine to enhance therapies for neurological disorders and also supports health maintenance and promotion.
Neurorehabilitation Laboratory aims to develop new rehabilitative treatments to improve dysmobility following neurological disorders and to investigate the effects and mechanisms involved. Furthermore, we lead clinical practice, research, and education in rehabilitation and broadly focus on developing human resources capable of leading neurorehabilitation.

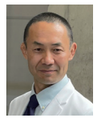
■Neurorehabilitation research to promote physical therapy for improving dysmobility following neurological disorders
Yamaguchi lab aims to gain insight into motor learning, which is the foundation of rehabilitation, the neuroplastic changes in the central nervous system underlying motor learning, and the relationship between neuroplasticity and behavioral changes.
We use active exercise and non-invasive stimulation methods (e.g., tDCS, rTMS) alongside neurophysiological evaluations (TMS, EEG) and motion analysis in healthy individuals and patients with neurological disorders. This research guides new rehabilitative treatments and examines their effects and mechanisms. Our goal is to connect neuroscience with clinical rehabilitation, providing neurorehabilitation evidence for patients and clinicians.

Tomofumi Yamaguchi

■Human resources development to lead neurorehabilitation research and practice
Yamaguchi lab develops researchers and clinicians who can conduct research based on clinical questions, apply insights to clinical rehabilitation, and bridge the gap between fundamental and clinical research.



Motor Function Analysis Innovative Rehabilitation Lab



Advanced Physical Therapy

M.D., Ph.D. Professor

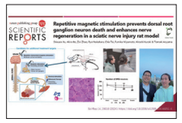
Tomoki Aoyama

The word ‘rehabilitation’ means ‘to make people competent again, to make them adapt to their environment again’ , but in modern times it is taken to refer to efforts to restore function after illnesses such as broken bones or stroke, or to support people’s reintegration into society. Rehabilitation has changed according to the historical background and needs of the times, and we aim to develop rehabilitation techniques that meet the needs of the new era.

In rehabilitation, the PDCA cycle is used to identify problems through ‘assessment’ , attempt to solve problems through timely and individually optimised ‘intervention’ and review methods through ‘evaluation’ of intervention effects. Based on this principle in research, our laboratory aims to solve a wide range of problems from the molecular, cellular, organ, individual and social levels, using both basic and clinical approaches, and is advancing the following diverse research themes.
・Regenerative rehabilitation
・Cancer rehabilitation
・Sports health
・Women’s health

Tomoki Aoyama
Akira Ito
Momoko Nagai-Tanima

・Tele-rehabilitation
・Medical and healthcare equipment development
・Multilevel functional analysis unit
・Healthcare infodemics.
Based on a problem-solving orientation, we educate students with planning, action, insight, clinical and integrated skills including organising and extracting problems, selecting events to be examined, examining analysis or intervention methods, measuring and analysing, and verifying results.



Development and Rehabilitation of Motor Function Clinical Biomechanics

Advanced Physical Therapy

P.T., Ph.D. Professor

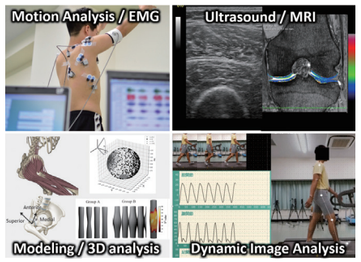
Noriaki Ichihashi

We aim to contribute to the development of rehabilitation and physical therapy. Human motion, from young to old, patients and athletes, are measured and analyzed using non-invasive equipment such as motion capture systems, force plates, electromyography, and ultrasonic diagnostic equipment. By focusing on the mechanical properties of muscles and joints, and their relation to motor function, we aim to develop effective methods of treatment and prevention.

We conduct education, research, and clinical practice with the aim of establishing an academic framework of physical therapy and applying research results to clinical practice. We train physical therapists that have both the clinical ability to treat and the ability to investigate the effectiveness of their treatment. The main ongoing research projects are;
1. Development of training to improve muscle mass, quality, and shortening
2. Morphological research into muscles and joints using ultrasound and statistical shape models
3. Simulation research into muscle function and joint stress using musculoskeletal models

Noriaki Ichihashi
Hiroshige Tateuchi
Todd Pataky
Masashi Taniguchi
Masahide Yagi
Tetsuya Hirono

4. Motion analysis using markerless motion capture and wearable sensors
5. Analysis of foot pressure distribution using simple gait measurements and machine learning
6. Verification of training to improve muscle and physical function in the elderly
7. Development of physical therapy to improve and prevent hip and knee OA



Biofunction

Advanced Occupational Therapy

Ph.D. Professor

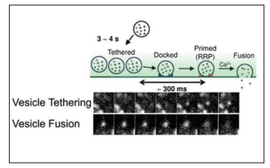
Mitsuharu Midorikawa

Our body consists of tens of trillions of cells, and exocytosis plays a crucial role in cellular communication. We are focusing on the smallest (~ 40 nm in diameter) and the fastest (within 1 ms) exocytosis in our body, i.e., exocytosis of the synaptic vesicles. We aim to elucidate how this slight biological reaction varies in different brain regions or under different circumstances to generate different properties of neural circuits.

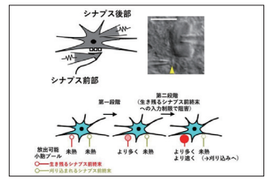
We mainly focus on the exocytosis mechanism of the neuron in the mouse central nervous system. To precisely measure the synaptic vesicles, of which diameter is only ~ 40 nm, to fuse with the presynaptic plasma membrane, we mainly use electrophysiology and live imaging technique. In addition, we are incorporating techniques such as super-resolution microscopy to visualize the molecular organization at the nanometer level and morphological methods to visualize the wiring of neural circuits on a single-fiber level.

By using these techniques to investigate differences between different neurons, as well as plastic changes resulting from development, adaptation, and learning, we aim to unravel how variations in exocytosis properties affect neural circuits and even higher brain functions. We aim to bridge our study to creating therapeutic strategies for developmental and mental disorders, neurorehabilitation, and beyond.

Mitsuharu Midorikawa



The tethering of the single synaptic vesicle to the plasma membrane (upper) and fusion (lower) at the mouse CNS neuron.



Direct electrophysiological recordings from presynaptic terminals and postsynaptic cells (upper) reveal the time course of presynaptic functional development at the mouse somatosensory thalamus (lower).

Clinical Cognitive Neuroscience

Advanced Occupational Therapy

Ph.D., OTR Professor

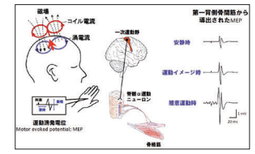
Nan Liang

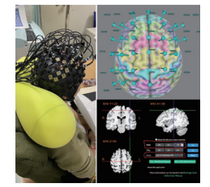
Therapeutic interventions focused on the central nervous system (CNS) activity are crucial for patients who suffer from physical disorders. By using neurophysiological, neuropsychological, brain imaging, and three-dimensional motor analysis techniques, our laboratory aims to measure non-invasively the changes in the CNS excitability during cognitive and motor activities. Both intrinsic motivation from ourselves and extrinsic motivation from patients empower us to provide new things from bench to bedside and vice versa.

Our laboratory aims to set forward the rehabilitation/ occupational therapy in an academic way with the education, research, and clinical practice. We engage in the lectures and practices related to the occupational therapy of physical disorders with the undergraduate students, and do researches in the specific areas with the graduate students. Everybody interested in the rehabilitation science and neuroscience with a fervent spirit will receive a warm welcome. The details of our research interests are shown below.
•The central mechanisms for voluntary movements
•The central mechanisms and training effects of motor imagery, action observation, and kinesthetic illusion
•Developments and clinical assessments of rehabilitative approaches by using VR/MR systems
•The recovery mechanisms for patients with the nervous system diseases

Nan Liang
Keisuke Irie
Miki Kaneshige
Yuto Iwanaga
Kengo Fujiwara

•The interaction of repetitive transcranial magnetic stimulation (rTMS) and motor learning
•Developments of digital therapeutics for the developmental coordination disorder (DCD)





Developmental Psychiatry

Advanced Occupational Therapy

The main focus of our laboratory is neurodevelopmental disorders, particularly autism spectrum disorder. We conduct clinical and research work from the perspectives of 1. child and adolescent psychiatry, 2. cognitive neuroscience research, and 3. forensic psychiatry. In addition, the Department of Advanced Occupational Therapy, centered in this laboratory, offers an educational program to train highly specialized personnel with expertise in neurodevelopmental disorders.

Elucidating the characteristic psychophysiology and cognitive processing of neurodevelopmental disorders is fundamental to establishing proper understanding and rational support. However, sufficient academic knowledge is still being accumulated. Our laboratory aims to conduct research that provides important clues for considering support for neurodevelopmental disorders and to give back to practice. In graduate school, students come from various backgrounds, including the medical profession, psychology, and music therapy. Students at the graduation thesis stage can also be exposed to multiple research methodologies.
The Department of Advanced Occupational Therapy, centered in our laboratory, runs the certificate program ‘Solving National Health Problems through Interventions for Developmental Disorders’ and the e-learning course ‘ASD project Basic course’, which is an essential version of this program to train highly qualified professionals with a deep understanding of the psychophysiology and cognitive processing of neurodevelopmental disorders.

Sayaka Yoshimura
Yusuke Kusano
Akiko Yamada

Brain Function and Rehabilitation

Advanced Occupational Therapy

Ph.D. Professor

Hiroyuki Inadomi

Brain Function and Rehabilitation is an academic field that aims to establish an interdisciplinary, scientific, and comprehensive approach based on neuroscience and psychiatry. Its goal is not only to improve functional and capability impairments caused by physical and mental illnesses but also to enable social participation despite disabilities. It focuses on developing personalized rehabilitation techniques tailored to individual needs and pioneering rehabilitation methods incorporating the latest scientific advancements.

Research in this field is focused on the future, aiming to develop practical evaluation and treatment methods. The key areas of study include:

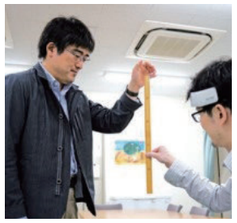
1. Research on Occupational Therapy and Psychiatric Rehabilitation
 - Examining employment support and work engagement for individuals with mental disorders.
 - Developing assessment scales for social cognitive functions.

2. Research on Well-being Among the Elderly and in Local Communities
 - Exploring factors related to ongoing social participation in the Elderly.
 - Creating programs to promote intergenerational exchange effectively.

Hiroyuki Inadomi
Tomohiro Kogata

3. Research Aiming to Establish Neurofunctional Rehabilitation Science
 - Exploring the application of Utena's Brief Objective Measure (UBOM).

Ultimately, Brain Function and Rehabilitation aims to enhance the quality of life and promote social participation through its findings and technologies. This research also plays a vital role in training highly specialized medical professionals and researchers committed to this field.



Measurement scene of the UBOM subtest "Ruler Catching Time."

Cancer Rehabilitation and Supportive Care

Advanced Occupational Therapy

Cancer is a serious disease that threatens human life. However, with medical advances, prognosis has improved. The important question is, "How do we live life after cancer?" Our laboratory focuses on initiatives, such as care for late effects, health promotion for cancer survivors, support for schooling and employment, and enhancement of peer support, and conducts research and education on long-term cancer occupational therapy, from the acute phase to after social reintegration.

Our laboratory supports cancer survivors, including children and adults, and patients and their families who have experienced brain damage, mainly brain tumors, regardless of age, so that they can live physically, mentally, and socially healthy, fulfilling their lives. We engage in clinical work, research, and education to elucidate the causes of neuropsychological complications and difficulties of living in society, build a long-term support system for the future, and develop practical methods for cancer occupational therapy.
We aimed to develop advanced medical professional leaders through clinical practice at Kyoto University Hospital and support at patient and family group.

Ami Tabata

Particularly, we are working on the following research themes:
1.Research on neuropsychological complications associated with cancer
2.Research on health promotion for cancer survivors

Baseline assessment before starting treatment for patients with brain tumor

Room used for rehabilitation and peer support activities

Molecular Basic Medical Science

Basic Medical Sciences

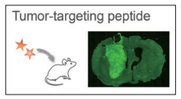
Ph.D. Professor

Motohiro Nonaka

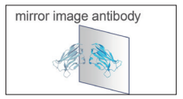
Our laboratory develops technologies to rapidly and efficiently extract key molecules from diverse biological systems using phage libraries displaying vast numbers of peptides, antibodies, and proteins. Our research focuses on biomarkers for intractable diseases such as cancer and autoimmune disorders, as well as novel antibody modalities with reduced side effects. We believe our findings will contribute to the advancement of personalized medicine in the future.

Our laboratory integrates phage display technology with next-generation sequencing to identify peptide sequences that bind to target molecules. We focus on developing diagnostics and therapeutics for refractory diseases by discovering novel disease markers and activity assessment markers for conditions such as cancer, allergies, and autoimmune diseases. Additionally, we are developing mirror-image antibodies as innovative drug modalities with minimal immunogenicity. Another key area of research is the modulation of glycan functions. Glycans play essential roles in nearly all diseases, yet many of their physiological functions remain unclear due to challenges in structural analysis and labeling. To address this, we screen and chemically synthesize glycan-mimicking peptides to regulate glycan functions in cells and organisms, aiming to control disease-related processes. Through our research, we strive to push the frontiers of science and contribute to society by applying our discoveries to biotechnology and medicine.

Motohiro Nonaka
Katsuaki Higashi



We are developing peptides that target the surface of neovasculature in malignant brain tumors. The figure shows the accumulation of fluorescently labeled peptides administered via the tail vein in a mouse model of malignant brain tumors.



We are developing a mirror-image VHH antibody composed entirely of D-amino acids. Mirror-image VHH antibodies have the potential to serve as a novel drug modality with reduced immunogenicity. (PDB ID: 1I3V)

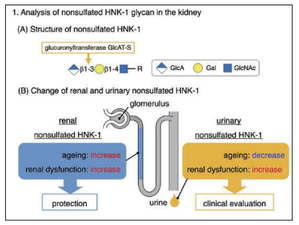
Glycobiology

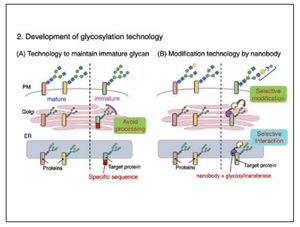
Basic Medical Sciences

Glycans modify the function of proteins and give cells individuality. Although their structures are complex and diverse, each glycan contains important biological information. Our group researches the function of non-sulfated HNK-1 glycans and develops technologies to control the expression of diverse glycan structures. However, if you find other interesting themes related to glycans, we will provide an environment in which you can pursue your research based on your own ideas.

Our group conducts research on two topics: 1. Non-sulfated HNK-1 glycans, composed of a characteristic trisaccharide structure, are specifically expressed in the kidney. By focusing on their carrier molecules and expression regions, we analyze the functional significance of non-sulfated HNK-1 glycans. Furthermore, this glycan is also detected in urine and exhibits significant changes in response to various renal dysfunctions. In the future, we aim to develop non-sulfated HNK-1 glycans as biomarkers of renal diseases. 2. N-glycans processing takes place in Golgi apparatus, which process diversifies the glycan structures. We recently found that a specific amino acid sequence maintains immature N-glycans even in the plasma membrane. Furthermore, by fusing nanobody with a specific glycosyltransferase, we discovered the possibility of selective glycosylation to target molecules. Through the development of these technologies, we are pioneering a new method to control glycosylation at will.

Jyoji Morise





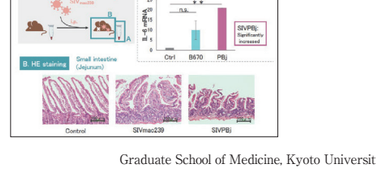
Developmental Neurobiology

Basic Medical Sciences

Our group aims to understand the cellular/molecular mechanisms underlying the neural circuit formation in the mammalian cerebral cortex during embryonic and neonatal periods. We focus on the developmental dynamics and physiological roles of intracellular machineries, such as microtubules and organelles. Through in vivo visualization and manipulation of intracellular machineries in cortical neural progenitors and neurons in mice, we try to untangle the complex yet sophisticated mechanisms of neocortical wiring.

The formation of precise neural circuits in the mammalian cerebral cortex requires coordinated cellular events including proliferation and differentiation of neural progenitors, migration and maturation of neurons, and circuit formation and subsequent remodeling. Our group aims to understand the cellular/molecular mechanisms underlying the neural circuit formation in the cerebral cortex. We are particularly interested in the developmental dynamics of intracellular machineries, such as signaling pathway, microtubules, and organelles. Through in vivo visualization and manipulation of intracellular machineries in neural progenitors and neurons in mice, we try to untangle the complex yet sophisticated mechanisms of neocortical wiring. We also ask how the dysfunction of such machineries leads to cellular pathogenesis of neurodevelopmental disorders. These research activities will help students to learn how the cellular/molecular events within a cell in vivo contribute to the structural and functional development of the brain.

Naoki Nakagawa



In vivo visualization of neural progenitor cells and neurons in the mouse cerebral cortex.

Microbial Pathogenesis

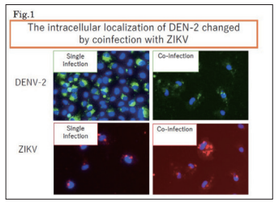
Basic Medical Sciences

Our research aims to elucidate the virus-host interactions involved in viral infection and pathogenicity. Unlike other microorganisms such as bacteria and fungi, viruses cannot grow without utilizing the functions of the host cell. Therefore, we believe that understanding the relationship between virus growth and host cell functions will lead to elucidation of the pathogenesis mechanism. Currently, we are focusing on the growth mechanisms and pathogenesis of mosquito-borne viruses and HIV.

Our group is currently working on the following research themes to understand the relationship between virus pathogenicity and host cell functions.
1) Mosquito-borne viruses
・Effects of competitive proliferation of multiple mosquito-borne viruses on virus pathogenicity (Fig.1).
・Elucidation of the mechanism of inhibition of mosquito-borne virus proliferation by symbiotic bacteria and insect-specific viruses.
2) Primate immunodeficiency viruses
・Understanding the pathological mechanism of the virus and effective protective immunity using an experimental system of Simianized-mice (Fig.2).
・Understanding the mechanism of spread and proliferation of the virus during the acute phase of infection, focusing on dendritic cells and macrophages.
3) Extracellular vesicles (EVs)
・Effect of EVs obtained from plants on the human immune system.

Kentaro Ibuki

In our group, each graduate student works on their own research topic and acquires skills and knowledge in virology, immunology, and cell biology.



Human Morphogenesis

Basic Medical Sciences

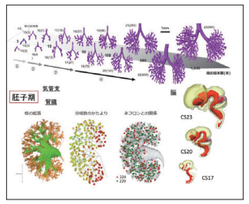
M.D., Ph.D. Professor

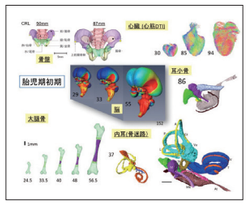
Tetsuya Takakuwa

Many people - some scientists, some not - are interested in early human development because it is closely related to the fundamental question: What are we, and where did we come from? In our laboratory, morphogenesis during the human embryonic and early fetal period has been analyzed using digitized datasets of high-resolution MRI and CT to show normal and abnormal development and to attempt to identify some preventive measures.

The human embryonic and early fetal period has been analyzed in three dimensions using digitized data sets that have allowed us to visualize the beautiful 3D morphology on display and further apply various analyses that accelerate the morphological analysis. The 3D coordinates of anatomical landmarks are provided for analyzing the positional change of landmarks of interest and their relationships, as well as for more detailed analysis using mathematical and statistical analyses. Morphometric data are useful for quantitative evaluation and demonstration of developmental features and for screening abnormal specimens, and which is necessary to gain insight into the dynamic and complex processes that occur during organogenesis. Our study could help to differentiate normal from abnormal development, which could lead to prenatal diagnosis in the embryonic and early fetal periods.

Tetsuya Takakuwa
Toru Kanahashi





Clinical Research and Development Studies

Clinical Laboratory Sciences

M.D., Ph.D. Professor

Momoko Nishikori

Lymphomas are malignancies of mature lymphocytes and are classified into many histologic subtypes reflecting the diverse phenotypes and functions of lymphocytes. In contrast to leukemia, the immune microenvironment is intimately involved in the pathogenesis of lymphoma. Our research focuses on elucidating the interactions between lymphoma cells and the surrounding microenvironment, which is influenced by the characteristics of their normal counterparts and by genetic and epigenetic alterations generated in lymphoma cells.

Just as there are different subsets of lymphocytes, lymphomas are classified into a variety of subtypes. Each lymphoma subtype has a unique relationship with its surrounding microenvironment. Since lymphoma cells themselves are derived from lymphocytes, altered interactions with surrounding immune cells inevitably play an important role in their pathogenesis. In collaboration with the Department of Hematology, we study lymphoma-microenvironment interactions using lymphoma cell lines and murine lymphoma models with M.S. and Ph.D. students. We investigate how genetic abnormalities, histone methylation patterns, and protein ubiquitination in lymphoma cells alter their intracellular signaling and interactions with surrounding cells. Our research aims not only to identify new therapeutic targets by elucidating the molecular biology of lymphoma, but also to discover new activities of existing drugs so that we can select the most appropriate treatment for each patient.

Momoko Nishikori
Yoko Nishinaka

Diagnostic Imaging

Clinical Laboratory Sciences

M.D., Ph.D. Professor

Yasutomo Fujii

Laboratory science aims to establish and realize concepts and methods for extracting and analyzing various data from molecular and cellular levels to the organ level, for the purpose of elucidating structure and function of living beings, clarifying etiology and pathophysiology of various diseases and/or establishing diagnosis and treatment of diseases. Accordingly, we promote studies on new concepts and technology on the basis of medicine, biology and information technology. We intend to encourage new talents who will act as leaders in the fields of education, research and clinical practice.

Our research projects, the results of which are expected to have a great influence in clinical practice, are as follows:
1.The search for a rating system of deeper remission in patients with rheumatoid arthritis (RA) using ultrasonography
2.Clarification of pathology in RA with obesity and/or atherosclerosis
3.Clinical application of ultrasonography for diagnosis of lung diseases
4.Development of a system for acquiring ultrasound C-mode imaging
5.Therapeutic application of ultrasound energy for refractory infection
In our laboratory, graduate students can take training for sonography (gastroenterology, cardiology, etc.) in the clinical laboratory of Kyoto University Hospital, in addition to performing the projects described above. Therefore, graduate students can accumulate experience required to get sonographer certification.

Yasutomo Fujii

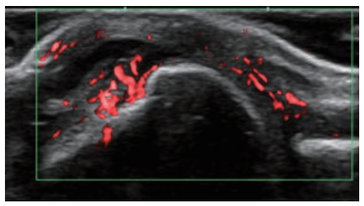


Figure 1.
Representative SMI image of a RA patient.

Figure 2.
Collection of ultrasound data.

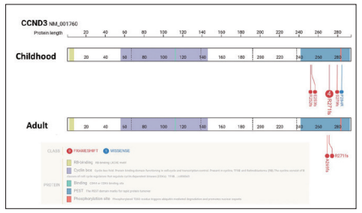
Clinical Genomics

Clinical Laboratory Sciences

Our laboratory aims to improve the cure rate of hematologic and oncologic diseases by elucidating genomic abnormalities involved in the pathogenesis and progression of the diseases and developing novel testing and treatment methods based on the findings. The laboratory is mainly targeting students with a background in clinical laboratory medicine, and is striving to train advanced medical professionals and researchers who can contribute to cancer genome medicine.

Our main research focus is acute myeloid leukemia (AML). We are identifying genomic abnormalities by next-generation sequencing and developing new testing and treatment methods based on the findings. We collaborate with Kyoto University Hospital and other medical institutions participating in the JCCG (Japan Children's Cancer Group), which enables us to conduct highly original research using clinical specimens. Through participation in research, students are guided to master basic techniques such as handling clinical specimens, cell culture, nucleic acid extraction, PCR, sequencing, genome editing, and how to conduct research. Students who are interested are also guided to obtain professional certifications for clinical laboratory scientists. Research results are presented at conferences such as the American Society of Hematology, the Japanese Society of Hematology, and the Japanese Society of Laboratory Medicine, and are published in papers.

Hidemasa Matsuo



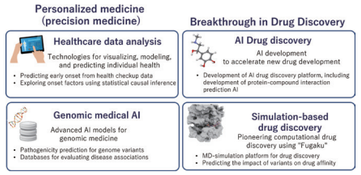
Biomedical Data Science

Clinical Laboratory Sciences

In the fields of life science and healthcare, huge amounts of personal data are being accumulated, including medical records, health check data, biological specimen information, and life logs of daily life. Biomedical data science is expected to discover new knowledge and create clinical value. Our laboratory aims to realize precision medicine and innovative in-silico drug discovery by utilizing data science and artificial intelligence technologies.

Our laboratory is conducting the following research themes:
- Healthcare data analysis: Development of methods to predict early onset of diseases using large-scale health checkup data and electronic medical record data, and search for factors that cause disease onset using statistical causal inference
- Genomic medical AI: Development of pathogenicity prediction methods for genome variants with unknown disease mechanisms, and development of databases for evaluating disease associations
- Simulation-based drug discovery: Evaluation of drug sensitivity and functional activity of target proteins using molecular dynamics simulations
- AI drug discovery: Development of chemoinformatics methods and an AI platform for drug discovery
Through research activities with research group members and collaborators from diverse backgrounds, we aim to develop talent that understands the background of medical and drug discovery data, and can propose solutions based on new problem discovery and data analysis.

Ryosuke Kojima



Advanced Medical Imaging and Image Analysis

Advanced Medical Engineering and Sciences

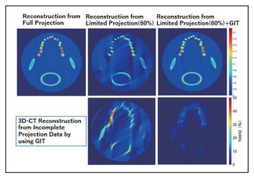
Ph.D.(in Eng.) Professor

Naozo Sugimoto

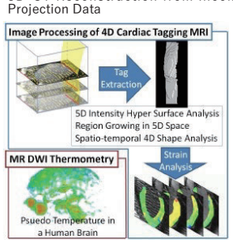
Multi-dimensional image processing technologies applicable to various clinical or basic research applications are focused in this group. Our objectives is to develop image information processing algorithm and systems to assist in extracting necessary information from biomedical image by more precise and more effective way. We are also collaborating with the field of Advanced Medical Devices and Systems.

We train specialists in the field of biomedical imaging and image processing including AI technologies through the research topics presented in the bellow. We emphasize the importance of understanding the imaging principles or physics for developing image processing technologies.
We are mainly working on the development of imaging methods, reconstruction techniques, post-processing techniques, and CAD systems for multi-dimensional images. Examples of the theme include high quality 3D-CT image reconstruction from incomplete projections, and quantitative analysis of 4D cardiac MRI. In the former, we have realized image quality improvement in various cases by estimating missing parts of projection data using our original generative AI method GIT. In the latter, we have achieved 4D myocardial tagging MRI with high spatiotemporal resolution and full automatic quantitative analysis of myocardial contraction rate by 5D image processing.

Naozo Sugimoto



3D-CT Reconstruction from Incomplete Projection Data



Multi-dimensional Image Processing & Analysis

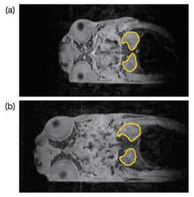
Advanced Medical Devices and Systems

Advanced Medical Engineering and Sciences

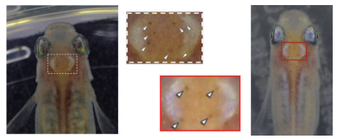
In living organisms, biological activities are maintained based on various networks of biological organization. In our group, various imaging modalities such as MR microscopy are utilized to visualize individual living organisms in vivo with a high spatial resolution and ultimately to clarify those biological activities and disease progression. Especially, small animal models such as medaka are employed to obtain longitudinal changes in the same individual by in vivo time-series imaging.

To visualize interactions in biological networks of an animal disease model, our group is working on development of an in vivo imaging system with high spatial resolution. As the imaging system, a noninvasive MR microscopy has been developed to be utilized in the same way as an optical microscope. As the animal disease model, the medaka fish is employed. To achieve in vivo time-series imaging, its handling process such as a hypothermic anesthesia procedure and an individual identification method has been also developed.
In our group, imaging principles and imaging hardware and software of the system that realize the principles are taught. In addition, group members are learning image analyses to extract characteristics of obtained images. Moreover, knowledge on mechanism of a disease and development of various animal disease models is obtained through research activities.

Tomohiro Ueno



Time series coronal images of the same individual of a p53 knock-out medaka by the in vivo MR microscopy (a)10 weeks of age, (b) 14 weeks of age, outlined kidneys show asymmetrical changes



Individual identification of inbred medaka based on the melanophore spot patterns on the head(the different spot patterns appears in the red and white outlined regions)

Advanced Medical Engineering and Intelligence

Advanced Medical Engineering and Sciences

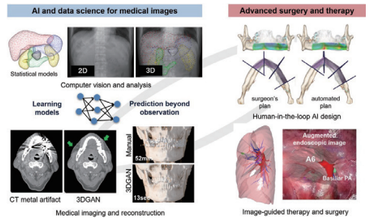
Ph.D. Professor

Megumi Nakao

Our laboratory is dedicated to research and education on mathematical and information technologies for biological and medical images or datasets, as well as on the application of artificial intelligence (AI) to imaging, diagnosis, and treatment. The field of “Advanced Biomedical Engineering and Intelligence” covers the intersection of informatics and biomedical engineering. It aims to create medical AI that plays a crucial role in next-generation medical systems.

We explore a machine learning and imaging framework capable of inferring high-dimensional biological information beyond the observed domain for medical treatment. Through the advancement of informatics-based methodologies, we aim to drive automation and elevate the quality of treatment processes, ultimately achieving low-burden, sustainable healthcare for both physicians and patients. Building on the theoretical foundations of machine learning and proficiency in programming skills related to image processing, computer vision and human-in-the-loop AI design, we train highly specialized medical engineering professionals who can independently investigate various clinical and health-related problems.

Megumi Nakao
Sho Mitarai



Laboratory of Information Systems

Advanced Medical Engineering and Sciences

Focusing on the analysis of various health science data and the development of information systems, we primarily work on software aspects while utilizing statistical and ergonomic methods. Our research includes developing systems for smooth information sharing among patients, families, and healthcare providers in home medical care and nursing, as well as creating pathogen databases, e-learning systems in health science, and interactive educational materials.

We are working on developing an "electronic communication notebook" using a tablet device with wireless internet access, a GUI, and a touch panel, making it easy for elderly users. In collaboration with the Nursing Science course, this system aims to enhance information sharing between core hospitals, clinics, and healthcare providers without relying on paper-based notebooks at patients' homes. It also allows patients and families to share information easily, contributing to the development of a ubiquitous regional home medical and nursing care system. Additionally, our work includes building a pathogen database, developing e-learning systems for health sciences, creating interactive educational materials for students and continuing education, and conducting statistical and ergonomic analyses of health science data.

Satoshi Sasayama

Advanced Medical Physics

Advanced Medical Engineering and Sciences

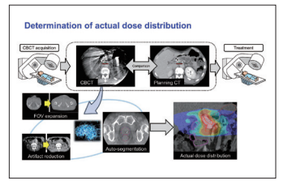
Ph.D. Professor

Mitsuhiro Nakamura

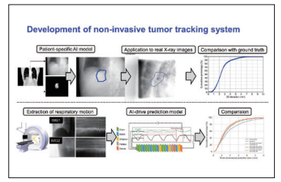
Medical physics is a discipline that enhances human health by applying principles of physics and engineering to medicine. Our focus is on radiation medical physics, where we conduct research to advance radiation medicine and provide education to train medical physicists. These professionals are equipped with expertise in physical engineering and radiology, alongside the ability to independently address and solve clinical challenges.

From the perspective of radiation medical physics, our goal is to cultivate researchers and specialists with the following competencies: (1) the ability to design and develop innovative radiation medical devices, (2) clinical expertise required to independently execute radiation therapy tasks, and (3) pedagogical skills to effectively mentor and train the next generation of medical physicists.
In research, we focus on advancing radiation medicine through the development of innovative technologies and the global dissemination of our findings via academic publications and conferences. In education, we train medical physicists to install radiotherapy equipment, design treatment plans, and implement quality control. Our students also engage in interdisciplinary collaboration, contributing to clinical discussions with professionals across fields. These efforts prepare medical physicists to lead in both research and clinical practice, addressing complex challenges and advancing medical technologies.

Mitsuhiro Nakamura



Determination of actual dose distribution



Development of non-invasive tumor tracking system

Innovation Unit for Near Future System and Technology

Community Health Care and Gerontology

M.D. Professor

Nobukatsu Sawamoto

Research on human higher-order brain functions has advanced by elucidating the functional mapping of individual brain regions. However, no single region functions in isolation; proper brain function requires integration through neural circuits. We investigate how higher-order functions arise from this integration and how dysfunction leads to clinical symptoms. Our goal is to apply this knowledge to improve symptom management and treatment.

Since the identification of Broca’ s area in 1861, knowledge of brain function localization has accumulated. However, interregional network connections suggest that individual regions contribute to functions beyond their intrinsic capacities. For example, in fetal cell transplantation for Parkinson’ s disease, dopamine production in the graft plateaus around six months post-surgery, yet clinical symptoms continue to improve for over a year as network integration progresses. Utilizing 7T MRI, PET, pathology, and electrophysiology, we investigate higher-order human brain functions. Through the research, we aim to elucidate the mechanisms underlying brain function and dysfunction while inspiring students with the depth, significance, and scientific appeal of brain research.

Nobukatsu Sawamoto
Koichi Ishizu
Atsushi Shima

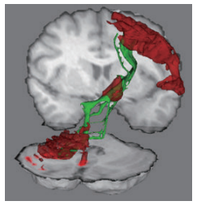


Figure 1.
Probabilistic tractography among the sensory-motor cortices, thalamus and cerebellum

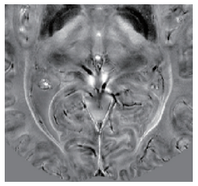


Figure 2.
Optic radiation visualized with 7 tesla MRI quantitative susceptibility mapping

Kyoto-McGill International Collaborative Program in Genomic Medicine

Kyoto-McGill International Collaborative Program in Genomic Medicine

Kyoto University and McGill University have established a joint Ph.D. degree in genomic medicine as world leaders in research and graduate education. This joint Ph.D. program provides intensive training in precision medicine through close collaboration between both Universities, which have achieved global recognition in the field.

In the program, students acquire advanced biology and informatics methodologies for analyzing large-scale and diverse types of life science and medical data, including genomics, metabolomics and proteomics data. Additionally, leadership development with a broad perspective and global insight on medicine is one of the goals. Therefore, not only genomics but also diverse backgrounds, such as medicine, epidemiology, mathematics, statistics, computing science, bioinformatics or public health, are essential qualifications or are expected to be acquire for Ph.D. admission. In this program, global researchers who demonstrate creativity, deep insight, sound judgment and a sense of ethics in the research of genomic medicine are cultivated.

Shuji Kawaguchi

DATA

History

1897	6	The Kyoto Imperial University was founded.
1899	9	The College of Medicine opened and the School of Medicine was established.
	12	The University Hospital opened and the Nursing School was established.
1903	4	The Fukuoka College of Medicine was opened and the College of Medicine was renamed The Kyoto College of Medicine.
	11	The first graduation ceremony was held in the Kyoto College of Medicine.
1911	4	The Fukuoka College of Medicine was separated from Kyoto Imperial University, so the Kyoto College of Medicine was renamed The College of Medicine.
	10	Midwife School was established in the University Hospital.
1919	2	The Imperial University Law was enacted and The College of Medicine was renamed Faculty of Medicine.
1939	5	The Provisional Special Division of Medicine was established.
1944	3	The Provisional Special Division of Medicine was renamed the Special Division of Medicine.
1945	4	The School of Nursing was established in the University Hospital.
1947	9	Kyoto Imperial University was renamed Kyoto University.
1949	5	Kyoto University was reorganized under the new educational system of the National School Establishment Law.
1951	3	The Department of the School of Nursing was renamed the School of Nursing.
	4	The Faculty of Medicine Kyoto University under the new educational system was opened.
1952	3	The provisional Department of The Special Division of Medicine was closed.
1955	4	The Premedical Course was established.
	7	Kyoto University Graduate School of Medicine was established.
1965		The Medical Library was established.
1972	5	The Institute of Laboratory Animals was established.
1975	4	The College of Medical Technology was established.
		The Congenital Anomaly Research Center was established.
1977	4	The School of Nursing was closed.
1979	4	The Center for Anatomical Studies was established.
1998	4	Three facilities (The Institute of Laboratory Animals, The Congenital Anomaly Research Center and The Center for Anatomical Studies) of the Faculty of Medicine were attached to the Graduate School of Medicine.
2000	4	School of Public Health (Master's program for 2 years, Doctoral program for 3 years) was opened.
		Medical Science (Master's program for 2 years) was opened.
		The Human Brain Research Center was established.
2003	10	School of Health Sciences was established.
2004	4	National University Corporation Kyoto University was established.
2005	4	Medical Science (Doctoral program for 5 years) was opened.
2007	3	The College of Medical Technology was closed.
	4	The Department of Human Health Science was established.
2008	4	School of Health Science was renamed School of Human Health Sciences.
2009	4	The Doctoral Course was established in the Department of Human Health Sciences.
2010	12	Medical Innovation Center was established.
2011	11	The Bio Frontier Platform Center (Medical Support Center) was established.
2014	2	Memorial Auditorium and Museum of the Faculty of Medicine was opened.
2015	11	AO admission was implemented.
2018	4	The Kyoto-McGill International Collaborative Program in Genomic Medicine (Doctoral Course for 4 years) was established.
	12	Professor Emeritus Tasuku Honjo was awarded the Nobel Prize in Physiology or Medicine.
2020	4	Center for Cancer Immunotherapy and Immunobiology was established.
2022	4	Center for digital transformation of healthcare was established.
2024	4	Center for Health Security was established.

Chronological Lists of the Deans and Directors (As of October 1, 2024)

Specialty	Name	Term of Office from	Term of Office to
Hygiene	Jiro Tsuboi	Jul 6.1899	Jul 13.1903
Medical Chemistry	Torasaburo Araki	Jul 24.1903	Jun 15.1915
Surgery	Hayazo Ito	Jun 23.1915	Jul 2.1921
Anatomy	Buntaro Adachi	Jul 2.1921	Jul 21.1925
Pharmacology	Kurata Morishima	Jul 21.1925	Apr 21.1928
Psychiatry	Shinkichi Imamura	Apr 21.1928	Apr 30.1932
Hygiene	Syozo Toda	Apr 30.1932	May 10.1936
Medical Chemistry	Kanae Maeda	May 11.1936	Apr 30.1938
Hygiene	Syozo Toda	Apr 30.1938	Nov 10.1938
Dermatology and Syphilology	Shinichi Matsumoto	Nov 30.1938	Nov 30.1940
Anatomy	Chikanosuke Ogawa	Nov 30.1940	Nov 28.1942
Anatomy	Seigo Hunaoka	Nov 28.1942	Dec 27.1944
Microbiology	Kiyoshi Kimura	Dec 27.1944	Dec 27.1948
Pharmacology	Kikuo Ogyu	Dec 27.1948	Dec 27.1952
Medical Chemistry	Senji Uchino	Dec 27.1952	Dec 26.1956
Anatomy	Ko Hirasawa	Dec 26.1956	Dec 16.1957
Dermatology and Syphilology	Toshihira Yamamoto	Dec 16.1957	Jun 14.1961
Anatomy	Isoo Horii	Jun 15.1961	Jun 15.1965
Pharmacology	Hajime Yamada	Jun 15.1965	Jul 31.1968
Pathology	Kozo Okamoto	Aug 1.1968	Aug 13.1969
Anatomy	Michio Okamoto	Aug 14.1969	Sep 1.1970
Anatomy	Michio Okamoto	Sep 1.1970	Dec 16.1973
Dermatology and Syphilology	Shigeo Ohfuji	Dec 16.1973	Dec 15.1975
Experimental Radiology	Tsutomu Sugahara	Dec 16.1975	Dec 15.1979
Medical Chemistry	Osamu Hayaishi	Dec 16.1979	Dec 15.1979
Microbiology	Yohei Ito	Dec 16.1981	Jul 26.1985
Public Health	Seiyo Sano	Jul 26.1985	Oct 1.1985
Public Health	Seiyo Sano	Oct 1.1985	Apr 1.1987
Internal Medicine	Haruto Uchino	Apr 1.1987	Mar 31.1989
Internal Medicine	Hiroo Imura	Apr 1.1989	Dec 15.1991
Integrative Brain Science	Kazuo Sasaki	Dec 16.1991	Mar 31.1993
Neurosurgery	Haruhiko Kikuchi	Apr 1.1993	Sep 30.1996
Medical Chemistry	Tasuku Honjo	Oct 1.1996	Sep 30.2000
Biological Sciences	Shigetada Nakanishi	Oct 1.2000	Sep 30.2002
Medical Chemistry	Tasuku Honjo	Oct 1.2002	Sep 30.2004
Cell Pharmacology	Shuh Narumiya	Oct 1.2004	Sep 30.2007
Anatomy and Developmental Biology	Kohei Shiota	Oct 1.2007	Sep 30.2008
Microbiology	Masao Mitsuyama	Oct 1.2008	Sep 30.2010
Immunology and Cell Biology	Nagahiro Minato	Oct 1.2010	Sep 30.2014
Hepato-Biliary-Pancreatic Surgery and Transplantation	Shinji Uemoto	Oct 1.2014	Sep 30.2018
Molecular and Cellular Physiology	Kazuhiro Iwai	Oct 1.2018	Sep 30.2022
Physiology and Neurobiology	Tadashi Isa	Oct 1.2022	

Deans and Directors (As of October 1, 2024)

Dean	Prof.	Tadashi Isa
Chairperson of Department (Human Health Sciences)	Prof.	Tomoki Aoyama
Member of University Education and Research Council	Prof.	Akifumi Takaori
Member of University Education and Research Council	Prof.	Koichi Omori
Vice-Dean	Prof.	Takashi Hanakawa
Vice-Dean	Prof.	Yasuyuki Fujita
Vice-Dean	Prof.	Takashi Mizowaki
Vice-Dean	Prof.	Yuichi Imanaka
Vice-Dean	Prof.	Tomoki Aoyama
Deputy-Dean	Prof.	Motoko Yanagita
Chairperson of Division (Medicine)	Prof.	Tadashi Isa
Chairperson of Division (Medical Science)	Prof.	Yasuyuki Fujita
Chairperson of Division (Public Health)	Prof.	Yuichi Imanaka
Chairperson of Division (Human Health Sciences)	Prof.	Tomoki Aoyama
Director of Center for Genomic Medicine	Prof.	Mitinori Saitou
Director of Institute of Laboratory Animals	Prof.	Masahide Asano
Director of Congenital Anomaly Research Center	Prof.	Hironori Haga
Director of Center for Anatomical Studies	Prof.	Hironori Haga
Director of Human Brain Research Center	Prof.	Takashi Hanakawa
Director of Center for Medical Education	Prof.	Tadashi Isa
Director of Center for Cancer Immunotherapy and Immunobiology	Distinguished Prof.	Tasuku Honjo
Director of Center for Digital Transformation of Healthcare	Prof.	Tomohiro Kuroda
Director of Health Security Center	Prof.	Yuichi Imanaka
Director of Medical Library	Prof.	Toshiya Murai
Director of University Hospital	Prof.	Akifumi Takaori
Assistant Director of University Hospital	Prof.	Shuich Matsuda
Assistant Director of University Hospital	Prof.	Hiroshi Seno
Assistant Director of University Hospital	Prof.	Etsuro Hatano
Assistant Director of University Hospital	Prof.	Toyohiro Hirai
Assistant Director of University Hospital	Prof.	Takashi Mizowaki

DATA

Number of Academic and Administrative Staff (As of May 1, 2024)

Academic Staff				Administrative Staff			Total
Professor	Associate professor	Senior lecture	Assistant professor	Administrative Staff	Technical Staff	Program-Specific Researcher	
76 (17)	65 (39)	55 (40)	60 (73)	50 (51)	14	(34)	320 (254)

( ): Number of Specially Contracted Fixed-Term Faculty and Staff

Number of Students (As of April 1, 2024)

Undergraduate Students

Medical Science

Year1	Year2	Year3	Year4	Year5	Year6	Total
112	117	116	110	109	102	666

Human Health Sciences

course	Year1		Year2		Year3		Year4		Total	
Advanced Nursing Sciences	17		18		25		30		90	
Advanced Rehabilitation Sciences (Advanced Physical Therapy)	2	84	6	82	16	8	26	2	50	176
Advanced Rehabilitation Sciences (Advanced Occupational Therapy)	6		3		5		13		27	
Multidisciplinary Medical Sciences	0		0		53		56		109	
Total	109		109		107		127		452	

Graduate Students

Master's Program・Professional Degree Program

	Year1	Year2	Total
Medical Science	28	26	54
Public Health	37	37	74
Human Health Sciences	76	74	150
Total	141	137	278

Doctoral Program (4-years)

	Year1	Year2	Year3	Year4	Total
Medicine	164	163	172	193	692
Kyoto-McGill International Collaborative program in Genomic Medicine	5	3	0	4	12
Total	169	166	172	197	704

Doctoral Program (3-years)

	Year1	Year2	Year3	Total
Medical Science	15	22	25	62
Public Health	18	14	22	54
Human Health Sciences	21	19	41	81
Total	54	55	88	197

Number of Undergraduate Graduates (As of April 1, 2024)

Medical Science

Under the old system (1903 ～ 1954)	5,673
Under the new educational system (1952 ～)	7,720
Special Division of Medicine(1942 ～ 1952)	804
Total	14,197

Human Health Sciences

School of Health Science(2004 ～ 2007)	565
School of Human Health Sciences(2008 ～)	1,666
Total	2,231

Number of Individuals Awarded a Degree (As of April 1, 2024)

Doctoral Degree

Type		Doctor of Medicine	Doctor of Public Health	Doctor of Medical Sciences	Doctor of Human Health Sciences	Doctor of Genomic Sciences
Old University System	According to the degree law before June, 1920	183	—	—	—	—
	According to the degree law after July, 1920	5,559	—	—	—	—
New University System	By completing the doctorate courses	5,085	137	162	121	3
	By submitting doctorate thesis	2,320	19	12	15	0
Total		13,147	156	174	136	3

Master's Degree

Medical Science	Master of Medical Sciences	489
Public Health	Master of Public Health	66
	Master of Public Health (Professional)	633
Human Health Sciences	Master of Human Health Sciences	901
Total		2,089

Number of Research Students and Research Fellows (As of April 1, 2024)

Type	Research Student	Research Fellow	Total
Medicine, Medical Science	87	12	99
Human Health Sciences	4	—	4

Number of Foreign Students (As of April 1, 2024)

Type	Undergraduate school	Graduate School	Research Student	Research Fellow	Short-term International Student	Special Research Student	Special Auditing Student	Total
Medicine, Medical Science	0	209	17	12	1	0	1	240
Human Health Sciences	0	14	6	0	0	0	0	20

Books・Journals (As of April 1, 2024)

	Number of books			Number of journals		
	Japanese	International	Total	Japanese	International	Total
Medicine, Medical Science	73,546	146,416	219,962	150	52	202
Human Health Sciences	23,272	4,322	27,594	40	11	51

Land area・Building area (As of April 1, 2024)

Land area

Faculty of Medicine Campus	63,494㎡

Building area

Faculty of Medicine・Medical Science	79,619㎡
Human Health Sciences	13,344㎡

Number of Dissections

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Systematic anatomy (Number of donated bodies)	23	24	29	25	21	24	23	27	20	29	31	39	16	20	29	21
Pathological autopsy cases	45	52	46	40	49	23	37	42	31	36	51	37	25	27	29	18
Forensic autopsy cases	89	69	99	99	118	93	75	100	71	106	87	126	112	144	112	94

Financial Status (¥ in thousands)

Operational Grants

Type	Amount of account settlement						
	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
Education	342,606	367,947	654,623	553,072	535,621	475,841	481,793
Research	939,858	609,838	552,559	734,229	874,511	1,066,776	1,673,970
General and administrative expenses	124,266	106,963	91,081	93,813	48,234	34,089	127,827
Personnel expenses - faculty	25,336	30,893	30,153	25,256	24,266	24,553	24,197
Personnel expenses - administrative	9,905	6,844	7,332	5,253	6,210	0	0
Total	1,441,971	1,122,485	1,335,748	1,411,623	1,488,842	1,601,259	2,307,787

*Personnel expenses include only salaries for foreign teachers, part-time lecturer allowances, and research support personnel expenses.

Expenses for Collaborative Research, Commissioned Projects and Donations

Type	Amount(Number of projects)						
	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
Collaborative Research	1,400,634(90)	1,317,685(76)	1,506,376(114)	1,319,143(100)	974,617(94)	1,020,189(113)	324,389(69)
Commissioned Projects	3,428,415(249)	3,097,927(280)	2,898,846(291)	3,413,694(262)	3,965,273(288)	3,184,974(286)	3,567,164(304)
Donations	403,896(120)	327,437(131)	347,217(134)	465,879(110)	337,615(121)	226,634(89)	465,132(134)
Total	5,232,945(459)	4,743,049(487)	4,752,439(539)	5,198,716(472)	5,277,505(503)	4,431,797(488)	4,356,685(507)

Grants-in-Aid for Scientific Research「KAKENHI」

Type	Amount (Number of projects)						
	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
Grant-in-Aid for Specially Promoted Research	60,000(1)	110,000(1)	–	–	–	–	–
Grant-in-Aid for Scientific Research on Innovative Areas	303,700(42)	287,300(35)	257,300(27)	182,600(22)	140,600(16)	111,900(8)	59,300(5)
Grant-in-Aid for Transformative Research Areas(A)	–	–	–	–	48,300(5)	55,100(9)	98,800(15)
Grant-in-Aid for Transformative Research Areas(B)	–	–	–	12,000(2)	–	–	–
Grant-in-Aid for Scientific Research(S)	200,200(7)	273,200(9)	199,500(7)	172,100(6)	255,300(7)	309,700(10)	231,600(8)
Grant-in-Aid for Scientific Research(A)	134,800(16)	133,500(13)	168,500(18)	175,300(19)	126,900(15)	124,000(13)	131,700(14)
Grant-in-Aid for Scientific Research(B)	356,900(78)	320,200(82)	364,800(92)	370,700(92)	366,500(91)	337,500(98)	317,300(85)
Grant-in-Aid for Scientific Research(C)	282,700(239)	251,000(231)	241,850(234)	221,910(221)	221,570(233)	237,650(252)	235,080(252)
Grant-in-Aid for Young Scientists(A)	43,700(7)	24,600(5)	14,300(3)	6,800(2)	–	–	–
Grant-in-Aid for Young Scientists(B)	171,750(142)	72,550(76)	13,600(25)	1,074(7)	469(4)	0(2)	–
Grant-in-Aid for Early-Career Scientists	–	106,700(74)	211,600(163)	236,800(208)	226,040(214)	227,660(221)	235,266(224)
Grant-in-Aid for Challenging Research (Pioneering)	106,000(67)	104,100(54)	71,700(40)	83,900(45)	85,700(45)	72,900(42)	60,700(38)
Grant-in-Aid for Challenging Research (Exploratory)	–	5,000(1)	5,000(1)	14,700(3)	14,000(4)	20,400(5)	20,500(5)
Fund for the Promotion of Joint International Research (International Leading Research)	–	–	–	–	–	100,000(1)	72,000(1)
Fund for the Promotion of Joint International Research (International Activities Supporting Group)	11,400(1)	Integrated into Grants-in-Aid for Scientific Research on Innovative Areas from FY2018					
Fostering Joint International Research (A)	–	41,400(4)	21,900(4)	0(1)	–	–	–
Fostering Joint International Research (B)	–	4,600(2)	16,400(4)	13,700(5)	19,500(5)	17,900(8)	22,800(7)
Grant-in-Aid for JSPS Fellows	40,430(43)	41,700(44)	54,011(55)	54,454(56)	54,800(60)	57,000(67)	64,700(64)
Grant-in-Aid for Encouragement of Scientists	2,900(6)	4,230(9)	1,920(4)	390(1)	5,280(12)	4,020(9)	4,480(10)
Grant-in-Aid for Research Activity Start-up	32,800(31)	30,600(29)	33,500(32)	48,200(48)	59,800(58)	54,100(58)	56,600(66)
Grant-in-Aid for Publication of Scientific Research Results(Database)	5,000(1)	5,300(1)	3,600(1)	2,400(1)	–	–	–
HIRAMEKI☆TOKIMEKI SCIENCE	–	–	270(1)	–	280(1)	–	–
Total	1,752,280(681)	1,815,980(670)	1,679,751(711)	1,597,028(739)	1,625,039(770)	1,729,830(803)	1,610,826(796)

Health Labour Sciences Research Grant

	Amount(Number of projects)						
	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
Principal Investigator	126,782(14)	100,213(10)	102,244(8)	131,985(13)	122,219(14)	130,347(17)	69,837(13)
Co-investigator	27,300(66)	31,484(73)	38,499(61)	167,024(83)	104,160(77)	118,609(76)	65,640(69)
Total	154,082(80)	131,697(83)	140,743(69)	299,009(96)	226,379(91)	248,956(93)	135,477(82)

International Exchanges (As of September 1, 2024)

Agreement for Academic Cooperation and Student Exchange

Country/Region	Partner Institution	Academic Cooperation	Student Exchange
Asia			
People's Republic of China	China Medical University	●	
	Tongji Medical College of Huazhong University of Science and Technology	●	●
	Fudan University Shanghai Medical College	●	●
	Peking University Health Science Center	●	
	China-Japan Friendship Hospital	●	
Republic of Korea	Yonsei University College of Medicine	●	●
	Seoul National University College of Medicine	●	●
Kingdom of Thailand	Faculty of Medicine Siriraj Hospital, MAHIDOL University	●	●
Taiwan	National Taiwan University College of Medicine		●
	Kaohsiung Medical University College of Medicine		●
	Taipei Medical University	●	●
Republic of Singapore	National University of Singapore Yong Loo Lin School of Medicine		●
Kingdom of Bhutan	Khesar Gyalpo University of Medical Sciences of Bhutan	●	
Republic of Indonesia	Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada/ Dr. Sardjito General Hospital	●	

Country/Region	Partner Institution	Academic Cooperation	Student Exchange
Europe			
French Republic	University of Bordeaux, Centre Hospitalier Universitaire de Bordeaux		●
Italian Republic	IFOM, The FIRC Institute of Molecular Oncology Foundation	●	●
Federal Republic of Germany	The Faculty of Medicine Eberhard Karls Universität Tübingen	●	●
	Bonn Institutes of Immunosciences and Infection, Medical Faculty, University of Bonn	●	
	The Max Delbrück Center for Molecular Medicine	●	●
Republic of Finland	The Faculty of Medicine, University of Oulu	●	●
North America			
United States of America	Perelman School of Medicine University of Pennsylvania	●	
	Brown University Warren Alpert Medical School		●
	Saint Anthony College of Nursing	●	
	Columbia University in the City of New York		●
	UC San Diego School of Medicine		●
Canada	McGill University Faculty of Medicine	●	

Students from Abroad (in FY2023)

Area	Country/Region	Graduate student	Non-regular student*
Asia	Republic of India	4	0
	Republic of Indonesia	4	2
	Republic of Singapore	1	1
	Kingdom of Thailand	4	2
	Republic of Korea	6	2
	Taiwan	18	9
	People's Republic of China	127	42
	Islamic Republic of Pakistan	2	0
	People's Republic of Bangladesh	2	1
	Republic of the Philippines	1	0
	Socialist Republic of Viet Nam	4	1
	Hong Kong	1	0
	Malaysia	1	0
	Republic of the Union of Myanmar	0	2
	Mongolia	3	2
	Democratic Socialist Republic of Sri Lanka	1	0
North America	United States of America	3	8
	Canada	5	0
Latin America and the Caribbean	United Mexican States	1	0
	Federative Republic of Brazil	1	4
	Republic of Colombia	0	1
	Republic of Peru	1	0
Europe	Italian Republic	0	1
	United Kingdom of Great Britain and Northern Ireland	1	1
	Republic of Uzbekistan	2	0
	Kingdom of Sweden	1	1
	Kingdom of Spain	1	0
	Federal Republic of Germany	0	5
	Republic of Finland	1	0
	Republic of Lithuania	1	0
	Russian Federation	0	1
Pacific	Australia	1	0
Middle East	Republic of Iraq	1	0
	Islamic Republic of Iran	2	0
	State of Kuwait	1	0
	Syrian Arab Republic	1	0
	Republic of Türkiye	1	0
	Lebanese Republic	1	1
Africa	People's Democratic Republic of Algeria	1	0
	Arab Republic of Egypt	7	1
	Republic of Kenya	1	1
	Republic of Zambia	0	1
	The Republic of the Sudan	1	0
	Republic of Benin	1	0
	Republic of Malawi	1	0
Total		217	90

Students going Abroad (in FY2023)

Area	Country/Region	Undergraduate student	Graduate student
Asia	Republic of Korea	1	0
	Republic of Singapore	0	2
	Kingdom of Thailand	2	1
	Taiwan	1	3
	People's Republic of China	0	1
	Kingdom of Bhutan	0	2
	Hong Kong	1	0
North America	United States of America	27	28
	Canada	0	13
Europe	Italian Republic	2	1
	United Kingdom of Great Britain and Northern Ireland	3	3
	Republic of Austria	1	0
	Kingdom of the Netherlands	0	1
	Federal Republic of Germany	5	1
	Republic of Finland	2	0
	French Republic	2	2
	Kingdom of Belgium	1	0
	Portuguese Republic	2	0
Pacific	Australia	0	1
Middle East	Islamic Republic of Iran	0	1
Africa	Democratic Republic of the Congo	0	1
計		50	61

*Non-regular student include Credited auditing students, Auditing student, Special auditing student, Special research student, Special exchange student, Short-term international student and Research student.

Endowed Chairs

Department of Respiratory Care and Sleep Control Medicine

【Establishment Period】April 1, 2024 – March 31, 2027 【Endowers】Philips Japan, Ltd., ResMed Ltd.
【Research Objectives】 1.To provide 24-hour respiratory management, including both wakefulness and sleep, aiming to improve outcomes for critically ill patients with multi-organ diseases.
2.To develop new medical devices and pharmaceuticals to achieve the above goal.
3.To conduct interdisciplinary studies on the impact of sleep-disordered breathing (SDB) on various disease conditions and contribute to clinical practice at the affiliated Kyoto University Hospital's Sleep-Disordered Breathing Care Unit.
4.To train physicians and specialists in respiratory care and sleep medicine.
【Faculty Members】 Susumu Sato, Hironobu Sunadome

Department of Community medicine supporting system

【Establishment Period】April 1, 2023 - March 31, 2026 【Endowers】Sugita Genpaku Memorial Obama Municipal Hospital, Hashimoto Municipal Hospital, Ako City Hospital
【Research Objectives】 ① Kyoto University Hospital will provide doctors at regional public hospitals with regular opportunities to learn the latest medical knowledge and provide specialized medical care in their respective fields. This will contribute to the development of regional specialists.
② Kyoto University Hospital will use information technology to build a remote diagnosis and medical support system that enables two-way communication between doctors in remote locations and doctors at Kyoto University Hospital.
③ Kyoto University specialists will also be involved in a wealth of regional cases, aiming to improve their overall diagnostic capabilities, not just their specialty.
④ Kyoto University will provide excellent young doctors with a research mindset working at regional general hospitals with clinical research literacy and practical training to develop doctors who can conduct high-quality research.
【Faculty Members】 Hideyuki Kinoshita, Shin Watanabe, Dai Yamazaki, Kiyomi Hamaguchi, Shinji Kaba, Hiroe Ohnishi, Tadashi Inuzuka

Department of Musculoskeletal Reconstruction

【Establishment Period】April 1, 2023 - March 31, 2025 【Endowers】KYOCERA Corporation
【Research Objectives】 We are independently developing artificial knee joint implants. By utilizing computer simulations and other analytical methods to assess knee joint dynamics and intra-articular contact pressure, we aim to enhance long-term durability and improve patient satisfaction.
【Faculty Members】 Akio Sakamoto, Shinichiro Nakamura, Yugo Morita

Department of Drug Discovery Medicine

【Establishment Period】April 1, 2024 - March 31, 2026 【Endowers】Sumitomo Pharma Co., Ltd., KYORIN Pharmaceutical Co., Ltd.
【Research Objectives】 To cultivate young researchers of drug discovery medicine by providing extensive knowledge and skills of translational research, pharmaceutical sciences, regulatory science, intellectual property and entrepreneurship, and to develop drug discovery methods based on advanced medical sciences.
【Faculty Members】 Masatoshi Hagiwara, Shuh Narumiya, Gen Ohtsuki, Chikako Saotome

Department of Advanced Medicine for Rheumatic Diseases

【Establishment Period】April 1, 2023 - March 31, 2026
【Endowers】 Nagahama City, Shiga Prefecture; Toyooka Public Hospital Association, Toyooka City, Hyogo Prefecture; Ayumi Pharmaceutical Co.; Asahi Kasei Pharma Co.
【Research Objectives】 (1) Enhancement of basic research on rheumatic diseases (2) Collection of clinical evidence on optimizing rheumatic disease treatment
(3) Training of nurses and pharmacists with expertise in rheumatic disease treatment (4) Contribution to regional medical care.
【Faculty Members】 Masao Tanaka, Akira Onishi, Koichi Murata, Takayuki Fujii, Shuichiro Nakabo

Department of aging science and medicine

【Establishment Period】April 1, 2022 - March 31, 2025 【Endowers】Meiji Holdings Co., Ltd.
【Research Objectives】 1.We aim to clarify the molecular mechanisms of aging and the molecular pathology of aged-related diseases to help promoting healthy longevity.
2.We aim to understand how nutrition, environment, temporal progression, and epigenomic status affect the rate of aging, senescence, and disease, with the goal of uncovering the underlying principal mechanisms of aging.
3.We aim to develop anti - aging approaches and work toward putting them into practice in society.
【Faculty Members】 Yoichi Nabeshima, Fumio Matsuzaki, Yoshihiro Uto, Minako Hoshi, Shinji Maegawa, Mayumi Mori, Quan Wu, Kanako Kobayashi, Chiaki Abe, Hirofumi Sogabe

Department of Neonatology

【Establishment Period】April 1, 2023 - March 31, 2027 【Endowers】Medical Corporation Imai Kai Adachi Hospital
【Research Objectives】 Objectives: In order to contribute to the improvement of the prognosis of preterm infants, we will lead basic and clinical research aimed at elucidating pathophysiology based on abnormalities in endocrine function in newborns. Up to now, we have conducted research mainly through clinical research, but based on this knowledge, we will develop research in animal experiments and cell experiments.
【Faculty Members】 Masahiko Kawai, Ryosuke Araki

Department of Therapeutics for Multiple System Atrophy

【Establishment Period】October 1, 2023 - March 31, 2027 【Endowers】SUNWELS Co., Ltd.
【Research Objectives】 ① Creation of animal models for neurodegenerative disorders ② Elucidation of disease mechanisms through human sample analysis
③ Exploration of biomarkers for early diagnosis ④ Development of therapeutic through multifaceted strategies
【Faculty Members】 Takashi Yamamura, Shuichi Matsuzawa, Hodaka Yamakado, Norihito Uemura

Surgery for abdominal oncology and organ regeneration

【Establishment Period】January 1, 2024 - December 31, 2026 【Endowers】Kinshukai
【Research Objectives】 To improve surgical outcomes for gastrointestinal and hepatobiliary cancers, advance organ regeneration research, train leaders for clinical application, and educate future surgeons through research dissemination and skill sharing.
【Faculty Members】 Takamichi Ishii, Kei Yamane, Hiromitsu Kinoshita, Takashi Sakamoto

Department of Head and Neck Oncology and Innovative Treatment

【Establishment Period】February 1, 2024 - January 31, 2029 【Endowers】Sky Corp.
【Research Objectives】 To establish advanced treatment methods for tumors occurring in various parts of the head and neck, and to provide optimal care to patients.
【Faculty Members】 Koichi Omori, Keigo Honda, Motoo Nomura

Regulatory Science of Medical Device Development and Innovation

【Establishment Period】October 1, 2024 - September 30, 2029 【Endowers】The Kobe City Hospital Organization
【Research Objectives】 To support the development of new pharmaceuticals and medical devices by leveraging the clinical research infrastructure backed by extensive clinical experience, we aim to foster regulatory science experts through personnel exchanges and other initiatives.
【Faculty Members】 Chiaki Sakai, Masahiro Tanji, Shigeki Takada

Department of Social Impact Assessment

【Establishment Period】November 1, 2024 - October 31, 2029
【Endowers】 Federations from seven prefectures (Osaka, Kyoto, Shiga, Hyogo, Nara, Wakayama, and Fukuoka) affiliated with the All Japan Federation of Democratic Medical Institutions Hankyu Hanshin Holdings
【Research Objectives】 • To advance and accumulate research on social impact assessment, evaluating the effects of various organizational activities not only on health but also from economic, social, and environmental perspectives.
• To promote Pay for Success (PFS) and Social Impact Bonds (SIB), establishing an academic foundation for collective impact through collaboration among industry, government, academia, and civil society.
【Faculty Members】 Daisuke Takagi, Daisuke Nishioka, Katsunori Kondo

Industry-Academia Collaboration Courses

Collaborative Research Laboratories Astellas Alliance Laboratory for Advanced Medical Research

【Establishment Period】April 1, 2023~March 31, 2026.
【Collaborative research】Astellas Pharma inc.
【Joint Research Topic】Drug discovery for advanced medical care
【Faculty Members】Shuh Narumiya, Chikako Saotome, Satoshi Nakamizo

Department of Advanced Medicine for Respiratory Failure

【Establishment Period】April 1, 2024 - March 31, 2027
【Collaborative research】Teijin Pharma Limited
【Joint Research Topic】Research on the pathophysiology of chronic respiratory diseases
【Faculty Members】Tomohiro Handa, Satoshi Hamada, Kimihiko Murase

Department of Clinical Bio-resource Research and Development

【Establishment Period】April 1, 2024 - March 31, 2026
【Collaborative research】KBBM
【Joint Research Topic】Research contributing to Precision Medicine using bioresources.
【Faculty Members】Masahiro Inoue, Kunishige Onuma

Department of Epilepsy, Movement Disorders and Physiology

【Establishment Period】June 1, 2023 – May 31, 2028
【Collaborative research】Sumitomo Pharma Co., Ltd., NIHON KOHDEN CORPORATION.
【Joint Research Topic】1) Elucidation of pathophysiological of intractable focal epilepsy focusing on EEG abnormalities and extracellular potassium ion disturbances, and 2) elucidation of the relationship between infra-slow activity (EEG recorded with a time constant of 2 seconds) and transient focal neurological episodes (TFNE) and the associated neurological disorders.
【Faculty Members】Akio Ikeda, Masao Matsuhashi

Department of Advanced Imaging in Medical Magnetic Resonance

【Establishment Period】April 1, 2023 - March 31, 2027
【Collaborative research】Canon Medical Systems Corporation
【Joint Research Topic】Development and evaluation of next-generation medical imaging
【Faculty Members】Koji Fujimoto, Kanae Kawai Miyake

Department of Regulation of Neurocognitive Disorders

【Establishment Period】April 1, 2024 - March 31, 2026
【Collaborative research】Cyn-K Bio, Inc.
【Joint Research Topic】Drug development for aging and immune-related disorders.
【Faculty Members】Kazuya Goto, Yuji Fukushima

Department of Immunology and Genomic Medicine

【Establishment Period】April 1, 2023 - March 31, 2026
【Collaborative research】Meiji Holdings Co., Ltd., Meiji Seika Pharma Co., Ltd.
【Joint Research Topic】Cell differentiation mechanism in immune system
【Faculty Members】Tasuku Honjo, Kenji Chamoto, Nasim Begum, Maki Kobayashi, Tomonori Yaguchi

Department of Digital Health and Epidemiology

【Establishment Period】July 1, 2020 - June 30, 2025
【Collaborative research】Eisai Co., Ltd. and Kyowa Kirin Co., Ltd.
【Joint Research Topic】Epidemiological studies on the quality of care and clinical outcomes utilizing various digital data
【Faculty Members】Yoko M. Nakao, Kayoko Mizuno

Department of Genomic Medicine

【Establishment Period】March 1, 2021 - February 28, 2026
【Collaborative research】Konica Minolta Co., Ltd.
【Joint Research Topic】Identifying issues and solving problems for the practice of genomic medicine in a new era
【Faculty Members】Hidenori Kawasaki, Akiko Yoshida, Masako Torishima

Laboratory of Tumor Microenvironment and Immunity

【Establishment Period】April 1, 2021 - March 31, 2026
【Collaborative research】Sumitomo Pharma CO., Ltd.
【Joint Research Topic】Drug discovery research based on elucidating the mechanisms by which stroma regulates immune responses in the tumor microenvironment.
【Faculty Members】Masakazu Hattori, Akiko Kobayashi, Yan Xu

Department of drug discovery for inflammatory skin diseases

【Establishment Period】May 1, 2021 - April 30, 2025
【Collaborative research】Maruho Co., Ltd.
【Joint Research Topic】Drug discovery for inflammatory skin diseases and exploring the potential of candidate compounds for development as therapeutic drugs.
【Faculty Members】Saeko Nakajima, Mami Shibuya

Department of Artificial Intelligence in Healthcare and Medicine

【Establishment Period】June 1, 2021 - March 31, 2025
【Collaborative research】Omron Healthcare Inc.
【Joint Research Topic】Leveraging medical records and time-series data from healthcare devices, we enable personalized disease risk assessment, improvement, and prediction.
【Faculty Members】Yohei Mineharu, Hirohiko Kohjitani

Department of Drug Discovery for Intractable Diseases

【Establishment Period】October 1, 2021 - September 30, 2025
【Collaborative research】Torii Pharmaceutical Co. Ltd, BTB Therapeutics GK
【Joint Research Topic】Developing novel therapeutics to address unmet needs
【Faculty Members】Takashi Nomura

Department of Personalized Cancer Medicine

【Establishment Period】November 1, 2021 - October 31, 2025
【Collaborative research】SCREEN Holdings Co., Ltd., AFI Corporation, Kyo Diagnostics K. K.
【Joint Research Topic】Development of innovative personalized medicine based on patient-derived cancer stem cell culture
【Faculty Members】Hiroyuki Miyoshi, Yukitoshi Takemura, Hisatsugu Maekawa, Fumihiko Kakizaki

Department of Immuno-Oncology PDT

【Establishment Period】November 1, 2021 - October 31, 2026
【Collaborative research】Meiji Seika Pharma Co., Ltd.
【Joint Research Topic】Molecular mechanism of immune activation in cancer immuno-PDT therapy and differentiation from other combination therapies
【Faculty Members】Kenji Chamoto, Chikatoshi Katada, Tomonori Yaguchi, Ken Matsumoto, Masashi Tamaoki

Next-generation clinical genomic medicine

【Establishment Period】April 1, 2022 - March 31, 2026
【Collaborative research】Nanpuh Hospital
【Joint Research Topic】We develop new cancer classifications and molecular targets through multi-omics analysis for precision medicine and drug discovery.
【Faculty Members】Akinori Yoda, Tomonori Hirano

Large Scale Medical AI (Fujitsu research lab.)

【Establishment Period】November 1, 2022 - March 31, 2025
【Collaborative research】Fujitsu Limited
【Joint Research Topic】Research on AI technology research for predicting outcomes and discovering insights through the analysis of integrated large-scale medical data
【Faculty Members】Shigeyuki Matsumoto

Department of Adaptive and Maladaptive Responses in Health and Disease

【Establishment Period】April 1, 2023 - March 31, 2028
【Collaborative research】Meiji Holdings Co., Ltd.
【Joint Research Topic】Toward understanding molecular and cellular mechanisms of leaky gut and brain aging
【Faculty Members】Takeshi Kawauchi, Shiho Ito, Ryo Yamada

Department of Innovative Drug Discovery

【Establishment Period】August 1, 2024 - July 31, 2027
【Collaborative research】Magmitt Pharmaceutical Co., Ltd.
【Joint Research Topic】Drug discovery research through investigation of pathology in intractable diseases
【Faculty Members】Masayasu Toyomoto, Hiroaki Ohara

Implementation Science in Public Health

【Establishment Period】October 1, 2024 - March 31, 2028
【Collaborative research】Healthtech Laboratory, Inc.
【Joint Research Topic】Advancing Practical Implementation Science
【Faculty Members】Yoshimitsu Takahashi, Tomonari Shimamoto

Related Centers and Facilities

Medical Library

The Medical Library, housed in a three-story building with a basement (total floor space, 2,246m²), was established in 1965 by integrating the individual department libraries previously scattered throughout the Faculty of Medicine. The library building contains offices for circulation and reference services, as well as rooms for periodicals, reading, stacks, and audio-visual materials. The Library serves as a major source of biomedical information on campus, as well as for researchers nationwide. Current collection includes 219,542 volumes, 6,065 periodical titles, and a number of electronic resources. The Library also offers a copying service for researchers and visitors.

Institute of Laboratory Animals

This institute was established in May 1972 as a joint-use research facility for animal experiments in the Faculty of Medicine (now the Graduate School of Medicine and Faculty of Medicine). The institute conducts animal experiments, production and breeding of laboratory animals, and development, education and research of laboratory animals related to medicine and life sciences. The current facility building is the second generation, and has been in operation since July 2003 after the old building was expanded and renovated. In addition, the National BioResource Project -Rat has been implemented since 2002 with this facility serving as the core organization.

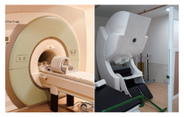
Congenital Anomaly Research Center

The Congenital Anomaly Research Center was established in April 1975 to conduct research into “human fetal medicine and the prevention of birth defects.” It preserves human embryos and fetal specimens, and records have been collected since 1961. To date, it has collected over 44,000 specimens. Through research using the most extensive collection of human embryos globally, we promote comprehensive research to elucidate the etiology and pathogenesis mechanisms of congenital abnormalities and their prevention. Our center is one of the world's leading centers for human embryology and congenital anomaly research, collaborating with many researchers both within and outside the university.

Center for Anatomical Studies

Established in 1982, the Center for Anatomical Studies (CAS) was founded to integrate various anatomical services that were initially dispersed across the department. The center houses dissection rooms for systematic dissection, pathological and forensic autopsies, as well as facilities such as lecture rooms for medical education, supporting education and research activities. Additionally, we provide advanced morphological research support, offering services including sample preparation, dissection, various staining techniques, electron microscopy analysis, and AI-assisted histological analysis to both internal and external researchers.

Human Brain Research Center



The Human Brain Research Center (HBRC) was established in April 2000 to further advance the already world-class brain science being carried out at Kyoto University Graduate School of Medicine in an even more comprehensive way. Specifically, by integrating psychological, neurophysiological, and functional brain imaging studies, the center was created for non-invasive research on higher brain functions in humans. Aiming to improve overall research efficiency, the HBRC promotes the shared use of its research facilities with researchers both within and outside Kyoto University. Currently, the activities of the HBRC go beyond the research-domain specific studies of neurophysiology and neuroimaging. Research on the functions of normative brains as well as brains with various kinds of neuropsychiatric disorders is conducted using a range of non-invasive brain measurement techniques.

Center for Genomic Medicine

The Center for Genomic Medicine was established in April 2004 as a core research facility of the Graduate School of Medicine. It aims to act as a center of excellence for genomic medicine research by conducting advanced studies in genomic epidemiology and human disease genomics based on the whole genome and comprehensive multi-omics information. The center promotes further medical and health sciences development through the social implementation of research findings. The center also supports research projects in genomic medicine across Kyoto University.

Center for Medical Education and Internationalization

The center was established in 2004 to enhance undergraduate and postgraduate medical education at Kyoto University. Its goal is to support the educational initiatives of each department within the Graduate School of Medicine by promoting system reforms and improving content cross-sectionally. For undergraduate education, the center has created a comprehensive framework for clinical training in collaboration with off-campus medical institutions and is continually updating the curriculum. Additionally, it actively promotes international exchange for students, supports faculty development, and develops new evaluation systems.

Medical Research Support Center

Established in November 2011, the Medical Research Support Center (MRSC) has been consistently providing cutting-edge technical support to researchers in both academia and industry. MRSC optimizes the use of research resources through centralized management of research equipment and by offering a wide range of contract-based analytical services. As of the 2024 fiscal year, it operates nine shared-use core facilities: the Drug Discovery Center, Division for DNA sequencing and Bioinformatics, Division for Mass Spectrometry, Kyoto University Live Imaging Center, Division for Mouse Behavior Analysis, Division for Small Animal MRI, Division of Medicinal Chemistry, Kyoto University Research Center San Diego (KURC-SD) and Division of Advanced Biomedicine.

Center for Cancer Immunotherapy and Immunobiology (CCII)

CCII was established in April 2020 to improve cancer medicine by solving various remaining issues in cancer immunotherapy. We have built a one-stop research system, from basic to clinical application, by bringing together cancer immunology researchers worldwide in a cross-disciplinary collaboration with medical institutions such as Kyoto University Hospital. We will further strengthen this network into the future. The founding director of the center is Tasuku Honjo, Distinguished Professor of Kyoto University Institute for Advanced Study, who was awarded the Nobel Prize in Physiology or Medicine in 2018 for his discovery of PD-1. As the first research center for cancer immunology in Japan, CCII aims to develop cancer immunotherapy, not just from the aspect of “cancer” and “immunology” . CCII members will be the forerunners in cancer immunology research and raise worldwide young leaders in this field.

Center for Digital Transformation of Healthcare

Kyoto University Center for Digital Transformation of Healthcare was established in April 2022. Our center fosters interdisciplinary collaboration among the four divisions of the Graduate School of Medicine—Medicine, Medical Science, Human Health Sciences, and Public Health—while also integrating advanced expertise from the Faculty of Humanities and Social Sciences (Law) and the Data Science Education Hub. By consolidating medical knowledge and data science across multiple scales, ranging from the molecular and cellular levels to organs, the human body, and society, we drive cutting-edge research in medical DX. Furthermore, we incorporate legal and ethical perspectives to promote responsible innovation. Our ultimate goal is to cultivate world-class professionals equipped with both technical expertise and a deep understanding of regulatory and ethical frameworks, enabling them to lead advancements in medical DX and contribute to the transformation of global healthcare systems.

Center for Health Security (CHS)

The Center for Health Security has a mission to ensure that people can live safely and healthily in both times of crisis and normalcy. Nowadays, we are experiencing various disasters with increasing frequency, such as typhoons, floods, earthquakes, wildfires, and pandemics, at least partially due to climate change. Silent crises are also approaching, including population decline, increasing pressure on social security, widening disparities, and antimicrobial resistance. Given these crises, it is becoming critically important to protect health and well-being. The Center is dedicated to advancing scientific knowledge, developing practical technologies, and designing and implementing effective policies and strategies for health security during crises and at risk of crises. The Center also strives to cultivate professionals who will drive continuous contributions to society by reinforcing health security. The Center is a solution-oriented platform dedicated to strengthening prevention, preparedness, response, recovery and reconstruction for crises that impact people's health and well-being, based on an all-hazard approach. Through interdisciplinary and international networking, the Center transcends sectoral boundaries to address social challenges and enhance people's health and well-being during crises and at risk of crises. It integrates expertise from diverse fields, including medicine, public health, disaster prevention, engineering, the natural and social behavioral sciences.

Campus Map